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Science and the Culture of American Childhood, 1900-1980

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Science and the Culture of American Childhood, 1900-1980

by

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Dedicated to Nick, my favorite tinkerer, who always wants to know why

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Science and the Culture of American Childhood, 1900-1980

Rebecca Stiles Onion, Ph.D.

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In American culture of the twentieth century, there has evolved a persistent popular association between the personal qualities of children and of scientists. Efforts to encourage children to get "hooked on science" have consistently noted this affinity, as Americans have ascribed curiosity, wonder, and delight in discovery to their children. Responding to debates within cultural history, childhood studies, and the history of science, this dissertation argues that tracking the ways that this cultural commonplace has been created, and showing how it has depended upon inequalities of gender, race, and class, can help us understand intermingled attitudes of awe and distrust toward science in public culture. In five chapters, the dissertation traces efforts to bring science into children's popular culture across the twentieth century, showing how these efforts constitute a very visible form of public science. In Chapter One, located in the Progressive Era, the American Museum of Natural History and the Brooklyn Children's Museum offer comparative case studies that show how "science" was perceived as a civilizing or empowering force in children's lives, depending on their social class. In the interwar period, children's culture taught that posing questions about the natural and technological worlds was a practice that cemented a white male child's position as the vanguard of evolution. Chapter Two examines the proliferation of children's non-fiction

and encyclopedias, and Chapter Three shows how chemistry sets created images of modern boyhood. In the postwar era, young scientists began to appear as an endangered species, as science promoters saw popular culture as a threat to the kind of individuality and focus necessary for serious inquiry. Chapters Four and Five show how promoters of the Westinghouse Science Talent Search and Robert Heinlein, author of a series of young-adult science fiction novels, sought to create alternative youth cultures hospitable to science. By examining the images of young inquirers that result from these popularization efforts, I argue that these images helped adults come to terms with their own relationships to innovation, while naturalizing the perception of science as an intellectual project of privilege.

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Introduction: A Curious Century: Children's Science as Public Science

In February 2012, President Barack Obama hosted a science fair in the White House, where he was photographed with a 14-year-old contributor to the fair, Joey Hudy of Phoenix, Arizona. One resulting image, reproduced below, captured the Commander-in-Chief's wide-eyed expression as he gleefully operated Hudy's invention, an "Extreme Marshmallow Cannon." This image had an afterlife, circulating on Facebook and Twitter (@karinjr, with a link to a Huffington Post article on the event: "In other 'Obama is Adorable News,' may I remind you of this?...You may say 'Aw' now"; @TJHtwits: "What a lovely man Obama is!"). The Obama re-election campaign recognized the image's power and created an animated GIF of the event of the cannon firing, posting it on the campaign's official Tumblr page.

In this image, Obama performed excitement, curiosity, and wonder in the face of a child's innovation, emotions that he stressed in the speech he gave to the assembled children, their parents, and the press. The subtext of the image: science and technology, especially when practiced by glasses-wearing youngsters, have the capacity to render even such powerful, worried men as Obama momentarily carefree. Like Neil DeGrasse Tyson of the American Museum of Natural History and Bill Nye, "the Science Guy," two science popularizers Obama lauded in his presentation, Obama shows through this performance that he has "dedicated himself to making science cool for young people."

At the same time as he modeled these positive emotions for the assembled group, Obama's speech contained a different message: children should hardly need to be told to like science; such a liking was genetically coded into the American personality. "We're a nation of tinkerers and dreamers and believers in a better tomorrow," Obama told the group. "You think about our Founding Fathers—they were all out there doing experiments—and folks like Benjamin Franklin and Thomas Jefferson, they were constantly curious about the world around them and trying to figure out how can we help shape that environment so that people's lives are better. It's in our DNA."[1] In identifying curiosity and a public-minded dedication to manipulation of the physical environment as "part of our DNA," Obama collapsed biological and cultural heritage, claiming science-mindedness as part of an American intellectual tradition that manifests itself in the young of each generation, whether or not that generation is biologically descendent from the actual Founding Fathers. By invoking a love of experiment as heritage, Obama also gestured at other tropes of American exceptionalism: rugged individualism balanced with concern for the welfare of a larger community; pragmatic approaches to problem-solving; and a commitment to physical mobility and personal freedom.

President Obama is a twenty-first-century descendent of the string of twentieth-century American adults—politicians, authors, teachers, journalists, museum workers, artists, toymakers—who have celebrated American children's "natural" potential in the scientific fields. As science teaching in school during this century has been the object of continual renovation and reconstruction, often maligned by scientists as insufficient or condemned by religious factions as corruptive, the parallel development of the science

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[1] Barack Obama, "Remarks by the President at the White House Science Fair," *Whitehouse.gov*, February 7, 2012, http://www.whitehouse.gov/photos-and-video/video/2012/02/07/president-obama-speaks-white-house-science-fair#transcript.

extracurriculum, which has proposed utopian spaces of science practice driven by pure emotions of curiosity and wonder, offers an intriguing opportunity for cultural analysis. The history of the evolution of this extracurriculum shows how ideologies of nationalism and rationalism have mixed with changing ideas about the nature of education, the meaning of scientific practice, and the proper duties of childhood in creating children's scientific popular culture. Looking at this extracurriculum can also expand our understanding of the gendered nature of science education; while, as historians such as Kimberly Tolley have argued, the experience of classroom learning during this time often discouraged girls interested in scientific careers, the maleness of the imagined audience of the "fun science" created alongside the formal curriculum may have cemented these exclusions.[2]

This history shows how the belief in a child's joy in science, as practiced independently in leisure hours, has changed adult understandings of the meaning of science itself. Scholars in childhood studies, including Karen Sanchez-Eppler, have documented the way that ideas and practices surrounding childhood have been central to the making of social meaning.[3] During the twentieth century in the United States, the folding of science into the set of activities deemed "typical" or "right" for children to practice in their leisure time meant that science would take on some of the universality and purity of childhood—or that science and childhood, as concepts associated with

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[2] Kimberley Tolley, *The Science Education of American Girls: A Historical Perspective* (New York: RoutledgeFalmer, 2003).
[3] Karen Sánchez-Eppler, *Dependent States: The Child's Part in Nineteenth-century American Culture* (Chicago: University of Chicago Press, 2005).

innocence, naturalness, purity, and timelessness, would mutually reinforce each other. This relationship between science practice and the joys of childhood is so deeply ingrained in present-day American common wisdom that a quotation from Einstein, “The pursuit of truth and beauty is a sphere of activity in which we are permitted to remain children all our lives,” appears on a page of a day-by-day Zen calendar; developmental psychologist Jean Piaget’s ideas about very young children’s scientific “experimentation” with life appear in *Time* magazine and find a popular afterlife in books for parents by psychologist Alison Gopnik[4]; and the toy industry sells a cornucopia of brightly-colored science toys in every shape and size, marketing to parents an image of the engaged child learning to question life on his own terms.

The growth of this association between children, childhood, and science practice has serious implications for our historical understanding of American attitudes toward some key aspects of modernity: innovation, futurity, “progress,” and the social circulation of scientific knowledge. Sociologists of childhood have often noted that children occupy a unique place in the culture of modernity, signifying, as they do, both a repetition of the past and the promise of the future. Allison James and Alan Prout write that, in secular modernity, where myths and religious conceptions about the passage of time have receded, “It is children rather than ‘fate,’ ‘gods’ or ‘demons’ who will most likely endure to shape and participate in any future social world; they are the ‘next generation,’ the

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[4] See Alison Gopnik, *The Philosophical Baby: What Children’s Minds Tell Us About Truth, Love, and the Meaning of Life*, 1st ed. (New York: Farrar, Straus and Giroux, 2009); Alison Gopnik, *The Scientist in the Crib: Minds, Brains, and How Children Learn*, 1st ed. (New York: William Morrow & Co, 1999).

‘guardians of the future’ on whose shoulders time itself sits.”[5] The close examination of the minds, habits, and tendencies of children—a project that was itself a product of modernity, and was institutionalized through the fields of developmental psychology and educational theory in the early twentieth century—contains fears and hopes about appropriate social reproduction in the face of what was perceived as rapid social change. The child came to represent stasis and change at the same time, as traditions and new possibilities mingled.

The patrons of the Brooklyn Children Museum in the early twentieth century embody this ideal conflation of constancy and change. In an image published in *Popular Science* in April 1908, they are seen clambering around on the rooftop of the Museum in the process of installing wireless radio equipment[6]; their forward-thinking involvement in new technologies was rooted comfortably in the Victorian mansion that housed their supervised experimentations. In promoting science play, as the adults involved with the Museum did, twentieth-century American adults were often nostalgic about their own childhoods spent investigating and exploring, while reassuring each other that their efforts would steadily better both living conditions in society as a whole and the individual child’s position within that society. In encouraging children’s science play, adults coming to a personal understanding of the meanings of modernity could visualize a

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[5] Allison James and Alan Prout, “Re-presenting Childhood: Time and Transition in the Study of Childhood,” in *Constructing and Reconstructing Childhood: Contemporary Issues in the Sociological Study of Childhood*, ed. James, Allison and Prout, Alan, 2nd ed. (London: RoutledgeFalmer, 1997), 236.
[6] Anna Billings Gallup, “The Children’s Museum as an Educator,” *Popular Science Monthly*, April 1908.

future regime of knowledge in which universal scientific literacy was natural, enjoyable, and fun.

However it might participate in this felicitous resolution of tensions, Obama's speech, while forwarding the idea that "American children are naturally scientific," was also uncertain, emphasizing the need for re-investment in STEM (science, technology, engineering, and math) education in a world facing major challenges. The relationship between txhe strains of celebration and anxiety in Obama's speech shows how the promotion of science play is historically contingent, containing traces of the century's changing attitudes toward science, nationalism, and childhood.

In this dissertation, which tracks the development of this relationship between childhood, science, and "fun" over eighty years of American cultural history, the contrast between adult attitudes before and after World War II serves to illustrate this contingency. Adults in the Progressive Era and the interwar years, such as the curators and supporters of the Brooklyn Children's Museum, were inspired by the teachings of the progressive education movement; they believed that children's affinity for science was natural, inherent, and constant, needing only to be activated by the proper tools and experiences—which they proposed to provide through the creation of a popular culture that would reinforce the association between experimentation and fun. This was the time when American production of such child-specific iterations of scientific popular culture as museums, non-fiction books, and science toys expanded greatly.

Since World War II, Americans, while retaining some of these beliefs in the innocent association between children and science, have bemoaned their children's lack of commitment to science in their high school years and beyond, making negative comparisons between the level of STEM achievement in this country and that reached in such "others" as Russia, Japan, China, and Korea. Some adults in the postwar era blamed popular culture for this failure, folding fear of loss of scientific "manpower" into a larger moral panic over juvenile delinquency and social conformity by arguing that children's youthful enjoyment of science was corrupted by a vapid and unsubstantial peer culture. Some, like science fiction writer Robert Heinlein, thought that boys who would otherwise be committed to STEM careers suffered at the hands of scientifically ignorant (and often female) teachers, authors of children's books, and librarians. Others, such as social critic Paul Goodman, thought that young people shied away from science because of the new association between science, technology, and the military. Still others believed that children failed to commit to science because of the new pressure to "achieve," which sapped the practice of its inherent fun; proponents of this point of view, such as Frank Oppenheimer, the founder of the San Francisco science museum The Exploratorium, favored a new approach intended to reconnect children and adults with what he saw as the universal joy of science practice.

It is part of this dissertation's goal to trace the ways in which larger changes—in industrialization, in understandings of human nature, in the professionalization of the sciences, and in America's position in the world—affected this change in the ideologies surrounding children's science play. Before World War II, I argue, adults creating children's scientific popular culture relied on evolutionary models of history that saw white American children (in particular, boys) as the pinnacle of years of refinement in human thought. Adults were reassured that if given the correct tools, American children would succeed in perpetuating the national project of accumulation of knowledge through avid scientific inquiry and practice. During and after World War II, this confidence largely disappeared, with the previous array of racial reassurances vanishing and a new awareness of global competition (and the potential for devastating global nuclear conflict) rising in its place. Part of the work of this dissertation is to define this change, asking how the shift in attitudes from prewar confidence to postwar anxiety might help us understand the complex present-day approach to the encouragement of science-as-play in American childhood.

Popular Science, Kiddie Science

The cultural objects and attitudes I examine in this dissertation form a body of "popular science" highly specific to its time and place. The knowledge that circulated in the basement chemistry lab, the science fair, and through the children's encyclopedia assumed the form that it did because of the way that American adults perceived the duties, rights, and advantages of being an American child. In tying this study to a larger history of evolving attitudes toward childhood, I follow recent suggestions of historians of science interested in articulating the specific cultural parameters that define the circulation of scientific knowledge. In 1994, Roger Cooter and Stephen Pumfrey argued that, to historians of science, science in popular culture was "shrouded in obscurity":

"Our ignorance both of the low drama and the high art of science's diffusion and modes of popular production and reproduction is staggering."[7] Since that time, work done in the realm of "popular science" has increased, while practitioners have called for an increased degree of specificity and cultural context in this work. Historian of science James Secord has called for a shift in focus from the "origins and producers" of scientific knowledge to the places where such knowledge circulates. "We need to analyze audiences and readerships closely and carefully, with the same awareness of cultural nuance we might bring to an account of life in the laboratory," he writes. "Otherwise, we are simply reproducing the notion that science passes from highly individualized sites of production to an undifferentiated mass public."[8] During the time under examination, the child "public" was anything but undifferentiated in the eyes of the larger culture; as Americans worried about, obsessed over, defined and redefined the meaning of childhood, their creation of "science fun" for this particular "public" was shaped by their new understanding of the cultural significance of this phase of life.

The site-based description and investigation of popular scientific cultures has provided a valuable method of approach to the problem of defining the circulation of scientific knowledge in childhood—particularly because the culture of American childhood during the twentieth century has been marked by the creation of previously nonexistent child-specific segments of popular culture. In their introduction to a

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[7] Roger Cooter and Stephen Pumfrey, "Separate Spheres and Public Places: Reflections on the History of Science Popularization and Science in Popular Culture," *History of Science* 32 (September 1, 1994): 237.
[8] James A. Secord, "Knowledge in Transit," *Isis* 95, no. 4 (December 2004): 662.

collection of essays about science "in the marketplace" in nineteenth-century Britain, Aileen Fyfe and Bernard Lightman articulate this perspective, arguing that historians must look at a wide variety of sites of interaction between "public" and "science," and think about the range of experiences that these "publics" might have within these sites.[9] The nineteenth century saw the birth of organized scientific societies and professionalization in the UK and the US—a development which, Fyfe and Lightman argue, called forth a new brand of "popular" science. In public spaces, the fruits of inquiry were offered for interested parties who were shut out from official scientific discourses.

Just as Fyfe and Lightman's collection of essays looks at the parlor, the gallery, the panorama, the exhibition, and the lecture as sites of encounter, recognizing that the impresarios and promoters who made these encounters possible operated with a wide variety of motivations (from desire for profit, to religious commitment, to philanthropic zeal), this dissertation examines popular science for kids as it appeared in the museum, the non-fiction children's book, the toy store, the science talent search, and young adult science fiction, while identifying the commitments of the adults involved in the creation of these cultural forms. In each of these instances, my goal is to articulate how the complex and evolving ideology defining the significance and nature of American childhood affected the form, content, and function of the playful science activities proffered for the enjoyment and edification of real children.

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[9] Aileen Fyfe and Bernard V. Lightman, "Science in the Marketplace: An Introduction," in *Science in the Marketplace: Nineteenth-Century Sites And Experiences*, ed. Aileen Fyfe and Bernard V Lightman (Chicago: University of Chicago Press, 2007).

The question of reception that Secord, Fyfe, and Lightman emphasize is a more difficult one. As is widely recognized by practitioners of the history of childhood,[10] finding evidence of children's reactions and contributions to culture can be difficult, bordering on impossible; adult archives don't often contain records of children's thoughts, and even when they do, because of the unequal power differential between children and adults, it is hard to separate a "true" reaction from a statement given in order to please an adult inquirer. However, I have tried whenever possible to include such input from child audiences as I can. I have found children's voices in the archive of the Brooklyn Children's Museum, where child patrons published a series of periodicals documenting their activities at the Museum; in the letters written to the *Chemcraft Science Club Magazine* from young people who had formed their own science clubs; and, at a remove, in oral histories documenting twentieth-century scientists' childhood relationships with chemistry sets, science-themed movies and television, and science fiction.

Perhaps most importantly, the association between science and childhood in popular culture has serious implications for the public's perception of the nature of scientific activity. What can an investigation of the American enthusiasm for science practice in childhood and youth tell us about the contentious relationship between many American adults and the scientific community? In arguing for a renewed examination of "science in popular culture," Katherine Pandora and Karen Rader have asked, "Is what

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[10] See, for example, Karen Sanchez-Eppler, forthcoming, *In the Archives of Childhood: Personal and Historical Pasts*; Maude Hines, "Review: Playing with Children: What the 'Child' Is Doing in American Studies," *American Quarterly* 61, no. 1 (March 1, 2009): 151–161.

we experience as the current relationship between scientists and the public an inevitable outcome of the nature of scientific investigation, or is it the result of choices that could have been otherwise?"[11] This history articulates one way in which the adult "public" has come to understand science to be something external to themselves. Contemporary observers of science in American culture, like science writer Natalie Angier, bemoan the segregation of science activity in childhood, and wonder why "childhood is the one time of life when all members of an age cohort are expected to appreciate science."[12] The common wisdom that children's investigations of the world around them are somehow akin to science practice—and, therefore, that children, if left to unfold "naturally," would of course translate the two-year-old's fun of pouring sand from one vessel to the other into the more directed and controlled "fun" of scientific investigation—contains within itself the converse idea that scientists are naturally childlike and unworldly. Does the strong relationship between science and "childishness" imply that a love of science is impractical or ill-befitting an adult citizen? And what does the association between science and "innocence"—a characterization that contradicts the very real implications of scientific work for everyday life—do to forestall a real discussion of these implications? An examination of the close cultural ties created between childhood and science in the twentieth century—ties that imply an exclusive relationship between an age cohort and a

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[11] Katherine Pandora and Karen A. Rader, "Science in the Everyday World," *Isis* 99, no. 2 (June 2008): 364.
[12] Natalie Angier, *The Canon : a Whirligig Tour of the Beautiful Basics of Science* (Boston: Houghton Mifflin Company, 2007), 1–3.

complex set of intellectual practices—can illuminate the current landscape of public perceptions of science.

Understandings of Childhood/Shaping Science Play

This dissertation considers forms of culture that were directed specifically at young people who were, in general, of elementary school age. I have chosen to look at this cohort because of the historical belief that children who were in elementary school were ideally situated between the undirected creativity of early childhood and the vocational commitments of adolescence; many of the entertainments produced for this age cohort encouraged the kind of rationally joyful inquiry that seemed, to adults, to be particular to this age. My chapter on the Science Talent Search (Chapter Four) looks at seniors in high school, but it does so because the Talent Search was interested in understanding seniors' scientific commitments as a product of their childhoods, and in identifying factors that allowed adolescents to preserve the spirit of curiosity that was understood to be the province of younger children, while also developing a more directed program of research. As with any form of study of popular culture, it's difficult to define the age of the audience of some of the cultural objects I examine. Although Robert Heinlein may have believed that his novels were directed at a twelve-year-old audience, younger and older readers clearly found them in libraries and read them, and while the Brooklyn Children's Museum generally served an elementary school population, some older children continued to come to the BCM in order to take advantage of its facilities.

Changing conceptions of the fundamental nature of childhood in American modernity must intimately inform an analysis of the social function of scientific popular culture for children. Scholars in the history of childhood and in the loosely defined field of childhood studies have traced these changing conceptions, pointing to places where larger social factors have shifted the place of children within the culture; this dissertation draws from this body of historical knowledge. During the time under examination, middle-class children of elementary school age definitively exited the world of wage labor, while steadily gaining emotional power within their families and in the public sphere. Sociologist Viviana Zelizer has argued that the beginning of the twentieth century saw "an expulsion of children from the 'cash nexus,'" as most middle-class families began to see children as "an exclusively emotional and affective asset" rather than as workers contributing to the family income.[13] The process of what Zelizer calls "sacralization" of children's lives was both a product and a cause of large-scale changes in children's everyday experiences; these changes included the end of many forms of child labor, the segregation of children from adults in public spaces, the beginning of compulsory schooling, and the creation of markets for goods aimed exclusively at children. While children ceased to earn money, their families began to spend more on their clothes, toys, and books, and the practice of giving children an allowance to buy some of these goods themselves began to gain in popularity.[14]

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[13] Viviana A. Rotman Zelizer, *Pricing the Priceless Child: The Changing Social Value of Children* (New York: Basic Books, 1985), 11.
[14] Daniel Thomas Cook, *The Commodification of Childhood: The Children's Clothing Industry and the Rise of the Child Consumer* (Durham: Duke University Press, 2004); Lisa Jacobson,

The contours of children's popular science, as it took shape in the US, were defined by these new social realities. Children's scientific entertainments often cost money, as I will describe in chapters on the market for science sets and for non-fiction books, but the children who were entertained by these sometimes-expensive toys and books were embodying a rational style of leisure, one that channeled their impulses toward novelty-seeking in favorable intellectual directions. Sometimes science play resulted in children earning money, through offering such services as testing water with a chemistry set or putting on a "chemical magic" show, or through the winning of prizes or scholarships from chemistry set company contests or science fairs. These small "salaries" were entirely appropriate for the new model of childhood, which demanded that any "work" children performed be educative, enjoyable, and result only in financial compensations that wouldn't wind up in the family coffers.

The vision of American children passing their newly abundant leisure time in science play appealed to American adults, as these adorable miniature investigations ideally combined productivity and pleasure, promising future success as well as providing immediate entertainment. This focus on childhood scientific capacity was a particular early twentieth-century American permutation of what sociologist Chris Jenks has identified as an "Apollonian" view of the child—an understanding of childhood as a period of pre-civilized purity, and thus, extraordinary mental advantage. (Jenks juxtaposes this paradigm with a previous understanding of children as "Dionysian":

Raising Consumers: Children and the American Mass Market in the Early Twentieth Century (New York: Columbia University Press, 2004).

uncontrollable, motivated by instinct, and in need of severe discipline.) In this paradigm, the child mind is pictured as unsullied, capable of connecting more perfectly to "truth" because it has yet to be clouded by the duties and obligations of adulthood lived in modernity. Jenks describes the "Apollonian child" as "naturally good," with a "clarity of vision" which is seen as "the source of all that is best in human nature." Children participate in the essential activity of human life, and in a modern era, their potential, if properly educated, points the way to a new way of living.

Operating from a Foucauldian perspective, Jenks identifies this investment in the shaping of the child's intellect as one aspect of a new regime of social control. Following Foucault's analysis of the function of institutional power in both extraordinary and everyday situations, Jenks argues that while the Dionysian child is punished, the Apollonian child is watched: "The crudity of the old regime of control in social relations gives way to the modern disciplinary apparatus, the post-Rousseauian way of looking at and monitoring the child in mind and body." Throughout this dissertation, I will show how adults providing opportunities for children's science play strove to offer freedom to these small investigations, while also constantly watching children's progress and analyzing its meaning.[15]

Jenks argues that the Apollonian child is a unique product of modernity. In her work on "rationality" in education, Valerie Walkerdine, arguing in a similarly Foucauldian vein, writes that investment in the development of rational thinking in

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[15] Chris Jenks, *Childhood* (London: Routledge, 1996), 70–80.

children is a fundamentally defensive impulse, a reaction to change that is intended to create a feeling of mastery for adults: "a fantasy of an omnipotent power over a calculable universe."[16] Gesturing toward educational thinkers such as John Dewey, and especially Jean Piaget, Walkerdine argues that their philosophical investment in science and mathematics learning is a product of their interest in engineering a better social order: "The rational dream sought to produce children who would become adults without perverse pleasures. These are the hopes invested in the power of reason."[17]

If Jenks and Walkerdine view education in rationality as a "dream" of control, this dissertation asks what happens when this idealized rationality is envisioned as intertwined with the freely determined realm of play. Anthropologist Sharon Stephens writes of childhood in modern culture: "The ideological construction of childhood as the privileged domain of spontaneity, play, freedom, and emotion could only refer to a society that contained and drew upon this private domain as the ground for public culture, discipline, work, constraint, and rationality."[18] Science play, as a form of directed inquiry (discipline, work, constraint, and rationality) that was also assumed to be "natural" to children's wants and needs, represented an ideal synthesis between the rational and the spontaneous; by promoting these rational entertainments, adults could hope to encourage

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[16] Valerie Walkerdine, *The Mastery of Reason: Cognitive Development and the Production of Rationality* (London: Routledge, 1988), 190.
[17] Ibid., 5–6.
[18] Sharon Stephens, "Introduction: Children and the Politics of Culture in 'Late Capitalism'," in *Children and the Politics of Culture*, ed. Sharon Stephens, Princeton Studies in Culture/power/history (Princeton, N.J: Princeton University Press, 1995), 6.

precious feelings of freedom, while also training children in regulated habits of mind that would serve them well in a modernized workforce.

The newly age-segregated form of public science culture for American children in the twentieth century—science presented in a "children's museum," or in the toy shop, or in science fiction intended only for young people—was a function of an increasing tendency toward a defined and child-specific culture. Marta Gutman and Ning de Coninck-Smith argue that, during the twentieth century, "the creation of a specialized material culture for children, the demarcation of differentiated buildings for them, and the separation of the lives of children and adults constituted a radical change to customary life in Western society."[19] While nineteenth-century popular science in the UK and the US often addressed itself to a multi-generational audience, as lyceums, museums, and libraries sought to reach adults and children alike,[20] these science toys, museums, and books were the product of new differentiations between culture "appropriate" for children and for adults. This dissertation contributes to a growing historiography that defines this spatially segregated children's culture, while asking how adult understandings of science, as a practice, required particular configurations of children's separate spaces.

In the United States in the twentieth century, adult encouragement of children's science play included careful cultivation of the perceived "natural" curiosity of

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[19] Marta Gutman and Ning De Coninck-Smith, "Introduction: Good to Think With—History, Space, and Modern Childhood," in *Designing Modern Childhoods: History, Space, and the Material Culture of Childhood* (New Brunswick, N.J: Rutgers University Press, 2008), 5.
[20] Sally Gregory Kohlstedt, "Parlors, Primers, and Public Schooling: Education for Science in Nineteenth-Century America," *Isis* 81, no. 3 (September 1990): 439.

childhood. In this, twentieth-century children's scientific culture departed from the morality of the children's science books published in the UK during the eighteenth and nineteenth centuries; in these, pedagogy in scientific matters was also meant to impart religious values, as in the volumes called "scientific catechisms," which took the form of a religious text in order to teach scientific "truths."[21] In the culture under examination in this dissertation, religious imperatives for scientific learning dropped by the wayside; while some nature study texts in the early part of the century still tried to associate learning from "nature's book" with getting closer to the Divine, most of these twentieth-century cultural objects relied on a vague invocation of the "joy of learning," letting inquiry, faithfully pursued, substitute for the previously privileged virtues of obedience, modesty, and service.

The books, toys, and museums under consideration in this work encouraged the value of curiosity; they were also invoking a more desirable alternative to the consumption-oriented child, addicted to the buying and owning of goods. As historians such as Gary Cross have argued, the twentieth century saw the entry of the child into the marketplace. Before this time, young people were "repositories of received learning and tradition"; the inclusion of children in the market of consumer culture meant "adults accepted change by giving novelty to their offspring."[22] While some adults worried that children's new relationship to the market would leave them hopelessly strung out on

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[21] Alan Rauch, "A World of Faith on a Foundation of Science: Science and Religion in British Children's Literature: 1761-1878," *Children's Literature Association Quarterly* 14, no. 1 (1989): 13–19.
[22] Gary Cross, "The Cute Child and Modern American Parenting," in *American Behavioral History: An Introduction*, ed. Peter N Stearns (New York: New York University Press, 2005), 30.

novelty,[23] framing children's curious relationship with the world as scientific, rather than insolent or greedy, allowed an acknowledgment of "modern children" as relentlessly interested in the new, while locating these qualities as positive and generative rather than transgressive. This relocation represented a shift from earlier perceptions of the value of inquiry. In her cultural history of curiosity in the early modern period, literary scholar Barbara M. Benedict describes curiosity as profoundly troubling to the established order. Benedict describes curiosity as a "cultural ambition," one that "resists control" and "threatens the status quo." For Benedict, modernity changes perceptions of the curious, as proof of science's power comes to light: "[Curiosity] comes to define the modern personality: the upstart."[24]

According to John Dewey, whose ideas informed so much of the culture under consideration in this dissertation, the raw resource necessarily to train scientific thinking was curiosity—a trait which children had in abundance, but which adults often lacked. Childhood habits of questioning, he argued in his 1910 exposition of the scientific method, *How We Think*, are at the heart of the *feeling* of science: "In the feeling, however dim, that the facts which directly meet the senses are not the whole story, that there is more behind them and more to come from them, lies the germ of intellectual curiosity."[25] Dewey warned that once adults became adults, they lose this "germ." Citing Sir Francis

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[23] See "I'm Bored!", in Peter N. Stearns, *Anxious Parents: A History of Modern Childrearing in America* (New York: New York University Press, 2003).
[24] Barbara M. Benedict, *Curiosity: A Cultural History of Early Modern Inquiry* (Chicago: University of Chicago Press, 2001), 5.
[25] John Dewey, *How We Think, a Restatement of the Relation of Reflective Thinking to the Educative Process* (Boston: D.C. Heath and Company, 1933), 32.

Bacon, who wrote in the *Novum Organum* (1620) that we "must become as little children in order to enter the kingdom of science," Dewey reminded his readers that there is an "open-minded and flexible wonder" inherent in childhood, and that this "endowment" is easily lost in adulthood: "Some lose it in indifference or carelessness; others in a frivolous flippancy; many escape these evils only to become incased in a hard dogmatism which is equally fatal to the spirit of wonder."[26]

Like Dewey, many of the promoters of science play who appear throughout this dissertation have held that children were closer to "the kingdom of science" in spirit than were adults. The history of encouragement of children's playful scientific inquiry is a contradictory one in which adults seek to direct the magic of children's constant questions about the world into productive channels, while retaining their originality and freshness of observation.

All-Inclusive Wonder?

Although American adults often naturalized science play as a universal mode of engagement, fun for all modern children, the whiteness and maleness of the children depicted in encyclopedias, toys, and books implied that scientific hobbies were represented as the property of the privileged. Throughout my examination of the formation of this popular scientific culture, I found very few depictions of children of non-white ethnicities "doing" science; the few representations that I did find were

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[26] Ibid., 33.

incidental, appearing in photographs of young museum patrons, rather than intentional, as would be illustrations in science books, or on chemistry set box tops. This was particularly true in the pre-World War II era. I show how these exclusions were related to a perception that the ability to think scientifically was an evolutionary gift—an inheritance given to "American" (white) children. The obliteration of this understanding in the postwar era was part of the anxiety surrounding such efforts as the Science Talent Search; in this chapter, and in my chapter on Robert Heinlein's science fiction for young people, I show how a new rhetoric of meritocracy borrowed from and adapted the racism of earlier decades. This is particularly interesting in light of the shift made in other realms of children's culture toward inclusion; as Julia Mickenberg points out in her work on children's literature and radical politics in the postwar era, many authors of children's non-fiction after the war made a conscious effort to include illustrations depicting non-white children in science books, and to explicitly address questions of racism.[27]

The presence of girls in this scientific popular culture is particularly important to examine, as the official curriculum and the structure of the scientific profession often discouraged girls from committing to scientific careers. White girls who do appear in scientific popular culture often manifest as allies of science; they are spectators, easily wowed by their brothers' or male friends' proficiency in manipulating chemicals to give a magic show, or easily-distracted counterpoints to the engaged boy hearing informal

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[27] Julia L. Mickenberg, *Learning from the Left: Children's Literature, the Cold War, and Radical Politics in the United States* (New York: Oxford University Press, 2006). See, in particular, chapter 6, "The Tools of Science: Dialectics and Children's Literature"; epilogue, "Transforming an 'All-White World.'"

lessons from an uncle or other adult. Girls, this culture implied, were engaged in science insofar as it was spectacular, provided visual stimulation, or contributed to consumer culture. Historians of education and of gender and the scientific profession have shown how women and girls were shut out of scientific discourse at a number of educational and professional levels; this dissertation shows how these foreclosures of interest also happened at a cultural level.[28]

Gender and power within children's popular scientific culture were also intergenerational matters. As women were increasingly shut out of the science classroom, they receded into the background as figurative science instructors in children's popular culture. As Sally Kohlstedt has noted, the end of the powerful nature study movement in the 1930s marked a closing of opportunities for female science teachers in the schools; prior to that date, women interested in science, shut out of careers in research, would often turn to school teaching in nature study. Also, prior to that date, fictional mothers and "maiden aunts" "were remarkable sources of information" to fictional children

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[28] Sally Gregory Kohlstedt, *Teaching Children Science: Hands-On Nature Study in North America, 1890-1930* (Chicago: University of Chicago Press, 2010); Margaret W. Rossiter, *Women Scientists in America: Struggles and Strategies To1940* (Baltimore: Johns Hopkins University Press, 1982); Margaret W. Rossiter, *Women Scientists in America: Before Affirmative Action, 1940-1972* (Baltimore: Johns Hopkins University Press, 1995); Tolley, *The Science Education of American Girls*; Sevan G. Terzian, "Science World, High School Girls, and the Prospect of Scientific Careers, 1957-1963," *History of Education Quarterly* 46, no. 1 (2006): 73–99; Laura Micheletti Puaca, "A new national defense: Feminism, education, and the quest for 'scientific brainpower,' 1940--1965" (Ph.D., The University of North Carolina at Chapel Hill, 2007), http://search.proquest.com.ezproxy.lib.utexas.edu/pqdtft/docview/304829779/abstract/138AA6512856BBAC8BA/1?accountid=7118.

inquiring about the world around them.[29] By the postwar period, male science teachers were preferred, and this shift was reflected in the popular culture of the time. During the postwar period, moral panics over juvenile delinquency contained speculation that boys would go astray because their fathers were either absent or effectively castrated by excessive female agency within the domestic setting. I found the same gender dynamics at play throughout my research. As I describe in chapters four and five, the panic over a lack of scientific manpower took a similar shape, with onlookers speculating that boys lost their natural affection for science when women failed to teach them correctly.

Plan of the Chapters

The chapters of the dissertation proceed chronologically, following evolving ideologies and expressions of the ideal of science play across the cultural locations where they appear. I have selected sites of children's culture whose creators perceived themselves as innovative in their time. In the **first chapter**, "Varieties of Museum Experiences: The American Museum of Natural History, The Brooklyn Children's Museum, and Progressive Productions of Wonder," I compare official representations of child visitors at the AMNH and the Brooklyn Children's Museum. This chapter covers an era in which school-based science education was profoundly influenced by the nature-study curriculum movement. This movement emphasized the connection of children with nature, arguing that this connection could produce scientific habits of mind, including the

[29] Kohlstedt, "Parlors, Primers, and Public Schooling: Education for Science in Nineteenth-Century America," 237.

capacity to observe and classify, even as it offered moral uplift. Using material from the two museums' official journals, *The American Museum Journal/Natural History* and the *Children's Museum News*, as well as archival materials, I argue that while the AMNH pictured children's engagement as an automatic process, conceptualizing the museum as a technology that could produce interest in large numbers of child patrons, the BCM embodied a model of engagement derived from progressive education, in which each child's interest produced a natural and ongoing interaction with the institution. I argue that this difference may have occurred because the BCM served middle-class students from then-suburban Brooklyn, while the AMNH viewed its role as a philanthropic one, attempting to reach underprivileged Manhattan children.

The **second chapter, "**Question-Boxes" Ask How and Why: Children's Reading as Research," shows how books published for children during the 1920s and 1930s participated in and shaped the assumption that children's reading should teach them to look at the material world as a source of imagination and fantasy, while indulging their natural curiosity by learning the details of nature, industry, and the human past. The curriculum movement known as "general science," which tried to reach high-school students by showing them the way that science existed in each part of everyday life, reached its greatest influence during these years; I argue that the debates within the world of children's publishing between those who would promote "realism" and those who advocated providing children with fairy tales and fantastical stories can be seen as an extracurricular analogue to the general science movement's push to demystify the modern world and promote a scientific mindset by refocusing students' natural curiosity toward the world around them.

The **third chapter,** "Thrills, Chills, and Magic: Home Laboratories and the Culture of Boyhood Science," argues that the marketing, packaging, and production of chemistry and other science sets exemplify expectations for science involvement during the interwar years. I argue that the figure of the young person using the chemistry set served as a visual encapsulation of the possibilities of modernity: chemistry boosters promoted the science as a way to understand all aspects of modern life, and boys using these ready-made sets in their basements represented all of the empowerment possible in gaining this understanding.

In the **fourth chapter**, "'How They Get That Way': The Social Meanings of 'Science Talent' in the Cold War," I use the records of the Westinghouse Science Talent Search to show how the idea of "fun" children's science changed during World War II and the postwar era, when identification of science talent took on new importance for national leaders and scientists took new interest in shaping curricula. I argue that this era was when our complex present-day attitudes about American science achievement were shaped: during this time, American adults worked hard to find children who enjoyed science and to encourage their hobbies, promoting science fairs including the Science Talent Search; at the same time, worries abounded that peer cultures and social conformity held American children back from their proper affinities for scientific thinking.

In the **fifth chapter**, “Science, Liberty, and Fiction: Heinlein’s Juveniles and Children’s Literature,” I extend the argument of Chapter Four, showing through the work of science fiction author Robert Heinlein how one scientifically minded adult struggled to develop what he viewed as boys’ natural affection for science, in the face of an uncomprehending peer culture and a fusty education system that feminized boys’ natural impulses. Using Heinlein’s correspondence, as well as textual analysis of his juvenile fiction, I show how the science-fiction author tried to present the “fun” of speculative fiction for young readers, while conforming to the requirements of his editor, reviewers, and librarians.

Conclusion: Forward to the Future

Understood in context, Obama’s delighted reaction to young Joey Hudy’s marshmallow cannon, coupled with his impassioned arguments for an increased commitment to STEM education, is the latest in years of adult expressions of mingled celebration and anxiety. The apparatus itself—a machine of war, designed to loft projectiles of a substance that’s soft, innocent, and sweet—embodies the paradoxes inherent in designing a science that’s “fun.” Adults have promoted science for children as a matter of simple enjoyment, stripped of its moral valence by the association with innocent childish play; this presentation, while intended to provoke children into “falling in love” with science, also denies both the difficulties of science practice and the complexities of science’s operations within society. In looking at and creating images of children “doing” science, critically assessing the state of children’s sense of wonder and discovery, and devising new forms of activities intended to fan the flames of scientific inquiry, those interested in promoting science-as-play also made arguments about gender, privilege, public space, and power.

Chapter 1: Varieties of Museum Experiences: The American Museum of Natural History, The Brooklyn Children's Museum, and Progressive Productions of Wonder

If a yearly visit to a science museum is an iconic feature of the childhoods of twenty-first-century American children, in the early twentieth century, such visits were novelties. The meanings that adults and children of that era attached to the sudden presence of science museums in children's lives were complex and multivalent. For example, two images represent a variation on the same subject: a young person, interacting with a museum, and presumably learning something in the process. Yet there are marked differences between the images. The girls in the first photograph, taken at the American Museum of Natural History (AMNH) in New York City, seem intimidated, almost afraid. The taller girl makes sure her younger friend (a sister?) stays close, and the two boys in the background look on with solemnity. The caption, written for the AMNH's official magazine, assumes that these children are seeing ("beholding") something completely new, and that they are attempting to correlate this newness with their experience as urban children. Thus, this habitat group looks to them like "a 'city' of strange birds."[30] Meanwhile, at the Brooklyn Children's Museum (BCM), boys climb around on the roof, installing wireless equipment that many adults would not understand. At home in their realm, they are supported by the museum, but they also contribute materially to its activities. They cut dashing, admirable figures, reminiscent of literary boy heroes Tom Swift or Frank Merriwell.[31]

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[30] "They Behold a 'City' of Strange Birds," *The American Museum Journal* XI, no. 7 (November 1911).
[31] Anna Billings Gallup, "The Children's Museum as an Educator," *Popular Science Monthly*, April 1908.

These two visually divergent representations of young people in museums represent larger differences in Progressive-era adult understandings of the meaning of science and modernity for young people's lives. In this chapter, I will ask how museum personnel, classroom instructors, parents, and other adult observers at the AMNH and the BCM in the years between 1881 and 1930 conceptualized a child's museum experience, seeking to understand the importance that adults attached to children's encounters with science in this new institutional context.

While many museums began to pay more attention to young visitors during this time, and other children's museums began to open in the United States after the founding of the BCM, I chose these two institutions for this comparative case study because of their physical proximity, their differing pedagogical approaches, and because both explicitly pointed to the creation of encounters between children and science as a major part of their missions. While the AMNH performed many other functions, including scientific research and outreach to adults, children took an increasingly large role in museum activities during this time. And while the BCM was technically a "children's museum"—a designation which doesn't necessarily indicate the teaching of science—children's education in various branches of science took pride of place in their slate of activities, as the museum's founders and curators often gestured toward children's scientific practice and later scientific accomplishments in their public representations of their museum's work. Finally, I have selected these sites because both museums engaged in active self-fashioning through the production of materials meant to represent the educative experience. Looking at promotional photographs produced by the staff of each museum, I will investigate the way that these images created a range of understandings about the nature of a child's encounter with science.

Historians of the progressive education movement note that education reformers of the time advocated for two seemingly opposed visions of schooling. "Modern" thought could be applied to create schools that were child-centered, exploratory, experimental entities, in the vein of John Dewey's Laboratory School; at the same time, an interest in efficiency and social engineering meant that some school reformers visualized the modern school as one that would "fit" children for their proper place in industrial society.[32] The AMNH, committed to a vision of Progressive-era philanthropy that contained a significant element of social engineering, viewed itself as a site where masses of sensorially impoverished city children, who operated from a significant social and intellectual deficit, could come into brief visual contact with a large and imposing body of knowledge. The museum believed that this contact would translate into revelations and personal transformations, though not necessarily into scientific careers.

Meanwhile, the Brooklyn Children's Museum, serving the then-suburban neighborhoods surrounding it, was a product of the Progressive education movement, with a commitment to allowing children freedom to inquire. Children's museums housed in separate buildings were a "particularly American museological phenomenon," as Thomas Schlereth points out; it was also a particularly Progressive phenomenon, indicating a belief that children needed a separate sphere where they could learn best.

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[32] Lawrence A. Cremin, *The Transformation of the School; Progressivism in American Education, 1876-1957* (New York: Vintage Books, 1964). See, in particular, chapter 2, "Education and Industry."

Brooklyn led the way in supporting a children's museum; Boston followed (1913), then Detroit (1917) and Indianapolis (1925).[33] The curators of the BCM, operating within a paradigm of middle-class sentimentalism surrounding childhood, saw the museum as "belonging" to the children, its activities driven by their interests; at the BCM, children's scientific interest became the motivator for the creation of a tight-knit museum community whose "alumni" achieved various metrics of middle-class success, including employment as scientists and engineers.

Many historians have noted that the Gilded Age was a time of prodigious museum building.[34] Fewer have examined the place of children, and of ideas about childhood, in the shaping of these museums and their missions. Historian Steven Conn, who regrets what he sees as the loss of the nineteenth-century research museum, writes that by 1926, serious science was no longer being done in museums, as the age of the amateur declined and universities took on greater authority as seats of knowledge-building. He ties this change to museums' growing emphasis on encouraging child visitors, arguing that "the shift to cultivating an audience of children is a symptom of the museum's loss of intellectual primacy" in the twentieth century.[35] This analysis ties the presence of

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[33] Thomas J Schlereth, *Cultural History and Material Culture: Everyday Life, Landscapes, Museums*, 1st pbk. ed (Charlottesville: University Press of Virginia, 1992), 99. Schlereth points out that the children's museum was a Progressive-era idea that found its true success in the postwar era. He writes that in 1941, only eight children's museums in the United States had their own facilities, whereas by 1985, more than fifty institutions could claim that status.
[34] Steven Conn, *Museums and American Intellectual Life, 1876-1926* (Chicago: University of Chicago Press, 1998); Michael G. Kammen, *Mystic Chords of Memory: The Transformation of Tradition in American Culture*, 1st ed (New York: Knopf, 1991); Neil Harris, *Cultural Excursions: Marketing Appetites and Cultural Tastes in Modern America* (Chicago: University of Chicago Press, 1990).
[35] Conn, *Museums and American Intellectual Life, 1876-1926*, 19.

children in the museum to a decline in seriousness. Seen from another angle, the twentieth-century invitation of children into the halls of museums, and the creation of museums meant particularly for children, could be more positively perceived as the product of a new interest in children's intellectual culture.

The AMNH and the BCM were influenced by and responded to the nature study movement, a complex and widespread curricular movement that gained authority at the turn of the twentieth century and retained primacy through the 1930s. Conn points to what he sees as museums' regrettable focus on a nineteenth-century mode of observation and taxonomical classification, which he argues put museums out of step with the newer laboratory-based biology. This emphasis on an older model of natural history meant that museums could quite easily ally themselves with the nature study movement. The movement, Sally Kohlstedt writes in her history of its commitments and reach, focused on introducing students in elementary schools to principles of scientific observation through investigating their local environments. Drawing from the tradition of nineteenth-century natural history, with its emphasis on "studying nature, not books" (in the words of Harvard's influential geologist and paleontologist Louis Agassiz), nature study amplified other ideas inherent in progressive education, including an emphasis on allowing children to form their own understandings through observation.

Kohlstedt writes that nature study drew from the anxieties of its time, manifesting a distinct antimodernism in its advocacy of contact with nature, while also retaining "an appreciation of the cultural possibilities of urban life."[36] The movement had allies in the major schools of education, supported a national society and a journal, and at its height created careers for many teachers as nature study specialists. At the same time, nature study's emphasis on the emotional experience of encounters with nature, and its incorporation of literature and art, brought criticism from some scientists, most notably psychologist Edward Thorndike, who decried this method of pedagogy as "sentimental" and wrote that curiosity, not affection, would drive scientific investigation:

> Not the girl who dearly loves her doll, but the one who cuts it open to see its insides, is likely to be an investigator of human physiology. The boy who collects moths, who steals birds' eggs, who pokes the unlucky crab over onto its back and in fascination watches his uncomfortable efforts to right himself, who takes his toy animals apart to put them together again, is nearer the scientific pathway than the noble product of sentimental nature study who loves the worms and cares for the dear plants.[37]

When considering the range of representations of childish encounters with nature in the two New York museums—from the loving touch to the curious investigation—it helps to remember the multiple meanings of the nature study movement for the early twentieth-century public. When regarding nature study, as Kohlstedt reminds us, people had different reactions depending upon their professional commitments, their geographical locations, and their understandings of the place of science in modern life.

The museum photograph is a major category of evidence in this chapter, as institutions sought to represent their work to their patrons, donors, and colleagues.

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[36] Sally Gregory Kohlstedt, *Teaching Children Science: Hands-On Nature Study in North America, 1890-1930* (Chicago: University of Chicago Press, 2010), 3.
[37] Edward L Thorndike, "Sentimentality in Science Teaching," *Educational Review* 17 (1899): 57–64.

Historians agree that the creation of childhood as a defined category coincided with the growing popularity of everyday photography in a mutually reinforcing way, resulting in a plethora of representations of children in photographs around the turn of the twentieth century.[38] Pierre Bourdieu has written about photography as an "ontological choice of an object which is perceived as worthy of being photographed, which is captured, stored, communicated, shown, and admired."[39] If this is the case, then the photographic record of the turn of the century shows that children, and in particular the education of children, was a subject that people found worthy of capture, communication, and admiration. Thomas Schlereth writes that photos of children "dominate the turn-of-the-century snapshot album."[40] As Schlereth points out, many expositions and conventions during the years between the Civil War and World War II featured photographs of children, often as part of exhibits designed to present the work of educational institutions and reform movements.[41] Expositions often featured actual children, as well, so that the adult viewer could see education occurring on film and in the flesh; at the 1904 St. Louis World's Fair, for example, a visitor could observe elementary school classrooms; at the Pan-Pacific Exposition in 1915, a Montessori kindergarten was held in an amphitheatre designed to accommodate adult visitors.[42]

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[38] Nancy Martha West, *Kodak and the Lens of Nostalgia* (Charlottesville: University Press of Virginia, 2000).
[39] Pierre Bourdieu, *Photography: A Middle-Brow Art* (Stanford, CA: Stanford University Press, 1990), 6.
[40] Thomas J Schlereth, *Victorian America: Transformations in Everyday Life, 1876-1915*, 1st ed (New York, N.Y: HarperCollins, 1991), 200.
[41] Schlereth, *Cultural History and Material Culture*, 94–95.
[42] Kohlstedt, *Teaching Children Science: Hands-On Nature Study in North America, 1890-1930*, 178; Rita Kramer, *Maria Montessori: A Biography* (New York: Putnam, 1976), 15.

In the Progressive era, the emotions mobilized by images of children—learning or at play—varied widely according to the perceived relationship between the viewer's social position and the child's. In the Progressive Era, photographers such as Jacob Riis and Lewis Hine used images of children to shock and move audiences, dramatizing not only material deprivation but also the loss of educational opportunity inherent in childhoods spent laboring.[43] The same era saw a proliferation of pictorialist images of childhood made by photographers such as Gertrude Käsebier, Clarence H. White, and Alfred Stieglitz; these photographers joined popular illustrators such as Jessie Willcox Smith and Elizabeth Shippen Green in depicting childhood as an idyllic, idealized realm apart from adult activity—a place where learning was natural and joyful. Magazines and advertisers used sentimental illustrations by Smith, Green, and their contemporaries to sell consumer goods; these examples show how images of protected childhood could sell a vision of a middle-class life.[44] Art historian George Dimock has written that the gap between Lewis Hine's photographs of child laborers and the serene portraits of children made by pictorialist contemporaries constitutes a dialectical relationship, in which the working-class child is seen as exploited and yet somehow repellent, "in need of rescue," while the middle-class child is idealized, abstracted, and observed with attention to

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[43] See, for example, Lewis Hine, *Making Human Junk* Child Labor Bulletin 3, 1915 1914.
[44] Anne Higonnet, *Pictures of Innocence: The History and Crisis of Ideal Childhood* (New York, N.Y: Thames and Hudson, 1998). Chapter 3, "A Golden Age," 50-71.

nostalgic detail.[45] Photographers depicting children in the museum operated within both of these opposed modes of representation.

In museum publicity photographs of children from the first three decades of the twentieth century, child patrons sometimes appear, like the children in Hine's photographs, to be needy, empty, and deprived, desperate to make contact with any natural object, and grateful for the chance to do so; alternatively, they are happy, cute, hard-working, and full of universal potential, like the young people depicted by pictorialist photographers and sentimental illustrators of the time. In photographs and articles published in its magazine, the *American Museum Journal* (beginning in 1919, *Natural History;* I will use the abbreviations *AMJ/NH*), the AMNH generally appears as a site where masses of sensorially impoverished city children could come into brief visual contact with a large and imposing body of knowledge. The museum's publicity held that this contact would translate into moral revelations and personal transformations. Meanwhile, at the Brooklyn Children's Museum, as represented in the chatty, informal pages of the *Children's Museum News* (*CMN*), children's natural scientific interest became the motivator for the creation of a tight-knit museum community. Behind these two modes of representation lie institutional beliefs about the nature of childhood, the transformative power of science and the natural world, and the impact that encounters between children and the museum might have on young lives; examining this publicity,

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[45] George Dimock, "Priceless Children: Child Labor and the Pictorialist Ideal," in *Priceless Children: American Photographs 1890-1925* (Greensboro, NC: Weatherspoon Art Museum, 2001), 7–22.

we can see how social class might circumscribe expectations about the meanings of these encounters.

The American Museum of Natural History: Producing "Natural" Childhoods

Images of children in the halls of the American Museum indicated a new direction for the institution in the early twentieth century. During the early history of the Museum, trustees tended to favor a vision of the museum as advancing the education of the "public" at large, while scientists on staff fought to gain resources for expeditions and research; around the turn of the century, as nature study became an official part of the New York City school curriculum, a "public" of schoolchildren emerged as a distinct focus for the AMNH—a focus that only grew throughout the 1910s and 1920s.[46] Henry Fairfield Osborn, the wealthy paleontologist who was the president of the museum from 1908-1933, had an active interest in science education.[47] Because Osborn exercised significant power as president,[48] the museum's activities during this period reflected his interests. Although not all of the millions of schoolchildren who had contact with the AMNH during his presidency were underprivileged, Osborn, an avowed eugenicist, had

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[46] John Michael Kennedy, *Philanthropy and Science in New York City: The American Museum of Natural History, 1868-1968* ([s.l: s.n.], 1968), 149. Kennedy finds that scientists' objections to the museum's educational mandate continued during the Osborn era, when the education department received more institutional support due to Osborn's commitments (210).
[47] See, for example, Henry Fairfield Osborn, *Creative Education in School, College, University, and Museum; Personal Observation and Experience of the Half-Century 1877-1927* (New York: C. Scribner, 1927).
[48] Victoria E.M. Cain, "'The Direct Medium of the Vision': Visual Education, Virtual Witnessing and the Prehistoric Past at the American Museum of Natural History, 1890-1923," *Journal of Visual Culture* 9, no. 3 (December 1, 2010): 294, doi:10.1177/1470412910380334; Ronald Rainger, *An Agenda for Antiquity: Henry Fairfield Osborn and Vertebrate Paleontology at the American Museum of Natural History, 1890-1935* (University of Alabama Press, 2004).

an interest in efficient reformation and "Americanization" of immigrant and poverty-stricken populations in the city.[49] The photographs of museum patrons published in the *AMJ/NH* during his tenure often emphasized the museum's work with these groups, depicting a museum visit or an encounter with one of the natural objects that the AMNH lent to schools as a moment when "deprived" children would experience nature in a way that would jolt them out of their city lives and lead them to a new moral truth.

Sally Kohlstedt writes that the nature study movement often brought together schools and cultural institutions such as museums, zoos, and botanical gardens. In New York City, teachers often turned to museums for assistance in implementing nature study curricula. The museum's turn toward education began in 1881, when curator Albert Bickmore began to give illustrated lectures to public-school teachers, which he believed would translate into enhanced education in natural history for students.[50] The turn of the century brought a renewed level of interest in education on the part of the museum's personnel, as, in 1903, the Board of Supervisors of the New York City schools performed an extensive reconstruction of the city's public school curriculum, intended to provide "A Correlation of the Pupil's Course of Study with World in Which He Lives; His Spiritual and Natural Environment." A major component of this reconstruction was the mandate to

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[49]Besides providing other institutional support for the eugenics movement, including hosting various eugenics conferences at the AMNH, Osborn co-founded the American Eugenics Society in 1922, and wrote the forward for his friend Madison Grant's *The Passing of the Great Race: Or, the Racial Basis of European History* (New York: Charles Scribner's Sons, 1922).
[50] George Sherwood, "What the American Museum Is Doing for the School Children of New York," *Natural History* XXII, no. 2 (April 1922): 101. In his 1969 history of the museum, Jean Le Corbeiller calls the Bickmore theory of knowledge transfer a "transmission-belt scheme" (Jean Le Corbeiller, "Early chapters for Jean Le Corbeiller's text for the pictorial history of the American Museum of Natural History", 1969, n.p.).

teach children nature study and geography.[51] Museums such as the AMNH offered a haven for teachers looking for resources for their new nature-study programs. In 1904, the Museum began to circulate nature study collections, or gatherings of specimens, contained in a box "about the size of a large suit case" for easier transportation.[52] Eventually, museums in other parts of the country copied this innovation; Chicago's Field Museum, for example, started a loan program in 1912, and St. Louis founded a museum dedicated solely to school lending.[53] By 1907, classes coming to the Museum could benefit from the guidance of a trained docent or attend a lecture in the auditorium; by 1917, the Department of Public Instruction lent lantern slides to schoolteachers; by 1922, the Department also distributed motion pictures. In 1927, the Museum opened a Trailside Museum and nature trails at Bear Mountain, outside of New York City; in 1928, a child could come to the museum on Saturday afternoon for a special program.[54] These activities were supported by the Carnegie Corporation and the Cleveland H. Dodge Foundation, as well as the City and State of New York.[55]

For an institution interested in crafting an image as a pillar of the city's intellectual life, child visitors offered a unique opportunity to prove that the museum's mission was charitable and worthwhile. Museum personnel, such as curator and later

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[51] Kohlstedt, *Teaching Children Science: Hands-On Nature Study in North America, 1890-1930*, 62–63.
[52] George Sherwood, "The Museum in Education," *Natural History* XXX, no. 5 (October 1930): 504.
[53] "The Field Museum Information," accessed June 11, 2009, http://www.fieldmuseum.org/museum_info/default.htm; Kohlstedt, *Teaching Children Science: Hands-On Nature Study in North America, 1890-1930*, 65.
[54] "Report to the Committee on Education of the American Museum of Natural History," March 14, 1940, 1, Central Archives, 1237; American Museum of Natural History Archives.
[55] Sherwood, "The Museum in Education," 503.

director George Sherwood, were quite aware that the Museum's sponsorship of educational activities offered significant public relations and financial benefits; Sherwood wrote to Osborn in a 1924 letter, "As you well know, there is no branch of the Museum that has so much influence with City officials and taxpayers."[56] How, then, were the activities of this branch represented for public consumption? During Osborn's tenure as director, the *AMJ/NH* published two special issues dedicated to educational activities—November 1911, and July-August 1927—as well as occasional articles about some aspect of the museum's work with children. In the following three sections of this chapter, I will show how the Museum depicted its wide-ranging interactions with children, as they took place inside the walls of the building on Central Park, where children viewed the AMNH's celebrated dioramas; in collaboration with schools, through the School Nature League; and, thanks to the technological achievements of the School Service system, even on the streets of the city.

The Magic of the Museum: Diorama Encounters

The transformative strength of the moment of encounter between child and museum object—a transmutation almost religious or magical in quality—is the subtext of many of the photographs of schoolchildren in the museum that the AMNH used to publicize its work. In 1931, a copy of an official history of the Museum carried embossed emblems of its various functions; the emblem for "Education" was Aladdin's magic

[56] George Sherwood to Osborn, Henry Fairfield, March 4, 1924, 1, Central Archives, 120; American Museum of Natural History.

lamp.[57] Historian Victoria Cain argues that Osborn's commitment to visual education meant that he believed that viewers encountering museum reconstructions of the natural world would experience "virtual witnessing," which could "awaken 'latent faculties' in the depth of visitors' psyches, and could influence visitors' observational practices, thought processes, even their physiological reactions."[58] The photographs of children in the museum reflected this belief and cemented the idea that the museum could be all-powerful in replacing the contact with nature that city children lacked. Henry Fairfield Osborn wrote in 1911 that the job of the museum educator was that of "interpreter" of science. Osborn delineated a hierarchy that compared naturalists to priests, standing between God and the child: "Some great law is first in the will of the Creator, then, like the light of a star so distant that it takes ages to reach the earth, it reaches the mind of some great naturalists, and finally it comes down, down, down to the vision of the very youngest." How can the naturalist make this law clear to the child? Through the museum, which can do more than illustrate—through the magic of vision, it can penetrate into the child's very being: "The best way to learn one of these laws is to see it in operation; this is far better than to read about it, for what is seen becomes part of oneself."[59] This belief in visual education provided a strong ideological underpinning for the museum's educational efforts, and explains, in part, how museum personnel could

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[57] Anonymous, *The American Museum of Natural History: An Interpretation* (New York, N.Y.: American Museum of Natural History, 1931).
[58] Cain, "'The Direct Medium of the Vision'," 290. Cain borrows the phrase "virtual witnessing" from Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton, NJ: Princeton University Press, 1986).
[59] Henry Fairfield Osborn, "The Museum of the Future," *The American Museum Journal* XI, no. 7 (November 1911): 223–225.

claim that education was taking place in what photographs of the time reveal was a quite crowded setting—so long as a child was able to stand on tiptoe to peer over his or her classmates at a diorama, a visual connection was made, and education was possible.

The visual representations of the museum's crowdedness reflected the educational landscape of Manhattan's schools. School administrators and personnel in the city faced many challenges during the last decades of the nineteenth century, including overcrowding (student-teacher ratios that were typically above fifty to one), lack of facilities, and low student retention.[60] The volume of children served by the Museum was a statistic that museum personnel enjoyed quoting,[61] but they also liked to show that they managed to process these children without incident or disorder. Two *AMJ* photographs of children waiting in line, one of which was considered so emblematic of the museum's educational program that it merited inclusion as a graphic element on the page, cemented the image of orderliness.[62] As Anne McClintock has argued, photography in the nineteenth century was often employed as a tool of surveillance, while the camera "embodies the panoptic power of collection, display, and discipline."[63] These children were corralled twice: once by their teachers, and once by the camera.

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[60] Kohlstedt, *Teaching Children Science: Hands-On Nature Study in North America, 1890-1930*, 59.

[61] Sherwood, "The Museum in Education." tallies the number of "contacts" made by the education department and points to growth over the decade of the 1920s, adding up visitors at the Bear Mountain facility, attendance at library loan exhibits, attendance at lectures, and pupils viewing motion pictures, using nature study collections, and viewing lantern slides. The total for 1924 was 4,662,301; the total for 1929 was 12,595,336.

[62] George Sherwood, "Cooperation with the Public Schools," *The American Museum Journal* XI, no. 7 (November 1911): 242–243.

[63] Anne McClintock, *Imperial Leather: Race, Gender, and Sexuality in the Colonial Conquest* (New York: Routledge, 1995), 123.

The implication for the viewer is that the experience of the museum is one of carefully regulated enlightenment. Eileen Hooper-Greenhill points out that a Foucauldian reading would see the museum, along with the school and the prison, as an apparatus to create "docile bodies."[64] Donna Haraway writes that the AMNH's project during its first fifty years was to undertake "the task of regeneration of a miscellaneous, incoherent urban public threatened with genetic and social decadence."[65] These photographs seem to support such arguments—and in their written words, museum personnel took care to point out that child visitors "behaved." Henry Fairfield Osborn viewed the lesson of order as one of the purposes of the museum. Osborn wrote in the *AMJ* in 1911, while describing the plans for expansion of the Museum, that the ultimate goal of this expansion was to create more order within the collections, and thus to impart to "uninitiated" visitors, young and old, what Osborn saw as "the greatest lesson that Nature has to teach us"—namely, "the reign of law and order."[66]

The museum's emphasis on "law" was most visibly related to the regulation of visitor behavior, but also extended into assumptions about the way that learning must work in the museum. Osborn and the AMNH believed that the moment of learning, because enabled by a visible and permanent object, could be endlessly reproducible. While some museum educators working in the AMNH did develop more lengthy pedagogical relationships with children (for example, Agnes Roesler, an instructor in the

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[64] Eileen Hooper-Greenhill, *Museums and the Shaping of Knowledge* (London: Routledge, 1992), 168.
[65] Haraway, Donna, "Teddy Bear Patriarchy: Taxidermy in the Garden of Eden, New York City, 1908-1936," *Social Text* no. 11 (Winter -1985 1984): 22–23.
[66] Osborn, Henry Fairfield, "Address of Welcome," *American Museum Journal* X, no. 3 (March 1910): 63.

Department of Education, who, in 1911, conducted a drawing and modeling class and founded a Children's Room to facilitate ongoing connections with children),[67] the results of these involved efforts were less often showcased in the *AMJ*/*NH,* reflecting a preference for an image of the museum as an efficient engine producing millions of educative experiences. A museum, contended Osborn, "can bring a vision of the whole world of nature, a vision which cannot be given in books, in classrooms or in laboratories."[68] The power of the museum was that it could, at will, provoke the kinds of epiphanies that the careful activity of science would take too long to bring about. The caption for one image of schoolchildren facing a diorama, for example, argues that the Museum could serve as "a laboratory, 'the country,' or a distant wilderness for New York City schoolchildren."[69] This claim positions the Museum as a powerful simulation of the sites where science learning would usually take place, and assumes that the experience of viewing could substitute for inquiry.

Readers were asked to "witness" the high level of interest children displayed toward specimens, as evidence of this effectiveness and value. J.A. Allen wrote in *AMJ* in about children's interactions with the mammal and bird exhibits: "The interest and value of this visual instruction to the children of the schools is best appreciated by witnessing the avidity with which they scan these elaborately presented glimpses of bird and

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[67] "Developing Artistic Instinct in Children," *New York Times*, May 8, 1911; Agnes Roesler, "The Children's Room of the Museum," *The American Museum Journal* XI, no. 7 (November 1911): 260–261.
[68] Osborn, "The Museum of the Future," 224.
[69] "The American Museum Serves...," *Natural History* no. March-April 1920 (n.d.).

mammal life."[70] The anonymous photographer who took the accompanying photographs positioned himself at the side of the group of children, so that the reader can "witness" this phenomenon more accurately.

As mentioned, the AMNH boasted of the number of children it served. Under these circumstances, it seems unsurprising that the museum would speak far more often of—and show far more photographs of—the moment of first contact between child and object, than it ever depicted or referred to the development of this moment into a more complicated and full understanding of the principles behind the object. In the nineteenth-century "object lesson," originally conceived by Swiss pedagogue Johann Pestalozzi, the teacher would use a familiar object, such a biscuit or a scrap of calico, and use it to help the student to an understanding of the unfamiliar processes that brought the object into its familiar shape.[71] In this permutation of object-based education, the natural objects presented inside the museum were presumed strange to the child patrons. Their strangeness was the reason for their presence in the museum, and their strangeness was enough to provoke the children's interest. In many cases, this type of instruction seemed to have devolved into something close to a belief in the magical powers of the thing itself. Although some docents and teachers were available to explain to museum visitors that the penguin in a diorama was feeding its chick rather than cannibalizing it, and children could read the label to discern this, the student-to-teacher ratio in all of these

[70] J.A. Allen, "The Habitat Groups of Mammals and Birds," *The American Museum Journal* XI, no. 7 (n.d.): 249.
[71] Sarah Anne Carter, "On an Object Lesson, or Don't Eat the Evidence," *The Journal of the History of Childhood and Youth* 3, no. 1 (2009): 9, doi:10.1353/hcy.0.0081.

pictures is quite high, and these children are quite clearly not looking at the label. Moreover, the visual joke of the photograph lies exactly in the misapprehension that the child visitor might experience; the ongoing process of learning about the actual course of penguin life is less appealing to "witness" than the humor of confusion.[72]

How did teachers respond to the Museum's approach to science education? Philip Pauly, writing about the development of the advanced curriculum of high school biology at DeWitt Clinton High School, in Manhattan's Hell's Kitchen, between 1900 and 1925, reports that the more scientifically engaged teachers preferred laboratory work to visits to the Museum, because "there was little opportunity for active observation or the study of living organisms." Moreover, Pauly writes, "in their perfection, the museum's framed tableaux aestheticized nature and gave students the impression that the best way to experience it was indoors, on a rainy day."[73] However, teachers in other schools and working in lower grades, perhaps more accustomed to the sentimental language of nature-study and of the contemporary animal welfare and humane education movements, reported many instances of what they saw as valuable connections resulting from museum visits.[74]

In the *AMJ*'s special Education issue in 1911, public school teachers offered testimonials as to the Museum's impact on their students, writing about the effect that the arrival of loaned specimens had on their classrooms. These testimonials, which would

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[72] "The Life of the Antarctic...," *Natural History* 1922 (n.d.).
[73] Philip J. Pauly, "The Development of High School Biology: New York City, 1900-1925," *Isis* 82, no. 4 (December 1991): 679–680.
[74] For further examination of the connection between nature study and humane education, see Kevin C. Armitage, "Bird Day for Kids: Progressive Conservation in Theory and Practice," *Environmental History* 12, no. 3 (July 1, 2007): 528–551.

have horrified Edward Thorndike, described emotional reactions, rather than scientific ones. “These little people of the second grade, brought up under the abnormal conditions of the city, love the birds of the collection. They smooth and pet them, and even kiss them when I am not watching,” wrote a teacher from Public School No. 76 in Manhattan. Another teacher, from Public School No. 84, in Brooklyn, offered the observation: “The first question they invariably ask is 'Is it real?' When assured upon this point they are always deeply interested, and very anxious to 'feel how soft the bird's coat is!'” From Public School No. 27, in Manhattan, came this story: “In one of the [loaned] collections is a parrot. It was the children's favorite. One boy in particular took a special interest in Polly. This boy one day offered to stay after three and put chalk and board rubbers away. Later it was found that his motive in staying was not to help his teacher. He wanted the chance to stroke the bird and talk to it.”[75] These letters echo the touching scenario presented in one archival photograph, in which a small boy caresses the trunk of one of the taxidermied elephants in a group, while the rest of his class appears to listen intently to the instructor.[76]

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[75] “A Symposium of Expressions from Primary and Grammar Schools,” *The American Museum Journal* XI, no. 7 (November 1911): 255–260. The only letter published in the entire issue that comes from a child hewed a very practical line: “Last month I was down to the Natural Museum History [sic] for the tenth time. I was very glad I went, because when my teacher ask [sic] to describe a insect, bird or anything I could stand up and answer all her questions correctly. When the class was tested I received a hundred per cent paper. I can assure you if anybody who is interested or wants to learn nature to go down to the Natural Museum History [sic].”

[76] H Miller, *Group of Children with Museum Guide Studying Elephant Group*, April 1922, AMNH Miscellaneous, drawer 94; neg. 39544; American Museum of Natural History Archives. Clearly a child visitor today would be punished for touching such a non-touchable display; I was unable to find an explanation for the Museum’s tolerance of this boy’s excited encounter.

This trope of the childish joy generated in contact with nature was sentimental, but it also had strong ideological implications. In the *AMJ*'s special education issue in 1911, a teacher, Rose Byrne, described a transformation in one particular child, Moses Rozansky. "As we went through the Museum's halls….the wolfish eyes of my little Rozansky grew snappingly bright," Ms. Byrne wrote. "Then the lines around the tight little lips softened, his whole face lit up with the humble reverence which one sees in the faces of old priests, the rough fingers clutched my arm, and he half exclaimed, half whispered, 'If we only were to know everything in here, Miss Byrne!'"[77] Here, Moses re-adopts the natural attitude of childhood through contact with the museum, abandoning unnatural knowledge (the education of the streets, which would cause a child to go "wolfish") and returning to the realization of wonder that is supposed to be the way children approach the world.

The question of the "correct" knowledge for children was often answered in the Progressive era by the theory of recapitulation, proposed primarily by German biologist Ernst Haeckel, which held that ontogeny (the development of an individual) would always recapitulate phylogeny (the development of a species). Stephen Jay Gould, in his comprehensive history of the concept's life in the scientific community, writes that this idea motivated the child study movement in the United States, for better or for worse, during the height of its popularity at the turn of the century. Academics invested in child study, most notably psychologist G. Stanley Hall, viewed recapitulation as their grand

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[77] Mary B.C. Byrne, "Tuesday at the Museum," *The American Museum Journal* XI, no. 7 (November 1911): 264.

unifying theory, pointing to such "evidence" as children's love for water or for rhyming games to show that young people were moving through their "savage" or "tribal" phases, on their way to young adulthood, in which they would embody the medieval habit of mind: dreamy, mystical, and troubled by occasional bouts of madness.[78] Gould points out that although the idea of recapitulation was discredited in the scientific community by the turn of the century, and the child-study movement had produced internal critiques of its widespread use in their own work by 1910, the theory continued to have powerful influences within the theory of child development even up until Dr. Spock, who wrote in 1968: "Each child as he develops is retracing the whole history of mankind, physically and spiritually, step by step."[79] Indeed, throughout the history of science education in the twentieth century, as we shall see, promoters of science-as-play reiterate a belief in recapitulationism as supporting "evidence" for a range of arguments about the order in which scientific concepts are introduced and the type of children who can handle scientific knowledge.

For children of the pre-adolescent stages, recapitulationism strongly prescribed an immersion in nature. If, recapitulationists argued, children were at a stage equivalent to "savagery" or tribal living, it was wholly appropriate for them to spend their summers at adult-regulated camps where they lived in "teepees" and performed impromptu rituals

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[78] See Gail Bederman, *Manliness & Civilization: A Cultural History of Gender and Race in the United States, 1880-1917* (Chicago: University of Chicago Press, 1995), chapter 3: "'Teaching Our Sons To Do What We Have Been Teaching The Savages To Avoid': G. Stanley Hall, Racial Recapitulation, and the Neurasthenic Paradox."
[79] Stephen Jay Gould, *Ontogeny and Phylogeny* (Cambridge, Mass: Belknap Press of Harvard University Press, 1977), 119.

around campfires.[80] This "savagery" should not be the kind of "savagery" that Moses Rozansky's "wolfishness" implied, but rather a more controlled and innocent experience. As Sarah Chinn has written, concern over children of immigrants living in urban settings often took the form of worries over premature promotion into adulthood. Photographer Jacob Riis called his subjects "odd[ly] old-mannish or old-womanish",[81] and as Chinn points out, G. Stanley Hall wrote in *Adolescence* that youth in the city were victims of the "urbanized hothouse life, that tends to ripen everything before its time." Chinn writes that what Hall and other moralizing experts wanted, in place of this "hothouse," was "progress on terms determined by established authorities."[82] By bringing children into a museum such as the AMNH, Bickmore, Osborn, and the others associated with the project hoped to trigger the natural desires of childhood, and divert the curiosity of children such as Moses Rozansky from inappropriate objects of study (gambling? alcohol?) onto age-appropriate contemplations.

The Museum and the Nature League: Sensory Diversions for City Children

In the late 1920s, near the end of the influence of the nature study curriculum movement, the AMNH cemented a partnership with the School Nature League. This organization, founded in 1917, sought to bring a "nature room"—or a space filled with specimens—into each public school, arguing that a room filled with "as woodsy a setting

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[80] Leslie Paris, *Children's Nature : the Rise of the American Summer Camp* (New York: New York University Press, 2008).
[81] Jacob A Riis, *The Children of the Poor* (New York: Charles Scribner's Sons, 1892), 21.
[82] Sarah E. Chinn, *Inventing Modern Adolescence: The Children of Immigrants in Turn-of-the-Century America* (New Brunswick, N.J: Rutgers University Press, 2009), 17.

as we can contrive" would provide an "open sesame" to young visitors that could be "brought into real touch with the living world of nature, even in the heart of a great city."[83] Beginning in the late 1920s, the Museum hosted the League's flower show, provided space for a model "nature room" designed to illustrate the League's activities in public schools, and furnished a venue for the Children's Fair, an early science fair co-sponsored by the League and the American Institute of the City of New York.[84]

By the time George Sherwood, then curator of the Department of Education, wrote this in an article in *Natural History* in 1930, he was repeating a familiar rhetorical trope: "The country dweller can hardly realize the restricted environment of many city children…Their knowledge of nature is limited to the dog, the cat, and perhaps the horse. The vegetable market window and the pushcart represent their knowledge of flowers. In a class recently at the Museum a child for the first time saw grass."[85] Teacher Mary B.C. Byrne, of Public School No. 9, in the Bronx, wrote that the museum was a help to the teacher wondering how to teach subjects such as "elementary classification" and "adaptation to environment" when "there is nothing at hand, save a stray fly or an English sparrow."[86] In another article describing the nature-study activities that the Museum assisted schools in carrying out, a teacher asks a deprived city child how one might know

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[83] "The School Nature League," n.d., Central Archives, 1237; American Museum of Natural History Archives.
[84] "The School Nature League Invites...," May 3, 1927, Central Archives, 1268; American Museum of Natural History Archives. See also Kohlstedt, *Teaching Children Science*, 166.
[85] Sherwood, "The Museum in Education," 505. For more on deprivation of children's senses in the city, see also Ruth E. Crosby, "Nature in New York's Lower East Side," *Natural History* XX, no. 2 (March-April 1920): 205.
[86] Byrne, "Tuesday at the Museum," 262.

that spring has arrived. “Because I saw them hanging the swinging doors on the saloons,” “Johnny” replies.[87]

Reformers such as photographer and writer Jacob Riis had long played on the pathos of the nature-deprived child, placing this aspect of the plight of the poor at the center of their arguments. Riis, for example, dedicated his 1892 *Children of the Poor* to his own “little ones,” whose childhood was clearly the obverse of the ones he observed through his camera. Riis proved their innocence rhetorically by describing their connection with nature (at the beginning of his dedication, Riis writes “they…come rushing in from the autumn fields, their hands filled with flowers ‘for the poor children’”).[88] In 1888, Riis wrote a letter to the New York *Tribune*, asking commuting readers to bring flowers in from their suburban fields and give them away to “urchins” on the streets of the city. “The pleasure of giving the flowers to the urchins who will dog their steps in the street crying with hungry voices and hungrier hearts for a ‘posy’ will more than pay for the trouble,” Riis argued. In his memoirs, Riis reported that when distributing flowers on the streets, he saw babies that “stopped crying and smiled as the blooming message of love was laid against their wan cheeks,” while the adults in the vicinity also responded to the influence of the flowers, and “the worst street became suddenly good and neighborly.”[89] This sentimental language was grounded in Progressive ideas about the influence of environment, and also participated in what

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[87] Sherwood, “What the American Museum Is Doing for the School Children of New York,” 107.
[88] Riis, *The Children of the Poor*, v.
[89] Tom Buk-Swienty, *The Other Half: The Life of Jacob Riis and the World of Immigrant America* (New York: W.W. Norton & Co, 2008), 224.

historian John Kasson diagnoses as the contemporary fascination with personal transformation.[90] The School Nature League, and, with it, the American Museum of Natural History, sought to bring bits of nature right into the hands of schoolchildren in public schools; in order to form an ideological case for this work, the League needed its children to seem as nature-deprived as possible.

The Museum sometimes explicitly pointed out the difference they expected the viewer/reader to see between the city children in their photographs and the child free in nature. For example, *Natural History* ran a photograph of a group of children planting a tree in Bar Harbor, Maine, right before a story about the League's work in New York City schools, and asked in the caption that the reader imagine for himself the difference between "the mental outlook of these children, with their free out-of-door life" and that of the children in the article to follow. The children's white clothes and the presence of ex-president Charles William Eliot of Harvard at the tree-planting are signals encouraging adult readers to recognize privilege—privilege naturally accompanied by the "freedom" to be "out-of-doors", along with a superior "mental outlook."[91] (This equation of the "free out-of-door life" and privilege, which frequently played upon adult readers' nostalgia for their own childhoods, was reinforced by articles in other issues of *AMJ*/*NH*

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[90] John F Kasson, *Houdini, Tarzan, and the Perfect Man: The White Male Body and the Challenge of Modernity in America*, 1st ed (New York: Hill and Wang, 2001), 8.
[91] "Planting a Peace Tree in the Park," *Natural History* XX, no. 4 (June 1920).

during this period, such as Frank H. Wood's elegiac "The Schoolboy and His Forest" and Theodore Roosevelt's boyhood reminiscences in "My Life as a Naturalist."[92])

These nostalgic evocations were counterbalanced with images of deprivation. The photographs in the following article were captioned with the pathetic imagined thoughts of the city children encountering "nature" in the form of stuffed birds and pussywillows in small rooms at city schools. "Oh, how I wish I could see these things growing!" one of these "serious-minded" children exclaims, while another muses, "The seashore must be a wonderful place."[93] Mrs. John L. Northrop, the president of the School Nature League, described the children who visited the nature study rooms that the League established at local schools as "suggest[ing] hungry little animals putting out tentacles in every direction, seizing with avidity on the knowledge they want, and finding learning not a task but a joy."[94] In these depictions, the "avidity" of city children becomes almost repellent, an object of wonder and pity for the privileged adult onlooker.

To the curators of the Museum, the League rooms sometimes looked as pathetic as the children using them, though this fact did not seem to deter them from pursuing a partnership with the organization. In a 1919 letter to Henry Fairfield Osborn, written after he visited a School Nature League room (and before the Museum began to work closely with the League), George Sherwood emphasized both the "avidity" with which the

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[92] Frank Wood, "The Schoolboy and His Forest," *Natural History* XX, no. 2 (April 1920): 120–123; Theodore Roosevelt, "My Life as a Naturalist," *American Museum Journal* XVIII, no. 5 (May 1918): 321–330.
[93] Mrs. John L. Northrop, "Nature and the City Child," *Natural History* XX, no. 3 (June 1920): 265–276.
[94] Mrs. John L. Northrop, "Making Naturalists in Norfolk Street," *Natural History* XXII, no. 2 (April 1922): 140.

children surveyed the natural objects, and the pathetic characteristics of the objects themselves: the children "examined" the most "common" of the flowers closely, although most of the specimens were "what we would call cast-offs," and did not "represent anything like a systematic series."[95] In a 1921 image of a nature room in P.S. 62 in Manhattan, we can see what Sherwood is describing: a clutter of posted images, cracked rocks, and dried ferns, in a room that seems not to be big enough for all of its child visitors to have a seat.[96]

What kinds of transformations in "mental outlook" did those involved in Nature League work expect to see? The theme of orderliness emerges once again: Gustave Straubenmueller, in recommending the Museum's continued involvement with the League, said that he found the nature rooms "especially valuable in dealing with the 'wayward and backward' children.'"[97] But these isolated and preserved pockets of nature were also intended to effect a far greater change, one that would reverse the contemporary demographic shift toward urban living. The School Nature League's founder, Alice Northrop, in a 1921 letter to Osborn, cited another goal of the League: to "create a counter-current from the city to the country."[98] Northrop eventually started a camp in the Berkshires, where students identified through the Nature League as particularly promising could spend the summer in the woods and cultivating a farm. In

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[95] George Sherwood to Osborn, Henry Fairfield, May 28, 1919, Central Archives, 1084; American Museum of Natural History Archives.
[96] Julius Kirschner, *Nature Room - P.S. 62 Manhattan*, June 1921, AMNH Miscellaneous, drawer 94; neg. 38976; American Museum of Natural History.
[97] "School Service Building: Suggestions Given by Dr. Straubenmueller," July 11, 1922, Central Archives, 1088; American Museum of Natural History Archives.
[98] Mrs. John L. Northrop to Osborn, Henry Fairfield, January 4, 1921, Central Archives, 1084; American Museum of Natural History Archives.

another letter to Osborn, in which she proposed this plan, she wrote, "Then it could work in the city Nature Rooms in the winter and in a Nature Camp in summer, we would surely turn out farmers and naturalists then by the score."[99] Alice Northrop, who was the widow of John Northrop, a professor of chemistry at Columbia, and whose son John H. Northrop eventually won the Nobel Prize in chemistry[100], was clearly aware from personal experience that it was more and more likely that modern scientific careers would take place in an urban or industrial laboratory, not on a farm or in the country; her argument was a moral and emotional one, rooted in an anti-modern longing for a past social order.

Northrop's comment raises the question of the Museum's vision of the long-term place of science in the lives of its child visitors. AMNH personnel only occasionally alluded to the future potential of the individual children who visited. In 1884, Morris Jesup, as President of the Museum, included in his annual report an appeal to donors based on possible returns in the form of human intellectual achievement. Jesup wrote, "Out of a great number who look on vaguely and experience only the healthful excitement of a natural curiosity, one here and there may be found endowed with special aptitude and tastes. Perhaps some child of genius, whose susceptibilities and faculties once aroused and quickened, will repay in the field of discovery and science, through the force of some new law in its manifold applications, all your expenditure a

[99] Mrs. John L. Northrop to Osborn, Henry Fairfield, July 5, 1921, Central Archives, 1084; American Museum of Natural History Archives. Grammar in original.
[100] "Alice Rich Northrop Memorial Camp," accessed August 11, 2010, http://www.northropcamp.org/.

hundredfold."[101] In a similarly rhetorical way, writing the 1911 education issue of the *AMJ*, the supervisor of the Public Lecture System of the Board of Education, George Leipziger, reminded readers of the rags-to-riches life story of British scientist Michael Faraday.[102]After a brief recounting of Faraday's story, Leipziger wrote, "So may other men arise to benefit the world, who shall have been directed to their career through the combined influences of the museum and the public lecture."[103] Although the magazine illustrated this hypothetical situation by a photograph of a real child reading an exhibit label at the AMNH, the child is not identified, nor does the text inquire after the conditions of his life, the depth of his interest, or his prior knowledge.

The truly rapturous language of anticipation and hope for scientific advancement was reserved for the children who were already within the social realm of the adults who worked at the Museum. The juxtaposition of two published pieces in the museum's official journal shows how the split between the progressive belief in experimental and exploratory education and in education as efficient training for industry was often

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[101] Henry Fairfield Osborn, *The American Museum of Natural History: Its Origin, Its History, The Growth of Its Departments to December 31, 1909* (New York, N.Y.: The Irving Press, 1911), 28.
[102] Faraday's life, historian of science Geoffrey Cantor writes, was a favorite subject of British biography in the half-century after his death in 1867, because, or so Cantor argues, its narrative lent itself to morality tales. As a youth, Faraday, born into a poor family of low social standing, became exasperated with his work as a tradesman at a book bindery and began attending chemist Humphry Davy's lectures, where he took detailed notes. On the strength of this work, Davy hired him as an assistant. This interest in and devotion to science, coupled with Faraday's religious affinities, meant that Faraday appeared often in biographies for Victorian readers, young and old, during the second half of the nineteenth century. Geoffrey Cantor, "The Scientist as Hero: Public Images of Michael Faraday," in *Telling Lives in Science: Essays on Scientific Biography*, ed. Michael Shortland and Richard R Yeo (Cambridge: Cambridge University Press, 2006), 171–194.
[103] Henry Leipziger, "The Museum and the Public Lecture," *The American Museum Journal* XI, no. 7 (November 1911): 220.

dictated by class concerns. When his son was born in 1922, T.D.A. Cockerell penned a short poem for *Natural History*, titled “To the New-Born Son of a Naturalist”. “You will see, where we are blind/We may seek, but you will find,” the poem salutes the new baby, hoping that “when you hold the golden thread/Passed on from days of long ago/The names of those remembered/For what they strove to do and know/May still have the power to stir the mind/And passing, leave a gift behind.”[104] While Cockerell saw his son as a future historical actor in the great drama of scientific knowledge-making, for other students visiting the Museum, science was simply an aid to their adjustment to their place in modern life. Or, as Superintendent of Schools William H. Maxwell wrote in the *AMJ* in 1911, in vision a bit less exalted than the “golden threads” Cockerell’s new son held in his hands: “The study of nature is the foundation of that knowledge which leads to increased productivity in industry and of those ideals of life that make for improved conditions of living.”[105]

“The Great Teaching Machine”: The Science Service Building and the Growth of “Contacts”

Jean Le Corbeiller, a mathematics professor who wrote an unpublished history of the AMNH, titled his chapter about the AMNH’s efforts at education “The Great Teaching Machine.” Le Corbeiller, writing in 1969, meant this as a compliment, speaking

[104] T.D.A. Cockerell, “To the New-Born Son of a Naturalist,” *Natural History* XXII, no. 5 (October 1922): 464.
[105] William H Maxwell, “Cooperation in Education,” *American Museum Journal* XI, no. 7 (n.d.): 219.

to the efficiency of the machine's production.[106] Thomas Schlereth has written that the end of the nineteenth century was a time when the pace of human activity decoupled from natural cycles and, with the help of technology, began to move "to the tempo of the timetable and the time clock."[107] As described above, the museum's emphasis on quantity and efficiency in the "contacts" it made with schoolchildren carried an implication that the learning experience could be decoupled from the child's actual experience and *produced,* at the museum's will. By the 1920s, in particular, museum personnel often compared all of this activity to modern technological miracles—comparisons that would resonate with readers accustomed to the language of what David Nye calls "the technological sublime."[108] For example, in 1927, George Sherwood wrote in his Annual Report that the work of the Museum was as impressive as the building of a skyscraper. "The mushroom-like rapidity with which a modern skyscraper takes shape fills us with astonishment, and we can hardly believe our eyes, as daily we see tons and tons of steel girders arise, story upon story… So it is in building the American Museum: it is the explorations and the research that constitute the foundation and the mighty supporting structure of the American Museum."[109]

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[106] Jean Le Corbeiller, "Early Chapters for Jean Le Corbeiller's Text for the Pictorial History of the American Museum of Natural History," 1969, Jean le Corbeiller Collection, MSS L67; American Museum of Natural History Archives.
[107] Schlereth, *Victorian America*, 301.
[108] David E Nye, *American Technological Sublime* (Cambridge, Mass: MIT Press, 1994).
[109] Quoted in Geoffrey Hellman, *Bankers, Bones & Beetles; the First Century of the American Museum of Natural History*, 1st ed. (Garden City, N.Y: Published for the American Museum of Natural History [by] the Natural History Press, 1969), 154.

The Museum advertised its educational efforts as part of this "modern miracle," especially the lending services that the Museum provided to public schools in the city.[110] As early as 1908, collections bound for the city's public schools traveled in automobiles marked with the Museum's name.[111] Museum archives contain many photographs taken of personnel sorting and preparing instructional material for schools—photographs that may have been intended, along with the accompanying charts, as supporting material for the Museum's case for building a new School Service facility.[112] In 1922, *NH* published a photograph of one of the motorcycle deliverymen who brought slides to schools, citing the distance traveled by the messengers each day.[113] A museum promotional film made in 1927, and possibly meant to commemorate that year's opening of the School Service Building, dwelt for minutes of its running time on the smooth, factory-like workings of the floor of the School Service Building which prepared lantern slides and suitcase nature–study collections to be lent to schoolteachers. Scenes of diligent workers packaging and filing slides, and of messengers packing boxes full of specimens and other materials into the back of the Museum's fleet of cars and motorcycles, were meant to

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[110] On another large organization that produced imagery of its own processes during this time, see David E Nye, *Image Worlds: Corporate Identities at General Electric, 1890-1930* (Cambridge, Mass: MIT Press, 1985).

[111] *Automobile Used to Deliver Various Collections to Schools for Teaching Purposes*, 1908, AMNH Miscellaneous, drawer 94; neg. 338728; American Museum of Natural History Archives.

[112] H.D. Rice, *Sorting Boxes of Lantern Slides for Delivery to the Public Schools* Photograph, December 1926, AMNH Miscellaneous, drawer 94; neg.311773; American Museum of Natural History Archives; Julius Kirschner, *Slides Packed and Ready for Delivery to the Public Schools of Greater New York* Photograph, April 20, 1925, AMNH Miscellaneous, drawer 94; neg. 310916; American Museum of Natural History Archives; Julius Kirschner, *Increase in Circulation of Lantern Slides, 1915-1924*, January 1925, AMNH Miscellaneous, drawer 94; neg. 310851; American Museum of Natural History Archives.

[113] "Quick Delivery...," *Natural History* (March-April 1922), n.p.

impress viewers with the quickness and efficiency of the Museum's system.[114] These "behind-the-scenes" photographs of the work done by the Education Department re-emphasize the modernity and power of the Museum's physical apparatus, leaving the viewer to imagine that with this level of technological sophistication on its side, learning would be a foregone conclusion.

The "School Service" film also contained many scenes of city streets filled with children playing—by 1927, the viewer would find the visual trope of children entertaining themselves on city streets had long become familiar through the photographs of Lewis Hine and Jacob Riis, and would have recognized the location of their play as a commentary on the poverty of these children's lives. In one striking scene in the film, a School Service automobile pulls up next to a group of playing children, who appear to be African-American. The Museum worker driving the car dismounts from behind the wheel, walks around to the back of the car, and brings out a taxidermied animal that might be a lizard. He puts the animal down on the sidewalk in front of a group of children, and the camera catches one of the children kneeling in front of it, then looking up at the museum worker, with a quizzical expression that seems to inquire as to the meaning of this encounter.

This moment requires a range of understandings from its viewer, including the belief that a child presented with a piece of nature—no matter how inert and unfamiliar—will immediately abandon his or her previous activity in order to step into a proper

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[114] William H Carr and Irving Dutcher, *The School Service of the American Museum of Natural History* 16 mm, 1927. On the opening of the School Service Building, see George Sherwood, "The School Service Building," *Natural History* XXII, no. 2 (April 1922): 113-115.

attitude of appreciative interest. The moment also positions the museum worker as intercessor and benefactor, echoing Osborn's belief that it was the "great naturalist"'s duty to serve as a conduit between God and the child. In this film, as in all its imagery, the AMNH argued that childhood in the city would impoverish not only children's bodies but also their minds. Further, the great Museum had the capacity to feed those minds through the insertion of short encounters with bits of nature. Meanwhile, in Brooklyn, as I will describe below, another vision of museum work was evolving, one which saw children as precious and precocious, capable of organically experiencing a long-term program of scientific involvement.

The Brooklyn Children's Museum: "Alert from Toes to Crown"

I heard a happy humming
As though a swarm of bees
Over a new-found garden
Were voicing ecstasies.

It came from eager children
Who thronged upstairs and down
Discovering fresh wonders
Alert from toes to crown.

They listened to a legend,
And joined in nature games,
Calling the bugs and beetles
By learned Latin names.

They buzzed about strange countries,
They burrowed deep in books,
And graced the maps and pictures
With rapt and reverent looks.

America extended
Her arms to every child,

And little foreign faces
Looked up at her and smiled.

The air was warm with welcome,
They felt as free to roam
Through each enchanted chamber
As if they were at home.

And many a drop of nectar
Their young souls stored away
To make a golden honey
To sweeten life someday.
-Anne Lloyd, "In the Children's Museum"[115]

The Brooklyn Children's Museum Seal, created in 1924 by Isabel Whitney, depicts a child's figure with arms and legs splayed, light radiating from its limbs. Whitney meant the figure to represent Ariel, "the sprite or spirit of childhood," "clothed with light, the irradiant power of the universe," "encased in a star." Whitney wrote that she struggled to represent the concept of the museum, thinking that "such an advanced ideal as the Children's Museum must needs be represented by the pictorial language of modernism," but adding that "today is an outgrowth of yesterday," and so "recognized symbols of the past must help in its expression."[116] Whitney and Lloyd, the author of the above poem, participated in the Children's Museum's self-articulation as a safe, cozy, familial place, where children, who were possessed of what Chris Jenks would recognize as an "Apollonian" capacity for growth and learning[117], would enter a natural paradise of education.

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[115] Anne Lloyd, "In the Children's Museum," *Children's Museum News*, May 1920.
[116] Isabel L. Whitney, "Children's Museum Seal," *Children's Museum News*, December 1924.
[117] Chris Jenks, *Childhood* (London: Routledge, 1996).

The BCM was founded in 1899, after one of the curators at the Brooklyn Institute of Arts and Sciences visited Europe and was impressed by exhibits at the Manchester Museum in England, which seemed to appeal to many children. The Children's Museum had strong associations with school-based progressive education movements. Anna Billings Gallup, who joined the Brooklyn Children's Museum's staff in 1903 and spent thirty-five years as its head, was a teacher who had spent four years at the Hampton School, giving classes in biology, and she had also received a degree in biology from MIT (Sc.B.).[118] Gallup was a founding member of the major professional group of nature-study educators, the Nature-Study Society, and often wrote about the Children's Museum's activities in the society's journal.[119] Thomas Schlereth writes that Louise Condit, the Museum's supervisor of education, was "an ardent disciple of John Dewey." The language of progressive education, with its emphasis on shaping instruction according to the child's interest, pervaded the rhetoric of the museum's curators and administration. Gallup believed in child-centered education, and spoke often of the value of allowing children to follow their interests within the museum's walls.[120] When the museum opened, the "Yearbook" of the Brooklyn Institute of Arts and Sciences, the Museum's parent institution, wrote that the museum would "attempt to bring the child or young person, whether attending school or not, into direct relation with the most important subjects that appeal to the interest of their daily life, in their school work, in the

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[118] George E. Hein, "Progressive Education and Museum Education: Anna Billings Gallup and Louise Connolly," *Journal of Museum Education* 31, no. 3 (2006): 161–174.
[119] Kohlstedt, *Teaching Children Science: Hands-On Nature Study in North America, 1890-1930*, 67.
[120] Hein, "Progressive Education and Museum Education."

reading, in their games and rambles in the fields, and in the industries which are carried on about them, or in which they themselves may one day be engaged."[121]

There is a large cultural distance between the utopian Progressive educational vision of a democratic exploration of science and nature, as embodied in the Brooklyn Children's Museum, and the circumscribed offer of moral authority automatically derived from nature, as presented at the American Museum. Thomas Popkewitz points out that although pragmatism, with its disavowal of authority figures, could be considered to be full of what Max Weber called "disenchantments", "the 'disenchantments' [of pragmatism] embodied new enchantments of attachment and belonging that today are embodied in discussions of modernity."[122] When centered on the work of John Dewey, Progressive interest in childhood learning resulted in "enchantments" with childhood and science, investing the learning child with the ability to bring the human race further along the road to full understanding and mastery of the external environment.

John Dewey's belief was that by teaching children to think scientifically, the teacher not only exploited natural tendencies of childhood, but also empowered the individual. As Popkewitz writes, "Dewey's pragmatism presupposes radical political theses about the individual as a purposeful agent of change in a world full of contingency."[123] Indeed, Dewey's modern child was one who could foresee future events, manage intuitive responses, and plan rational courses of action, all using scientific

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[121] Sydney Reid, "The Children's Wonder-House," *The Independent*, January 4, 1912.
[122] Thomas S. Popkewitz, ed., *Inventing the Modern Self and John Dewey: Modernities and the Traveling of Pragmatism in Education*, 1st ed (New York: Palgrave Macmillan, 2005), 32.
[123] Ibid., 4.

thinking. The difference between this child and the recapitulating “savage” was one of newness and possibility, as opposed to a rote repetition of history. John Dewey’s daughter, Evelyn Dewey, wrote of “the modern child” in 1934:

> He is set amidst resources greater than Solomon dreamed of. Science has given him the wings of the eagle, the fins of the fish, long-distance eyes and ears so that he masters space and time. Matter has become his plaything. Running it through the mold of his imagination he changes its form at will. He inherits the intimacy of the stars and even dreams of transcending the boundaries of the planet. He is the last throw out of the Pandora's box of civilization.[124]

For this child of modernity, who looks very much like the Children’s Museum’s “Ariel,” the mastery of space and time, while new to his parents, has provided new “playthings” for the “imagination.” This child combines the inheritance of resources (a rich environment), which include enhanced sensory awareness provided by technology, with his own (natural) imagination and dreams. This child is not running through the same old phases of savagery on his way to adulthood, but is instead a product of accelerated evolution; his instincts should be trusted, and his interests indulged.

The Children’s Wonder-House

The architecture of the BCM spoke volumes about its child-centered intentions. The BCM was initially housed in a Victorian mansion—the Adams House, in Bedford Park.[125] Gallup wrote that the house’s “picturesqueness of situation” rendered it uniquely

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[124] Katherine Glover and Evelyn Dewey, *Children of the New Day* (New York: Appleton-Century, 1934), 11.
[125] Edward P Alexander and American Association for State and Local History, *The Museum in America: Innovators and Pioneers* (Walnut Creek: AltaMira Press, 1997), 53.

suited for the children's museum.[126] Indeed, a comparison of two images of the museums makes it clear that the BCM's facility may have been far less menacing than the AMNH's fortress to a potential child visitor.[127] The Adams House became an integral part of the BCM's self-image—its appearance on letterhead used by the BCM Women's Auxiliary shows how the mansion became emblematic of the institution itself.[128] Caroline Worth, writing for the journal *Childhood i*n 1922, dramatized the founding of the museum as a natural regeneration of the old house, which had once housed children as a family dwelling but had become "grim and neglected, as would any home in which the sweetness of childhood failed to enter." The museum established itself almost of its own accord: "Hundreds of birds seemed to fly into the parlors of the old mansion, and to arrange themselves in glass cases. The dining room disappeared, likewise the kitchen and bedrooms. Butterflies of every hue joined with moths, beetles, and dragon-flies in forming an Insect Room…The great family of children took possession of the building."[129] Likewise, in a 1912 article about the museum in the *Independent*, journalist Sydney Reid nicknamed the place "The Children's Wonder-House," drawing attention to the childish ownership of the physical plant.[130] At the time of its opening, the BCM was

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[126] Anna Billings Gallup, "The Children's Museum as Educator," *Popular Science Monthly*, April 1908, 371.
[127] Gallup, "The Children's Museum as an Educator"; "Completed Facade of the Museum," *American Museum Journal* (1900).
[128] Women's Auxiliary, Brooklyn Children's Museum, n.d., Central Archives, 115; American Museum of Natural History Archives.
[129] Caroline M. Worth, "The Children's Museum," *Childhood* 1, no. 4 (June 1922): 11.
[130] Reid, "The Children's Wonder-House."

intended to appeal to young people ages six through twenty.[131] The museum contained "departments" of botany, zoology, geology, meteorology, geography, and history; there was also a library stocking textbooks, popular science volumes, and magazines, including *National Geographic*, *Nature*, *Bird-Lore*, and some more ambitious fare, including the *American Journal of Science* and the *Journal of Applied Microscopy*.[132]

The idea of a museum "just for kids" was particularly suited to this time and place. Historian John R. Gillis describes what he calls (following German sociologists Helmut and Helga Zeiher) the "islanding of childhood," or the twentieth-century phenomenon of the creation of separate and idealized realms of childish existence. Gillis argues that this "islanding" is part of the "mythical geography of childhood," a constructed sense of place that serves the adult by providing imaginary "children to live *by*," while separating actual childhood experiences from adult life.[133] In this case, the "island" of the museum was said to be inhabited and possessed by children's intellects. "All development has been indicated by interest, so that the children have actually made the museum; the management and city authorities simply doing what was needed." Gallup wrote in a pamphlet rejecting a proposal to absorb the Museum into the Brooklyn Institute of Arts and Sciences, "The child must feel that the whole plant is for him, that

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[131] "The Children's Museum of Brooklyn Institute," *Scientific American* Vol. LXXXII., no. No. 19. (May 12, 1900): 296.
[132] "The Children's Museum," *The Year-Book of the Brooklyn Institute of Arts and Sciences* 12 (1900 1899): 12.
[133] Gillis, John R, "The Islanding of Children - Reshaping the Mythical Landscapes of Childhood," in *Designing Modern Childhoods: History, Space, and the Material Culture of Childhood*, ed. Gutman, Marta and De Coninck-Smith, Ning (New Brunswick, N.J: Rutgers University Press, 2008), 318.

the best is offered to him because of faith in his power to use it."[134] The physical spaces reflected consideration for what an adult visitor from out of town called "short-legged humanity."[135] In 1919, the *CMN* noted that the children greatly appreciated the museum's acquisition of a set of small folding chairs and a low table: "No longer will children have to stand up or lean against the polished glass or lie on the floors on their stomachs when they laboriously print the names of the birds and butterflies they have drawn. It is such a comfort not to have to stretch up to the big tables made for big folks!"[136] When a class of librarians-in-training visited the Museum in 1926, a librarian recounted a story that she said was typical of the children's proprietary attitude toward the museum: "One small boy, looking at the young women…scowled, and in no uncertain tone declared, 'This is a Children's Museum.'"[137]

The BCM positioned itself as more appropriate for children than the other museums, zoos, and botanical gardens in the city, and suggested that attendance at the Children's Museum could serve as preparation for later enjoyment of these more adult institutions. In 1919, for example, the *CMN* reported on a twelve-year-old boy from Coney Island who had read a book about nature activities in New York[138], and had decided to make his way to all of the institutions named. Hitting upon the Children's Museum first, the *News* said, he realized that the Museum could "serve as an introduction

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[134] Reid, "The Children's Wonder-House," 33.
[135] Elizabeth E. Scantlebury, "Spokane Should Have a Museum for Children," n.d.
[136] "From the Children's Point of View," *Children's Museum News*, February 1919.
[137] "Library Notes," *Children's Museum News*, December 1926.
[138] George N Pindar, *Guide to the Nature Treasures of New York City; American Museum of Natural History, New York Aquarium, New York Zoölogical Park and Botanical Garden, Brooklyn Museum, Botanic Garden and Children's Museum* (New York: Pub. for the American Museum of Natural History by C. Scribner's Sons, 1917).

to the larger museums." "He understood the collections because they are simple, he found books to read about the collections; he could attend the lectures, make experiments, join the League, and work with the other boys for certificates of credit and a medal." In the end, the *News* opined, the boy would be able to return to his quest, more fully prepared to ingest adult material.[139]

While the children who came to the BCM were city children, and admission to the museum was free (at least in 1912)[140], they were not necessarily economically disadvantaged. The neighborhoods bordering the Museum—today known as Bedford-Stuyvesant and Crown Heights, and primarily African-American in ethnic makeup—were, during the early twentieth century, bedroom suburbs for middle- and upper-middle-class families.[141] Gallup wrote in 1908 that many of the Museum patrons were introduced to the Museum when they came "with their parents, or the family nurse." Nor were these children pictured as living in such a stripped-down, impoverished environment as the AMNH's school patrons, or the children who visited the School Nature League's nature rooms. Gallup also referred to children "returning from country outings" in September and visiting the Museum full of stories about the way that they'd applied nature study to their experiences.[142]

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[139] "One Boy's Achievement," *Children's Museum News*, October 1919.
[140] Reid, "The Children's Wonder-House."
[141] Mario A. Charles, "Bedford-Stuyvesant," ed. Kenneth T. Jackson, *Encyclopedia of New York City* (New Haven, CT: Yale University Press, 1995).
[142] "The Tale of a Microscope," *Children's Museum News*, March 1932. Sydney Reid also mentions children arriving at the Museum "dragging unwilling nurses" ("The Children's Wonder-House," 33).

Moreover, the children who visited the BCM did not arrive empty-handed, like the children served by the AMNH. The Brooklyn Institute conceived of the Children's Museum as a place where children could bring things they might find in their daily lives: "Boys and girls often find odd and curious animals, or plants, or minerals, about which they would love to know something." The scientific staff attached to the Children's Museum would be happy to identify this flotsam and jetsam for the Museum's patrons, the piece went on to say, offering information about "its place, history, uses, name, and structure."[143] This offer assumed at least a degree of variety within the patrons' environment; the AMNH did not imagine "its" children as ever having seen any animal except rats and horses. Some evidence exists that suggests that children visiting the BCM received supplementary materials from their parents; George Schoonhoven, a 14-year-old patron, reported to a local newspaper that his parents had purchased him a microscope and a camera to help his research in natural history.[144] A final clue to the middle-class status of the Museum boys and girls during the first quarter of the century lies in the stories the staff told about the success of their "graduates," many of whom returned from college to share their experiences with the curators (more on this below). During the teens and twenties, teenagers from the working class were far more likely to drop out of high school than their middle-class counterparts, and immigrant children (those who were

[143] "The Children's Museum," 249.
[144] "The Children's Museum," *The Junior Eagle* (Brooklyn, February 22, 1914).

born outside of the United States, or whose parents were) were the least likely of their cohort to end up attending any high school at all.[145]

Thus, the BCM's image as an "islanded" paradise of learning, where children's interests could shape scientific inquiry, relied on the middle-class status of its patrons. The "family" of children inhabiting the old Adams House was not pathetic, vaguely menacing, or in need of discipline, in the way of the AMNH's impoverished young masses, and because of this, the BCM could indulge in flights of fancy about an institution ruled by youth's desire to know. Below, I will further describe how the BCM represented the activities of its young patrons, and show how these representations added up to a sentimental vision of the proper place of science in children's lives.

The Middle-Class Science Experience: Adorable Strivers

Unlike the children pictured in the AMNH's publicity materials, who often seemed wistful or desperate, easily fulfilled by encounters with small tokens of nature, the children of the BCM manifested an easy familiarity with science that adult onlookers found nothing less than cute. The writers of the *CMN* deployed anecdotes about children's knowledge for the purposes of humor. Describing the summer field activities of the Children's Museum League in November 1915, the *CMN* reported that "before the summer was over, children of less than ten years of age were talking quite freely about 'Pholus pandorus,' 'Hemaris thysbe,' and a hundred other species of moths, butterflies,

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[145] Melissa R Klapper, *Small Strangers: The Experiences of Immigrant Children in America, 1880-1925* (Chicago: Ivan R. Dee, 2007), 121.

beetles, bugs, and grasshoppers."[146] The *CMN* reprinted a letter from an eleven-year-old girl in 1926, asking "in scientific vein" whether there are people living on Mars. "I asked a college boy," said Marie Sharpe, "and he said scientists say or imagine that there are long, thin, straggly people there. But it seems impossible for people to live on or in a star…I should think if there were, it would be such a weight on the star that it would fall to earth."[147] This childish inquiry, clearly published to serve as a humorous anecdote, carries a far different emotional valence from the anecdote printed in the *AMJ* about "Johnny"s answer to his teacher's question about seasons changing ("I know it's spring because I see them hanging doors on the saloons"). Marie's question, although it also indicated a lack of knowledge, indulged adult ideas about the fanciful imaginations of children, and combined this with an admirable attempt to sort her fancy out "scientifically."

This rhetorical position, in which children's participation in science became an occasion for gentle adult amusement, was echoed and reinforced in the images that accompanied the *CMN*'s articles. Photographs printed in the *CMN* resemble pictorialist images of childhood and popular illustrations from artists such as Jessie Willcox Smith and Elizabeth Shippen Green, which imagined childhood as an idyllic, idealized realm apart from adult activity. In the popular illustrations that Anne Higgonet describes, which lie within a regime of visual representation that emphasized the innocence of "ideal childhood," the innocent, adorable, and anonymous child was classed as privileged by

[146] "Children's Museum League," *Children's Museum News*, November 1915.
[147] "A Sheaf of Letters...," *Children's Museum News*, May 1926, 273.

virtue of being represented in distinctly upper-middle-class settings. These settings also tended to be—in direct contrast to Riis' alleyways, or Hine's factories—created especially for children. [148] Often, these children were pictured at play or reading books, a modality of representation that abetted the growing perception that a child was always learning—and that learning was an idyllic process, carried out independently, but always with material support provided by a prosperous family situation.

In publishing photographs of museum children, the *CMN* often achieved cuteness through the juxtaposition of punning captions. These often emphasized to the adult onlooker the similarity between the natural objects that the children were engaging and the children themselves. The Museum kept a hive of bees indoors; in an image titled "Busy Bees," a hive of children gathers the "honey" of knowledge while observing the insects' activity.[149] An image titled "Opening Buds," featuring a group of junior-high-aged children in a park, depicts children who may be observing botanical signs of spring, but the adult looking at the photograph is instead invited to think of the children as the buds prepared to flower.[150] Considering the fear adults manifested in other contexts throughout the 1920s about adolescent boys and girls mixing freely in social settings, this photograph is all the more notable for its assumptions of innocence.[151] Finally, in an image titled "What Beauties Heaven and Nature Can Create," children look under a log

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[148] Higonnet, *Pictures of Innocence*.
[149] "Busy Bees," *Children's Museum News*, December 1925.
[150] "Opening Buds in Brower Park," *Children's Museum News*, May 1925.
[151] Paula S. Fass, *The Damned and the Beautiful: American Youth in the 1920's* (New York: Oxford University Press, 1977).

for interesting animals and fungi, while adults looking at this picture are invited to see children anew as "beauties."[152]

In a departure from the unidirectional educational mode of the American Museum, at the BCM, children's interest was expected to manifest itself in activities that would contribute to the Museum. In 1917, the *CMN* reported on several gifts children had given to the Library, adding that "the interest felt by the children in the Library has been expressed from time to time by gifts of books and useful material." (In this case, "useful material" included one Morton Wadsworth's gift, "an unusual Chinese nut, resembling the bronzed head of a deer, which has aroused the curiosity of children in visiting classes.")[153] Thus, one child's interest could multiply. Indeed, in order to receive a Museum certificate in bird study, a child needed to "show" in what ways she had succeeded in interesting others in birds.[154] Children also assisted in museum promotion, as the Museum started a Children's Museum League in 1915, whose members were to wear a special badge and promote Museum membership among their friends.[155] By 1920, the members of the League were enjoined to "make short addresses about the Museum in classrooms or school assemblies," or "invite friends to bring box lunches and spend a whole day at the Museum under your guidance." ("One member brought his friends on a bicycle one at a time from a distance of two miles.") For their efforts, League members

[152] "What Beauties Heaven and Nature Can Create," May 1930.
[153] "Library Notes," *Children's Museum News*, February 1917.
[154] "Requirements for Certificate in Bird Study," *Children's Museum News*, March 1918, 22.
[155] "The Children's Museum League," *Children's Museum News*, May 1915.

successful at recruitment (having brought fifteen members into the Museum fold) were given a bird book with "colored pictures."[156]

According to the BCM's official accounts, child attendees at the Museum naturally arrived at a satisfactory mode of behavior through the force of their interest in the Museum's activities. In 1913, the *CMN* touted its visitors' abilities to wait, writing that the small size of the lecture room at the Museum meant that children might stand on line waiting for up to two hours on a crowded holiday. "The patience and good behavior of these youngsters is a constant source of wonder with us," wrote an anonymous author, adding that many children waited for two hours "without any signs of disorder." The reason given for this "good behavior" was that many of the young visitors felt "proprietary interest" and had come "for definite purposes."[157] While several photographs of children the BCM took "waiting on line" as their subject, just as the AMNH's promotions did, these images were intimate and amusing, as opposed to distant and impersonal. In an image titled "On the Line," small signs of the patrons' personalities, such as a look off into the distance, a face made, or a hat fiddled with, render the obedient waiting all the more notable—a child suppressing naughty impulses in order to gain access to knowledge is both adorable and admirable.[158] In an exterior view of children waiting for the museum to open on a weekend morning, titled "Coming Early," museum patrons look like pilgrims, waiting for access to "their" house; the loose informality of

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[156] "Children's Museum League," *Children's Museum News*, March 1920.
[157] "Do Children Appreciate the Lectures?," *Children's Museum News*, December 1913, 18.
[158] "On the Line," *Children's Museum News*, December 1913.

the line, as well as the fact that this is Saturday morning, suggests that these kids are here on their own initiative.[159]

One final image of children waiting to access the museum serves to highlight the difference between what it means to look at children waiting out of interest, versus what it means to look at a picture of children waiting because they must. In 1920, the museum began an "Americanization" program, which was mostly carried out in the American History section of the museum and consisted of discussions of American democratic processes and famous figures of United States history.[160] As Melissa Klapper writes, programs of this sort were not uncommon at institutions serving children during this era; "children and adolescents were natural targets for Americanization efforts, as it was assumed they could influence their families and home life."[161] A photograph of forty boys arriving at the museum to attend the program ran on the front of the *CMN* in March 1920. In this image, these boys look miserable and cold in the "slush and fog," and one imagines them being forced to wait outside while the photographer gets the shot; possibly, the museum wanted to record this moment in order to thank the Red Cross for its help with transportation.[162]

Unlike the AMNH personnel, who discussed children's achievements in vague or sentimental terms, the BCM was quite clear about exactly what was learned at the museum, and by which children. Museum tests were carried out to ascertain the amount

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[159] "Coming Early," *Children's Museum News*, April 1926.
[160] "An Americanization Program," *Children's Museum News*, February 1920; "Americanization Lessons," *Children's Museum News*, March 1920.
[161] Klapper, *Small Strangers*, 133.
[162] "Forty Boys of 7B...," *Children's Museum News*, March 1920.

of knowledge gained by individual students, and the *CMN* described them as a pleasure, not a trial. Whether that was actually the case is, of course, less clear.[163] Tests were seen as being in line with children's own desires: in April 1916, for example, the *CMN*'s Library Notes reported that a "small boy" had picked out several mineral samples for the beginning of his studies in mineralogy, and added that this was "another step toward his expressed ambition 'to know all about everything in the Museum.'"[164]The bird clubs, for example, resulted in a visible increase in knowledge; in December 1913, the *CMN* reported that four boys who had become interested in birds the year before, Edward Crane, Carl Funaro, George Schoonhoven, and Wilfred Kihn, now had familiarity with a hundred living birds, although "Carl says he knew but three a year ago, and Edward thinks his own list could not have exceeded half a dozen."[165] Describing summer insect collecting activities, the *CMN* wrote in 1915 that "no one was satisfied" until they learned the names of the species obtained.

The same group of children transferred knowledge of the bird specimens in the Museum into everyday life and schoolwork: "The effect of studying birds at home is registered in the children's daily conversations about living birds that they are beginning to observe in the parks and highways; in the discriminating questions that the children ask in the Museum, and the ease with which they can answer the questions asked in the bird lessons at school."[166] The strong connections between the Museum and the Woodcraft

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[163] "Museum Tests," *Children's Museum News*, April 1922, 52–53.
[164] "Library Notes."
[165] "Bird Walks to Prospect Park," *Children's Museum News*, December 1913, 22.
[166] "Children's Museum League."

and Boy Scouts organizations were partially based on the Museum's stated mission to help Scouts and Woodcrafters study for badge tests.[167] Children competed for prizes in subject areas, striving to win such items as a "hand lens" (a prize for excellence in "insect study"); a book on trees ("tree study"); and a "balanced aquarium" ("the study of aquatic life").[168]

The field trip was a major aspect of the Museum's activities in the first quarter of the twentieth century, as well as a way for adults to teach children the habits of an ambitious and directed mind. The BCM hoped to inspire children to look for birds and insects local to Brooklyn, and Anna Billings Gallup cited as successes several instances of children who became outdoor bird-watchers after their museum experience, using equipment lent to them by the museum.[169] Lectures given at the Museum emphasized Brooklyn flora and fauna; lecture options for May 1915 included "Birds that Arrive in Brooklyn in May" and "Fur-Bearing Animals in the Woods near Brooklyn."[170] When the Museum League held an insect collection contest in 1916, the *CMN* was careful to point out that children working inside the city limits comprised most of those who had assembled the winning collections, and that this proved that "confinement to the city need not prevent the attainment of good results in insect collecting."[171] In service of another League contest, students in mineralogy took "mineral collecting trips" into "nearby

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[167] "The Children's Museum," *The Junior Eagle* (Brooklyn, July 19, 1914).
[168] "Prize Contests," n.d.
[169] Anna Billings Gallup, "A Children's Museum and How Any Town Can Get One," 1926.
[170] "Lectures," *Children's Museum News*, May 1915.
[171] "Children's Museum League Members Exhibit Their Insect Collections in Competition for a Prize," *Children's Museum News*, November 1916, 80.

vacant lots."[172] Many of the field trips led by the Museum during the summer of 1919 were to local spots, including the nearby excavation sites for the subway on Eastern Parkway, for mineralogy; Prospect Park, for bird-watching; and the shore at the end of Flatbush Avenue, for observing ocean life.[173] This emphasis on the local was another difference between the BCM's approach and that of the AMNH, which assumed that child visitors had no access to any bit of nature that was worth observation.

Field trips helped teach children how to collect out of interest, rather than greed. Museum educators believed that children's enthusiasm for natural objects, when undirected, too closely resembled a mindless search for novelty; museum activities tried to channel this enthusiasm, remodeling the grabby habits of collecting children into a more disciplined program of acquisition. In 1917, the *CMN* wrote about the progress of the summer insect-collection program, noting that the children had initially started out "with no purpose beyond that of catching and holding in their hands some brightly-colored bit of insect life," but that as they realized that the "cabbage butterflies, swallowtails with broken wings, and monarchs with wings rubbed colorless by too-eager fingers" did not present well when mounted, they moved on to more specifically directed collecting. In this scenario, participating in scientific modes of classification and presentation made the children abandon their desire to "catch everything that flies", in favor of a "businesslike purpose" that, while effective in curbing acquisitiveness, could

[172] "Working for Prizes," *Children's Museum News*, February 1917, 103.
[173] "A Series of Field Trips," *Children's Museum News*, January 1919.

also lead to conservationist thinking.[174] In another description of summer trips, the *CMN* wrote that children prepared their own collecting apparatus, saying that "many moments of happy anticipation" went into the exercise of scrubbing and varnishing cigar boxes, refurbishing butterfly nets, and readying cyanide bottles. (The *CMN* stretched perhaps a bit too much when reporting that the children also "appreciated the advantage of making their outfits neat and uniform in appearance, and keeping them in good condition.") Good behavior continued on the trip itself, as the children conducted their business without, as the instructor accompanying the trip was quoted, "a word of friction, or a jar." "Placed in a field with something definite to do such as insect collection or plant study the children expand freely," the article continued. Appealing to the adult sense of the picturesque, the author indulged in a moment of description: "In the open country, the children present an attractive sight flashing their white nets, chasing butterflies, collecting wild flowers for the plant presses, and making vigorous use of the geological hammers in search of crystals."[175]

The *CMN* often ran photographs of single children working diligently on collections they compiled on these trips. If the dominant mode of the AMNH child was simple wonder and sentimental attachment, the BCM child channeled his wonder into profitable work. The *CMN* ran a photograph of Grinnell Booth, a participant in one of the museum's summer entomology programs, in a quiet corner of the Adams House,

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[174] C.R., "One Phase of the Summer's Work," *Children's Museum News*, November 1917, 10. See also discussions about greed and covetousness in "A Woodcraft Hike," *Children's Museum News*, May 1922, 59; "Field Trips for 1922," *Children's Museum News*, 1922, 5.
[175] "Days A-Field and What They Mean," *Children's Museum News*, November 1920, 2.

processing the fruits of his insect collecting. The accompanying text noted that Grinnell was one of the most enthusiastic students in the program, "hesitating at times about going home for lunch for fear he would 'miss something.'" (Grinnell was also mentioned in the following month's *CMN*, as the youngest competitor in an insect-collection contest, with an entry that "compared quite favorably" with the older boys'.)[176] These pictures of children working were clearly set up for adult appreciation, as in a 1917 image of George Ris and his mineral collection, in which the "trays of home manufacture" that house his specimens are turned outward for the camera to capture, creating the impression of a little shopkeeper displaying his goods.[177] In her own photo op, Bernice G. Schubert "of 1483 Union Street" was also shown with her collection (hers displayed in a Chiclet box), and described as "one of the happiest little girls in the Bedford Section all last summer," a description belied by her somewhat doleful expression.[178] Next year, the *CMN* noted, she planned to raise butterflies from the caterpillar stage. These three images, grouped together, present a picture of children learning to direct inquiry into tangible profit. The museum itself acts as a stage for their quiet, well-behaved labors.

Wireless Station: Boys' Questions, Boys' Futures

"'They argue almost to the point of the bayonet,'" Anna Billings Gallup told a reporter in 1912, describing the discussions which she saw take place between older, "earnest" boy visitors engaged in operating the Museum's wireless station. The reporter,

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[176] "Summer Work in the Busy Bee Room," *Children's Museum News*, October 1916.
[177] "Mineral Study in the Museum," *Children's Museum News*, November 1917.
[178] "A Good Way to Spend the Summer," *Children's Museum News*, January 1919.

Sydney Reid, went on: "These heated arguments are not about baseball, football, tops, marbles, or kites. They are about moot questions of science. The big boys have exhausted text books, know all that the masters can tell about particular subjects, and are pushing their theories and inquiries into the unknown." Reid wrote that a group of older boys at the Museum was so enamored of the wireless station that they "labor afternoons, Saturdays, and holidays, from love of their occupations, and because they 'want to know.'"

The maleness of this group—the boys' status as "big brothers" of the museum "family"—was a major part of its appeal. In her profile, Reid wrote, "Schoolgirls use the museum and its library freely, but they do no original work."[179] An article in the Brooklyn *Junior Eagle* in 1914 did mention two sisters—Katie and Fannie Weitzer, of 974 St. Mark's Place—who involved themselves in the wireless station, but their names never pop up in the *Children's Museum News*, and their futures as wireless operators, if they did continue with this interest, are not mentioned.[180] Within the museum's official publicity, out of all the activities carried out in the Brooklyn Children's Museum, the most glamorous club of all—the club that did scientific work that involved climbing about on roofs and performing "original" theorizing—was one made up only of boys.[181]

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[179] Reid, "The Children's Wonder-House," 30.
[180] "The Children's Museum," *Junior Eagle* (Brooklyn, January 18, 1914).
[181] A similar pattern of conditional inclusion can be seen later in the museum's history: in the 1930s the BCM's Brooklyn Pick and Hammer Club, made up of patrons interested in mineralogy, included several young women, whose presence is recorded through their contribution to the newsletter that the club produced (*Pay Dirt*). The young women, however, appear not to have been invited on the field trips that the club's members lovingly recounted in the same newsletter, which served as important sites of community formation. I write about this club and its newsletter in a forthcoming article, "Writing a 'Wonderland' of Science: Child-Authored Periodicals at the

The romance of these museum "big boys" was part of a larger cultural affection for the young inventor-hero, who, during the years between 1906 and the US entry into WWI in 1917, was often an adept at wireless communication. Historian of communication Susan J. Douglas writes that the subculture of boys and young men who constructed and operated amateur wireless stations was accompanied by—or perhaps co-created with?—strong media interest in the phenomenon. Newspapers covered wireless operators with breathless praise; Douglas points to the case of Jack Binns, a twenty-six-year-old wireless operator who saved a group of incoming Italian immigrants from shipwreck when he spent hours sending a distress call to nearby vessels. Binns' youth—he was 26 at the time—was often emphasized in the newspaper reports of his heroic actions. Douglas writes that children's books and magazines joined in the lionization of wireless operators, and that many high schools had wireless clubs, while importers and marketers made basic equipment available at a price that rendered it accessible to middle-class children.[182] Meanwhile, the nature-study movement, Sally Kohlstedt writes, tended to avoid producing textbooks and curricula that covered the physical sciences. A combination of factors, including the greater involvement of women (and thus, of future teachers) in biological sciences, and the cultural belief that young children had an affinity

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Brooklyn Children's Museum, 1936-1946," slated to be published in *American Periodicals* 23:1 (Spring 2013).

[182] Susan J Douglas, *Inventing American Broadcasting, 1899-1922* (Baltimore: Johns Hopkins University Press, 1987). For more on youth participation in wireless culture, see Michele Hilmes, *Radio Voices: American Broadcasting, 1922-1952* (Minneapolis, MN: University of Minnesota Press, 1997), especially chapter 2, "How Far Can You Hear?".

for animals and plants, led to this state of affairs.[183] The Children's Museum library seemed to follow this belief, as it considered books about physics and astronomy to be appropriate for older museum patrons, while describing nature study books as intended for their younger "museum children."[184]

The emergence of the wireless station at the museum seems to have resulted from children's desires. Gallup said that the museum put together a lecture series in physics in 1906 "in response to an expressed demand from the boys." This course led to the initiation of the wireless station project, which Gallup said was exclusively run by the "boys" themselves. Gallup's language indicated that this innovation on the Children's Museum's part was not received entirely positively in the greater community of museum workers—she said that "some have maintained that physics and electricity are not germane to museum work," which should remain focused instead on collecting and cataloging objects of scientific interest—but argued that "a children's museum calls for such modifications and adaptations of methods as will enable children to use it," and that "the keynote of childhood and youth is action."[185] An assistant curator, Mary Day Lee, who began working at the Museum in 1907, became a de facto specialist in these "older boys," offering lectures on minerals and physics and helping the boys with their wireless station.[186] The place of these "boys" in the museum family was a treasured one. Reid reported that, in return for the space that Lee and Gallup afforded them to work on the

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[183] Kohlstedt, *Teaching Children Science: Hands-On Nature Study in North America, 1890-1930*, 119–120.
[184] "New Books in the Library," *Children's Museum News*, December 1933.
[185] Gallup, "The Children's Museum as an Educator," 375.
[186] Reid, "The Children's Wonder-House," 34.

wireless station, "if a fuse blows out or anything goes wrong with museum apparatus, the ingenious and industrious boys immediately fix it…led by James Parker, they installed a complete telephone service for the museum, and this has worked well during three years."[187]

Although Douglas writes about wireless amateurs who challenged authorities by clogging airwaves with their communications, the boys at the BCM carried out their wireless experiment within the parameters of the establishment. In 1915, the *CMN* reported that the boys who worked on the wireless station were working hard to meet government requirements regarding wavelength and dampening levels. When the United States entered World War I, the wireless station was shut down, by order of the government; the *CMN* reported with pride that many boys previously active at the BCM's wireless station were now serving in the military.[188]

Museum staff reported that the wireless station produced successes, as did many of the museum's activities, by directing children's interest into a productive context. In 1915, the *CMN* published an account of a mother who came to the BCM with a younger child, and when the child introduced her to a staff member, launched into an account of how the BCM had saved one of her older boys from "incorrigibility." This mother's account offers a window into the way that the group of boys working in the wireless station took science as the foundation for their community. Before she moved to the

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[187] Ibid., 30. Another article in an unnamed newspaper, published on January 25, 1914, also mentioned a museum patron, 14-year-old Andrew Bostwick, who fixed whatever "bell or electric light" might be out of order, making it so that Anna Gallup "rarely need[ed] to call an electrician." "The Children's Museum," January 25, 1914.
[188] "Wireless," *Children's Museum News*, December 1917.

BCM's neighborhood, she said, she had despaired for her son's future; "the neighbors advised me to thrash him." However, after visiting the BCM, "he awoke to an interesting world." The museum removed the obstacles to interest which the school system had artificially placed between her son and the world, and the child began to be devoted to wireless telegraphy. In the wireless station of the BCM, "he handled apparatus, asked questions, and performed experiments." His peers helped him see the value of scientific discourse: "He heard the discussions and arguments of the older boys who frequently disagreed on scientific questions…As a listener, and sometimes as a participant in these heated arguments, he learned to do his own thinking." As time went on, "the Museum became his play room, his study, and his work shop all in one," while he developed new ambitions and ended up enrolling in a technical high school and pursuing a degree in electrical engineering. The Museum, the happy mother said, "applied the stimulus and continued the encouragement until the boy was old enough to make his decision and plan his own future."[189]

The wireless boys offered one of the Museum's best opportunities to prove that "its" children were long-term successes. In 1916, for example, the *CMN* recorded that the world, and the staff of the BCM, had recently been excited by announcements of wireless communications between Arlington, VA, Honolulu, and Paris: "Such an achievement as this stirs the imagination of all people, but to the staff of the Children's Museum there was added a deep personal interest." Two young men, Austen Curtis and Lloyd

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[189] Anna Billings Gallup, "A Mother's Account of a Children's Museum Lad," *Children's Museum News*, January 1914, 26–28.

Espenschied, who had been instrumental in the initial opening of the wireless station at the BCM, were involved with these tests. In the accompanying photograph, taken while the boys were still living in Brooklyn and attending the Museum, Espenschied looks somber, serious, and focused; Curtis leans away from Mary Day Lee, looking raffish, almost mischievous. The article notes that while Espenschied had graduated from a technical school and worked for AT & T, Curtis had learned in the "school of experience," traveling to "many lands" as a wireless engineer, living in Brazil and finally returning to work for the Western Electric Company.[190] An article in the Brooklyn *Daily Times*, preserved in the Museum's archives, pointed out that Curtis, a "particularly efficient" young man, was "the chief wireless engineer for the Brazilian government before he was old enough to vote."[191] When he came back from Brazil, Curtis brought the Children's Museum a collection of tropical insects, and, later, a live spider monkey named Plato, who was to become a favorite Museum pet.[192] During the first World War, the *CMN* reported that Curtis, a First Lieutenant in the Reserve Signal Corps, was "engaged in very important specialized wireless work."[193] In 1918, Curtis wrote to the *CMN* to tell them he'd been promoted to captain in the Radio Corps, and in 1919, he came back, along with a number of other Museum "alums," to visit the curators and staff.

The war, in fact, provided many opportunities for the *CMN* to catch up with the wireless alumni. In 1918, the *CMN* reprinted in its entirety a letter sent by a soldier who

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[190] "The Wireless Station," *Children's Museum News*, January 1915.
[191] "Brooklyn Boys Radio Chiefs," *Brooklyn Daily Times*, October 25, 1915.
[192] Reid, "The Children's Wonder-House."
[193] "Wireless."

learned radio at the Museum. In jaunty prose, the letter professed best wishes to all of the boys at the station, and called himself "a small part of the Museum contribution toward the war." "Perhaps the big bugs that pull the strings didn't do such a bad thing after all when they gave the boys a few instruments to play with," he concluded.[194] A letter from another, unidentified wireless graduate, excerpted in another issue of the *CMN*, showed how modernist ideology, founded on technology, went hand-in-hand with patriotic sentiment: "Everywhere the American Army goes we clean up, for our modern ideas and thoughts keep us from drifting into century-old ruts. I think our modern ways will awaken the Europeans and give them a different light."[195]

The wireless boys were the best example of follow-through that the Museum got from its "graduates," but other examples of successful "alumni" abounded. Unlike the AMNH, the Children's Museum could, and did, point to specific examples of children whose experience with the museum led to a career in science—unsurprisingly, perhaps, most of these successes were male. At the National Education Association in 1926, Anna Billings Gallup gave a speech that highlighted the usefulness of these former patrons to society. The museum's displays, she said, "fired one boy with a zeal for insect lore that wrought his way through the University and eventually saved from a threatening insect plague, the wheat crop of Indiana." The mineral room "[inspired] one boy to become a

[194] "The Wireless Class," *Children's Museum News*, October 1918, 5.
[195] "In a Lively Sector," *Children's Museum News*, November 1918, 15. For more on American ideologies of technological superiority and the assumed accompaniment of cultural dominance, see Michael Adas, *Dominance by Design: Technological Imperatives and America's Civilizing Mission* (Cambridge, MA: Belknap Press, 2006).

curator of minerals and two to qualify as mining engineers."[196] Along the same lines, in 1929 the *CMN* reported on a museum "alumni," Foster H. Benjamin, who had become an entomologist and was currently a "technical expert" in the "battle against the Mediterranean Fruit Fly," which was threatening Florida's fruit crop.[197] These individual successes stand in stark contrast to the AMNH's stated goals for its patrons' encounters with science, which included a generalized ability to live well in society and to contribute efficiently to industry.

Conclusion: Unequal Uses of Wonder

In the early histories of the Brooklyn Children's Museum and the American Museum of Natural History, Progressive interest in modern science and technology came together with the era's emphasis on childhood, development, and education. The two museums used images of child visitors as publicity tools, representing visions of how museum learning worked for their members, donors, and colleagues at other museums. These images, and the written descriptions of museum learning included in the AMNH's magazine *The American Museum Journal/Natural History* and the Brooklyn Children's Museum's *Children's Museum News*, show how ideas about the nature of science learning reflected divergent Progressive concepts of childhood. When the AMNH operated from the assumption that its patrons were empty vessels, susceptible to being emotionally moved by the briefest of contact with natural objects, it participated in a

[196] Gallup, "A Children's Museum and How Any Town Can Get One."
[197] "Museum 'Alumni'," *Children's Museum News*, November 1929.

vision of impoverished city childhoods that was colored by the ideology of Progressive child-saving efforts and beliefs in the need for efficiency. The children in its photographs incite pity, which can be tempered by the adult onlooker's satisfaction in the thought that the great museum has ameliorated their thirst for knowledge—and, because of its permanency, can do so for masses of children at once. The children of the BCM, on the other hand, were depicted as inherently scientifically engaged, capable of careful and exacting scientific work if properly coached; as represented in photographs, they were cute, funny, and, in the case of the wireless boys, daring and admirable. Both modes of representation were meant to show the museum's efficacy and secure material support; on the one hand, evidence of moral growth in poorer child patrons could assure the reform-minded of the efficiency of the museum in providing city children with a lost connection with nature, while on the other hand, photographic proof of the affinity of the middle-class child for museum projects could provoke feelings of pride in modern teaching methods and hope for a scientific future.

Chapter 2: "Question-Boxes" Ask How and Why: Children's Reading as Research

In a 1930 article in *Parents' Magazine*, author and journalist Maude Dutton Lynch argued that if parents would simply ask children what they wanted to read, they would be surprised by their offspring's need for information about the "real" world. Like adults, who had in recent years made nonfiction an increasingly lucrative publishing category, children were motivated to read not only in order to lose sight of the world, but also in order to bring that world into closer focus.

> [Children] want to know the story of mankind and the story of the earth; they want to know all about ships, and railroads, and aviation; they want to know how books are made and the story of milk. They want books about electricity, about the stars, about moths, about how cities build their water supplies. They want encyclopedias of their own to turn to in time of need and to roam about in, urged on by the itch for more knowledge.

Publishing companies, happy to oblige, had begun to put out "books to which the child could turn himself to find the answer to his many 'hows,' or to read along the line of his particular interests at any particular time." Providing these "information" books could help children learn to read quicker, Lynch went on, arguing that interest in the big world would provide an indispensable stimulus to continued learning.[198]

The image of the questioning child, who would find answers in the pages of books, pleased parents, authors, and publishers. While the subjects of the books examined in this chapter were not always explicitly scientific, the attitude of inquiry promoted—habits of curiosity, interest in the material world, and experimentation—was often linked with the scientific method, and was always recommended to children as a superior way of

[198] Maude Dutton Lynch, "Books Children Like and Why...," *The Parents' Magazine*, November 1930, 23.

thinking. If the photographic images of children in the Brooklyn Children's Museum (examined in the last chapter) participated in a sentimental cultural ideal that saw children as innocent exemplars of what it meant to inquire and to learn in the museum context, those who produced and promoted "information" books, which gained ever-more currency during the teens, twenties, and thirties, transposed the image of what Gary Cross would call the "wondrously innocent"[199] inquirer into the realm of literature and reading.

Scholars of children's literature, most influentially Jacqueline Rose, have long argued that "children's" literature is an adult project meant not only for children's eyes but also to reassure adults about their own worlds. For Rose, belief in the purity and promise of children's literature is the result of a Western culture intimately concerned with problems of epistemology. Rose writes: "Children's fiction emerges…out of a conception of both the child and the world as knowable in a direct and unmediated way." To prove that this concern with "knowability" stretches across genres of children's fiction, Rose argues that in the nineteenth century, both fairy tales, which purported to connect children with an "uncontaminated record of our cultural infancy," and adventure stories, which took readers on an "exploratory and colonialist venture which assumed that discovering or seeing the world was the same thing as controlling it," stemmed from the same adult impulse to reconnect with a pure and unconfused world. "The child is, if you like, something of a pioneer who restores these worlds to us," Rose writes, "and gives

[199] Gary S Cross, *The Cute and the Cool: Wondrous Innocence and Modern American Children's Culture* (Oxford: Oxford University Press, 2004).

them back to us with a facility or directness which ensures that our own relationship to them is, finally, safe."[200]

Adult-reported evidence of children's supposedly ravenous hunger for "information books" in the interwar period reinforces Rose's argument about the meaning of children's fiction, while amplifying her point about the cultural function of "knowability." If the connection between a reading child's mind and the "lost" worlds of fairy tales or explorers was reassuring to adults, the researching child, lost in the pleasure of "finding out" facts, represented the potential for a harmonious individual relationship with the proliferating knowledge available to modern citizens. Commemorating the careers of husband-and-wife author-and-illustrator team Maud and Miska Petersham in the *Horn Book Magazine* in 1946, on the occasion of their winning a Caldecott Medal, Irene Smith Green recalled an incident that proved the popularity of their illustrated subject books about the history of various commodities: "I can remember a little girl on Christmas Day in 1939 running about the house, neglecting toys and picture books, hugging *The Story Book of Rayon* and caroling to her parents' astonishment, 'Goody for good old rayon!'"[201] This remembered image advanced several reassuring arguments about young people and about the world. Children cared about the complex processes that enabled the comfortable modern lives they were living, and children's reading was a chance for the young individual to meaningfully align his or her own natural intellectual pleasures with the changing landscape of the "real" world.

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[200] Jacqueline Rose, *The case of Peter Pan, or, The impossibility of children's fiction* (London: Macmillan, 1984), 9.
[201] Ibid.

In this chapter, I will examine the phenomenon of the "information book," tracing the proliferation of these non-fiction tomes for children to intertwined cultural ideas about the natural and beneficial curiosity of childhood, the possibility of epistemological certainty in a material world fundamentally changed by scientific and technological change, and the importance of encouraging a "healthy" sense of wonder in children hungry for "stories." I will examine how the authors of these "information" books taught children about the importance of being curious and informed, arguing that these books present this attitude as a new moral imperative. I will show how the "information" book presented an image of the industrial world as a fascinating, complex, yet knowable and inherently good realm of adult activity. Finally, just as I have argued that the utopic image of science learning in the Brooklyn Children's Museum depended upon the middle-class status of the child patrons, I will show that the naturalized image of the curious child that these books presented to their readers was reliant upon the shadow presence of those presented as stupid and incurious: "lower" animals, "savages," and girls.

Encouragement of science-mindedness through reading was a way in which children's books of the interwar period could be "modern" and respond to ideas current in progressive education, while also recycling Victorian ideas about the perfectibility of human knowledge and the moral benefits of learning. During this period, as Nathalie Op de Beeck writes, children's literature established itself as part of the middle-class child's life: "Along with newspaper reading and radio listening, habits of book buying and ownership signified quality of life, socioeconomic class, and modern subjectivity for a child who read at home with parents, went to libraries that in earlier eras had denied access to the disruptive young, or associated books with a classroom setting or holiday gift."[202] The publishing industry worked hard to promote reading, through activities like Children's Book Week, promotions through the Boy Scouts of America, and the establishment of prizes like the Newbery and Caldecott medals (1922 and 1938).[203]

Within the growing children's book industry, the publication of nonfiction was an important trend, and one that highlighted battle lines between children's book professionals and educators. In 1919, Franklin Hoyt, of Houghton Mifflin's department of education, made a speech at the meeting of the American Library Association in which he argued that modern life rendered fiction completely unattractive to children; they should, instead, have stories about the world itself.[204] Leonard Marcus, in his history of the children's book industry, wrote that the fight between those who favored the fairy tales and traditional stories for children and those who wanted to create a "new literature" of developmentally appropriate nonfiction about the world was one between librarians, including the New York Public Library's Anne Carroll Moore, and progressive educators, including the Bank Street School's Lucy Sprague Mitchell.[205] "It is only the blind eye of an adult that finds the familiar uninteresting," Mitchell wrote in the

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[202] Nathalie Op de Beeck, *Suspended Animation: Children's Picture Books and the Fairy Tale of Modernity* (Minneapolis: University of Minnesota Press, 2010), 13–14.
[203] Ibid., 145.
[204] John Tebbel, "For Children, With Love and Profit: Two Decades of Book Publishing for Children," in *Stepping Away from Tradition: Children's Books of the Twenties and Thirties*, ed. Sybille A Jagusch (Washington, D.C.: Library of Congress, n.d.), 16.
[205] Leonard S Marcus, *Minders of Make-Believe: Idealists, Entrepreneurs, and the Shaping of American Children's Literature* (Boston: Houghton Mifflin Co, 2008), 101–103.

introduction to her *Here and Now Story Book* (1921). "Too often we mistake excitement for genuine interest and give the children stimulus instead of food." "Stimulus" included "the fairy story, the circus, novelty hunting," "Red Riding Hood, circus Indians, and Cinderella."[206] If stories are to be part of education, they must "further the growth of a sense of reality, give the child the sense of relationship between facts, material and social: that is to further scientific conceptions."[207] Children's interest in the relationship between these facts would naturally provoke "inquiries which hold the germ of physical science."[208] At least some editors agreed with this assessment and came down on the side of the "milk bottles" rather than "Grimm" (as Virginia Haviland of the Library of Congress defined the divide[209]); in 1930, Scribner's editor Alice Dalgliesh wrote in *Publishers' Weekly* that "modern life is full of interesting, real things, and there is no time for sugary little fairy tales of the type that used to be published by the dozen."[210]

Although these books about "real things" were self-consciously aligned with the progressive education movement, in their moral allegiance to learning about the "real," they reached back to Victorian ideals about reading and learning. Alan Rauch, writing about the nineteenth-century culture of "useful knowledge" in the UK, designates encyclopedias, instruction manuals, and didactic works for children as "knowledge

[206] Lucy Sprague Mitchell, *Here and Now Story Book, Two-to Seven Year Olds; Experimental Stories Written for the Children of the City and Country School (formerly the Play School) and the Nursery School of the Bureau of Educational Experiments* (New York: E.P. Dutton & Company, 1921), 21.
[207] Ibid., 25.
[208] Ibid., 28.
[209] Marcus, *Minders of Make-Believe*, 101–103.
[210] Cited in Ibid., 121.

texts," while also arguing that a growing taste for realism in fiction proves the growing "cultural significance of knowledge."[211] The "knowledge texts" produced for children in the US during the teens, twenties, and thirties reinforced the cultural significance of knowledge in their own context, designating research and curiosity as moral goods. In a short piece called "The Reference Habit," reprinted in Eleanor Atkinson's children's encyclopedia *The How and Why Library* (1934), Frank Crane, a Presbyterian minister and author,[212] advised young readers to "know where to find out the facts." Using a self-consciously modern metaphor to advance his argument about the moral benefits of the "reference habit," Crane told his readers: "Knowledge is power, but we do not have to carry the whole power plant in our heads. It is enough to know where the power can be had, and to have the wires up so that we can draw upon it at any time." Functionally, Crane said, this meant that children should revise their idea of what reading was for; rather than browsing for pleasure, children should start "going to books as we go to a drug store, to get some particular thing that we want." Children should "get the habit of spending an afternoon or a morning once a week, if possible, in the library looking up subjects about which you are curious or in which you are interested."[213]

While this image of a world of serious, directed research might seem initially incongruous with the sentimental vision of childhood, the Jessie Willcox Smith painting of two children lost in a sea of books, created for a 1921 Children's Book Week

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[211] Alan Rauch, *Useful Knowledge: The Victorians, Morality, and the March of Intellect* (Durham, NC: Duke University Press, 2001), 2.
[212] Frank Crane, *Four Minute Essays* (New York, Chicago: W. H. Wise & co., inc, 1919).
[213] Frank Crane, "The Reference Habit," in *The How and Why Library*, ed. Eleanor Atkinson, vol. 3 (Cleveland, OH: LJ Bullard and Co, 1934), 470.

promotional poster, is a good example of the way that the idea of the researching child maintained visual appeal consistent with pictorialist illustration: in this image, two children are lost in research in a room filled with what appear to be sets of encyclopedias, seemingly so hungry for information that one of them has moved on from one reference book to another without closing the first. The end-papers of the encyclopedia *New Wonder World*, first published in 1921, echoed this vision—in this image, a brother reads to two sisters from the encyclopedia, painting word-pictures that flawlessly combined fantasy and reality upon the nursery wall. In these illustrations, the realm of inquiry was a protected one, bringing a big, complex world to children safe in domestic spaces.

The new prominence of non-fiction in the children's market echoed similar trends in adult books. Books intended to introduce readers quickly to complex subjects were some of the most popular of the 1920s, with authors such as Will Durant and Hendrik van Loon seeing lucrative returns on their "outline" books.[214] Simon and Schuster began awarding their Francis Bacon award at this time, named after the great empiricist "in recognition of his own daring and monumental achievement in taking all knowledge for his province": "The purpose of the award is to stimulate and reward the writing of books which, in the celebrated phrase of Professor James Harvey Robinson, 'carry on the conscious adventure of humanizing knowledge.'" Judges for the award included Durant, Van Loon and Edwin Slosson, of the non-profit science journalism advocacy group

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[214] Joan Shelley Rubin, *The Making of Middlebrow Culture* (Chapel Hill: University of North Carolina Press, 1992).

Science Service[215]; John Dewey and astronomer and science popularizer Harlow Shapley sat on a council advising the jury. "Effectively organized and animated, truth is infinitely more romantic and more exciting than fiction," the sponsor said.[216]

The connection between the Bacon award and science popularizers Slosson and Shapley shows how the growing sales of non-fiction for adults and children complemented contemporary trends in popularization of science for adults. Historian of science Ronald C. Tobey says that the years between 1919 and 1930 were when what he calls an "American ideology of national science" took root. Scientists tried to convince the public that coordinated research, sponsored by the government, was necessary; the experience of World War I, in which it became clear that American industry's use of science was far behind the more sophisticated Germans, was an important wake-up call.[217] Like the writers of the children's books about industry, which I will discuss in the second section of this chapter, American writers of science books for adults tried to relate science closely to the achievements of industry. For example, *Creative Chemistry* (1919), by chemist and journalist Edwin Slosson, contained chapters such as "The Race for Rubber," "Three Periods of Progress," and "What Comes From Corn." Historian of medicine Bert Hansen characterizes popular American science writing of the 1920s as participating in a "rhetoric of magic and marvels," which he describes as "nervous

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[215] For more on the history of the Science Service, founded in 1920, see chapter 4.
[216] "The Francis Bacon Award", n.d., Smithsonian Institution Archives, Record Unit 7091, Box 41, Folder 11.
[217] John Rae, "Application of Science to Industry," in *The Organization of Knowledge in Modern America, 1860-1920*, ed. Alexandra Oleson (Baltimore, Md: Johns Hopkins University Press, 1979), 249–269.

striving for popular interest that characterized science writing at this time"; many books for adult readers shared with children's information books the propensity to describe industry as a "wonder."[218]

The distinction between the adult popular science books and children's encyclopedias, industrial biographies, and "wonder books" lies in the explicit instruction in reference, research, and inquiry that the children's books offered. While adult "information" books held out the promise of social improvement through knowledge, those intended for children rarely rested on advancement as an enticement, preferring instead to model the joys of inquiry for its own sake. In showing how the editors of *St. Nicholas Magazine* encouraged the young people who wrote for its pages to strive for realism in their stories, Anna Redcay points to a paradox of adult-child relationships in the late nineteenth and early twentieth centuries: "As childhood became a protected, privileged state, those traits generally considered natural to the child were no longer always perceived as being attainable without careful adult guidance."[219] The representation of inquiry in these information books is similarly paradoxical. The tendency toward acute observation, "natural" curiosity, and hunger for knowledge about material processes and objects were all traits that adults believed children possessed; they were also traits that these information books encouraged incessantly and explicitly. These books assumed that children had questions about nature, technology, science, and

[218] Bert Hansen, *Picturing Medical Progress from Pasteur to Polio : a History of Mass Media Images and Popular Attitudes in America* (New Brunswick N.J.: Rutgers University Press, 2009), 128.
[219] Anna M. Redcay, "'Live to Learn and Learn to Live': The St. Nicholas League and the Vocation of Childhood," *Children's Literature* 39 (2011): 58.

industry. They also anxiously reiterated the importance of posing such questions, in effect making "asking why" a modern virtue.

"That is a Good Question": The Book of Knowledge*'s Instruction in Inquiry*

Journalist Arthur Mee introduced the first volume of his *Children's Encyclopedia* to young British readers by telling them about the book's genesis. In this origin story, his daughter Marjorie asked her mother so many questions ("whys and whats and whens") that Mrs. Mee exclaimed, "Oh, for a book that answered all these questions!" Marjorie's queries were nothing less than existential: "So there came into [Marjorie's] mind the great wonder of the Earth. What does the world mean? And why am I here? Where are all the people who have been and gone? Where does the rose come from? Who holds the stars up there? What is it that seems to talk to me when the world is dark and still?"[220] Mee, who had participated in the UK's boom in popular science books during the early twentieth century through his editorship of *Harmsworth's Popular Science*, writes that these questions provoked him to create a children's book capable of acting as an all-powerful operating manual for children perplexed by the world around them.[221]

The children's encyclopedia was a product of the late nineteenth century, and came to prominence in the United States in the 1910s and 1920s. Publishers and booksellers worldwide began to capitalize on the serial format of the encyclopedia as a

[220] John Hammerton, *Child of Wonder: An Intimate Biography of Arthur Mee.* (London: Hodder and Stoughton, 1946), 126.
[221] Peter J Bowler, *Science for All: The Popularization of Science in Early Twentieth-Century Britain* (Chicago: University of Chicago Press, 2009), 154–158.

source of profits in the beginning of the nineteenth century.[222] Larousse first published a children's encyclopedia in France (*Encyclopedie de jeune age*) in 1853.[223] The *Book of Knowledge* was published as the *Children's Encyclopedia* in the UK starting in 1910, and in the U.S. as the *Book of Knowledge: The Children's Encyclopedia*, starting in 1911.[224] The *World Book Encyclopedia*, intended for children and sold as "organized knowledge in story and picture," was first published in 1917-1918 by the Hanson-Roach-Fowler Company, and was published throughout the twenties and thirties by W.F. Quarrie & Co. in Chicago.[225] The *Compton's Pictured Encyclopedia*, also for children, founded by Frank Compton, was first published in 1922.[226] While both *Compton* and the *World Book* presented articles in alphabetical form, and while the *Book of Knowledge* had a unique subject-based organization, several lesser-known series encyclopedias imitated the *Book of Knowledge*'s approach. These included the *Wonder Book of Knowledge* (Philadelphia, the John C. Winston Co, 1921), the *How and Why Library: Little Questions that Lead to Great Discoveries* (Cleveland, the LJ Bullard Co, 1934), and the *New Wonder World: Library of Knowledge* (Chicago, Geo. L. Shuman and Co, 1932).

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[222] Robert Lewis Collison, *Encyclopaedias: Their History Throughout the Ages; a Bibliographical Guide with Extensive Historical Notes to the General Encyclopaedias Issued Throughout the World from 350 B.C. to the Present Day*, 2d ed. (New York: Hafner Pub. Co, 1966), 10.
[223] Ibid., 190.
[224] Ibid., 298.
[225] Ibid., 202–204.
[226] Ibid., 205.

The *Book of Knowledge* became a fixture in American childhood libraries.[227] Educator and author Lucy Sprague Mitchell's husband read to their son Jack from the *Book* every night; afterwards, Jack was required to prove what he learned by dictating an abstract to Lucy.[228] Despite the seeming rigidity of Jack's experience, the *Book* wasn't solely a pedagogical tool; it functioned for at least some children as an object of desire. Author Robert Heinlein bought a *Book of Knowledge* set with money he earned from delivering newspapers.[229] Poet Howard Nemerov (b. 1920) wrote "Boy With Book of Knowledge," memorializing his boyhood experience with the tomes, in 1975. Nemerov describes the *Book* as entering through his senses, comparing the aggregate series to a "vast pudding of knowledge,/With poetry rare as raisins scattered through,/The twelve gold-lettered volumes black and green."[230]

The Book of Knowledge, which eventually became an iconic fixture in American childhood libraries, was not an encyclopedia in many senses of the word. The *Children's Encyclopedia* was originally published as a series of magazines, with content presented in "departments" of interest; when the series was transformed into the volumes of the encyclopedia, the departmental organization of the magazines was preserved, and the result was a series of alternating sections on loosely grouped topics, rather than an alphabetical list of subjects. Although the books weren't typical "encyclopedias," Mee

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[227] Grolier claimed in 1946 that they had sold more than 3,500,000 sets of the Book since the first edition. Hammerton, *Child of Wonder: An Intimate Biography of Arthur Mee.*, 130.
[228] Joyce Antler, *Lucy Sprague Mitchell: The Making of a Modern Woman* (New Haven: Yale University Press, 1987), 265.
[229] William H. Patterson, *Robert A. Heinlein: In Dialogue with His Century: Volume 1 (1907-1948): Learning Curve*, First ed. (Tor Books, 2010), 27.
[230] Howard Nemerov, "Boy with Book of Knowledge," *Poetry* 126, no. 5 (1975): 251.

insisted that they be titled as such. His biographer wrote, "He was so obsessed by the idea of providing for the young folk of his time a book which would bring to them all the essentials of useful, scientific, and practical knowledge, and also the endless entertainment that books could convey, that he would listen to nobody's criticism and held fast to his contention that any work which could cover an immense field of instruction and entertainment was truly encyclopedic and well within the meaning of the word, so why not be bold and call it by its proper name?"[231] Mee also insisted that the CE come with an Index, which in the UK was titled "A Little Guide to Knowledge," despite its large size (352 royal octavo pages containing 90,000 entries).[232] Mee thought that children needed to be able to use the volumes for research; the index allowed the work to retain its mandate as a "research" set, while also maintaining a strong editorial voice in each of its "sections."

The *Book* was made up of 16 "departments," of which seven were explicitly scientific; these included "Natural History" (by Ernest Ingersoll, American naturalist and writer for *Harper's*, *Scribner's,* and the New York *Times*[233]); "Plant Life" (by British botanist Edward Step, author of multiple illustrated guidebooks to British flora and insect life[234]); "Familiar Things" (by Harold Begbie, British journalist, biographer, and

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[231] Hammerton, *Child of Wonder: An Intimate Biography of Arthur Mee.*, 112.
[232] Ibid., 124.
[233] C.L. MacKenzie Jr, "Biographic Memoir of Ernest Ingersoll: Naturalist, Shellfish Scientist, and Author," *Marine Fisheries Review* 53 (1991): 23–29.
[234] Edward Step, *Wayside and Woodland Blossoms : a Guide to British Wild Flowers (First Series) with Clear Descriptions of 394 Species* (London: Frederick Warne & Co., 1948); Edward Step, *Marvels of Insect Life a Popular Account of Structure and Habit,* (New York: R.M. McBride and Co., 1938); Edward Step, *Insect Artizans and Their Work,* (New York: Dodd Mead

imperialist[235]), "Our Own Life" (by British writer, eugenicist, and reformer Dr. C. W. Saleeby[236]), "The Earth" (also by Saleeby), "Men and Women" (occasionally featuring scientists, and written by British author Ernest A. Bryant) and the "Book of Wonder" (questions, often scientific in nature, sent in by readers, and answered by Arthur Mee himself). The remaining sections were geographical, historical, and literary; one section featured crafts that could be done at home. Each "section" of about ten pages was called "The Child's Story Of…" with the name of the department appended. Each volume of the *Book of Knowledge* contained alternating sections from each of these departments; at the end of a section, the reader was alerted as to the page number where the thread of the section's argument would be picked up once again.

Like many public figures who made the entertainment of children their business in this period, Arthur Mee's public image was of a Peter Pan-like adult, able to write for children because of his identification with their essential qualities. John Hammerton, Mee's friend and biographer, wrote of Mee that he was "a child of wonder moving through a world of endless surprise to his questing mind; the keen edge of his interest and

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and company, 1919); Edward Step, *Shell Life, an Introduction to the British Mollusca,* (London ;New York: F. Warne & co., 1901).

[235] Harold Begbie, *Other Sheep: A Study of the Peoples of India, with Particular Reference to the Collision Between Christianity and Hinduism* (London: Hodder and Stoughton, 1913); Harold Begbie, *The Vindication of Great Britain: a Study in Diplomacy and Strategy with Reference to the Illusions of Her Critics and the Problems of the Future* (London: Methuen, 1916); Harold Begbie, *The Life of General William Booth, the Founder of the Salvation Army* (New York: The Macmillan Co., 1920).

[236] G.R. Searle, "Saleeby, Caleb Williams Elijah," ed. Lawrence Goldman, *Oxford Dictionary of National Biography, Online Edition* (Cambridge [Eng.]: Oxford University Press, 2011).

joy in life was never blunted: it might indeed be said that he never quite 'grew up.'"[237] Mee didn't have a college degree, but rather began working as a journalist in his teens; Hammerton wrote that when the Book was printed in the US, the Grolier editor Holland Thompson asked whether the author had any university degrees, honorary or other: "I explained that if he had had a university training I thought there would have been no *Children's Encyclopedia*, which called for imagination, inventive genius, and a common feeling with the natural curiosity of children, none of these things being products of universities."[238]

Hammerton depicted Mee as a natural intellect, untainted by organized education; this depiction suited the *Children's Encyclopedia*'s image as a book to be read outside of school, for the pure joy of it. Although other children's encyclopedias, including *Compton's*, advertised themselves as mobility tools, to be read in order to gain position in the world, the *Children's Encyclopedia/Book of Knowledge* assumed that children's "want to know" was a pure, almost otherworldly instinct, and that parents' want to answer was as well.[239]

Rather than being a tool for movement upward in a social hierarchy, the *Book of Knowledge* presented itself as an all-powerful learning tool, which could heal the unevenness of specialization in the modern world through its availability to all children.

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[237] Hammerton, *Child of Wonder: An Intimate Biography of Arthur Mee.*, 18.
[238] Ibid., 131.
[239] In *Parents' Magazine*, Compton's advertised with a classic plea: "Help Them Now—and they'll help you then…" The photograph in the advertisement was of a couple watching a boy and a girl bent over a book. "Help Them Now—and They'll Help You Then..." (Compton's Pictured Encyclopedia, April 1930).

This agenda, in its modern belief in the inherent goodness of knowing, connected the internal benefits of curiosity with the external good of social leveling. John H. Finley, the president of City College of New York between 1903 and 1913, wrote the introduction to the first American edition of the *Book of Knowledge*, which encapsulated this idea of the democratic power of knowledge.[240] Finley characterized the power of the encyclopedia as similar to the power of the modern technologies of transportation. He wrote that he had read the books in the city, and thought "that their pages were like automobiles, or aeroplanes or street cars or railway trains, carrying the city child into the country among the trees and rocks and birds and brooks and grass and mountains and clouds, where he could see and hear about the wonders of Nature." Conversely, the "magic volumes" could also "bring all the great achievements of man, the wonders of inventing and discovering, to those shut in by the mountains or by the sky on a little patch of flat plain and prairie." The *Book of Knowledge* could smooth geographical differences; it could also serve as an all-purpose teaching aid, passing specialized knowledge down to young people. The Book represented a "heritage" that is "beyond the reach of the unaided senses of these boys and girls, and which they can occupy as their own only by the help of those who have added the lenses of microscopes and telescopes and other instruments to the lenses of their eyes, who have read in rocks or bones or words the memories of the ages gone, or who have travelled far beyond their horizons in the present."

[240] Finley was later editor-in-chief of the New York Times and president of the American Geographical Society, and was on the board of trustees of the Science Service between 1925-1940. Isaiah Bowman, "Obituary: John Huston Finley 1863-1940," *Geographical Review* 30, no. 3 (July 1, 1940): 355–357; Marvin E. Gettleman, "John H. Finley at CCNY. 1903-1913," *History of Education Quarterly* 10, no. 4 (December 1, 1970): 423–439.

Finley believed in the possibility of comprehensive knowledge through commitment to the whole corpus of the *Book*. By reading the encyclopedia fifteen minutes a day, Finley argued, a "boy of ten" could finish all twenty volumes in three years, "and he would at thirteen know more about the earth and the life on it than the wisest men knew a few generations ago."[241] Defying the laws of recapitulation, the modern child could move beyond the past before entering his teens.

Finley's introduction picked out the themes that the *Book of Knowledge* emphasized in its pages: a great increase in one's knowledge was an evolutionary birthright; children should feel good about their generation's potential to know more than the wisest people of past generations; and the encyclopedia itself was an all-powerful and objective technology of learning. As Arthur Mee, in his introduction to his department, "The Child's Book of Wonder," told children: "Questions will never stop as long as the world lasts, because out of the answer to one question another question grows; and so, all through the world and down all the ages of time, people have been saying to themselves, 'I wonder why.'"[242] Although Finley himself guessed that not many boys and girls would read his introduction, all of these themes were addressed explicitly in the *Book*'s articles. The content matter of the "knowledge" that the encyclopedia delivered was accompanied by many lessons about how and why a child should form and pose questions.

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241 John H. Finley, "Introduction," in *The Book of Knowledge*, vol. 1 (New York City: The Grolier Society, 1911), v–vii.
242 Arthur Mee, "Does the Moon Pull the Sea?," in *The Book of Knowledge*, vol. 1, 20 vols. (New York City: The Grolier Society, 1911), 33–43.

Like many of the industrial biographies and historical outlines that followed it in the field of children's publishing, the *Book* was a moral commentary upon the importance of questioning; to cease to question, its authors told its readers, was to fail to evolve, to lose one's place in the hierarchy of things. The Book's authors (or its editor) believed strongly in the theory of evolution; in its pages, religious objections to Darwinism barely appeared. The section in "The Child's Story of Men and Women" on Charles Darwin not only presented evolution as completely true, but painted Darwin himself as a kind of scientist Santa Claus: "Darwin's was a full life and a beautiful one. Everybody loved him; he was so simple and kind and generous and tender. Nobody could have believed that this shy and modest old gentleman could be the great Darwin who had stirred the mind of the whole world, and who [sic] scientists regarded as far greater than kings."[243]

The belief in the theory of the evolution of species on this earth was accompanied by a strong assertion of the hierarchy of species and people—a hierarchy in which the highest place would be occupied by the most adaptive, curious, and inquiring life forms. For the authors and editor of the *Book of Knowledge*, the lesson of Darwinism was that those who questioned would be those who would survive. A child reader could find instances of this hierarchy in all of the Book's "departments." C.W. Saleeby, in his "Our Own Life" department, wrote often of the inferior mentality of "lower" creatures, such as those found at the bottom of the ocean: "They have neither eyes nor ears, and they can only feel. The world as these creatures know it is just of two kinds—part of it feels as if it

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[243] Arthur Innes, "Famous Men of Science," in *The Book of Knowledge*, vol. 3 (New York City: The Grolier Society, 1911), 857.

could not be eaten and part of it feels as if it could." Saleeby compared these creatures, who had to depend upon their emotions rather than their more rational senses in order to direct their actions, to a child closed off from the world: "It is as if a child spent its life in utter darkness in bed, with nothing to see or hear, and with only one kind of change in all its life—the change between having something in its mouth and having nothing." Saleeby acknowledged that this life might sound terrible to the child reader, but wrote, "There are people in the world whose life is not much better."[244] Children should pose questions and exercise their minds because "Everything that men find out is of value to us, and the things that men have already found out make our lives happy and useful, and make all the difference between our lives and the miserable lives of savages, which to us seem scarcely worth living at all."[245]

This "difference" was a precarious one; a child should imagine itself balancing on the knife-edge between savagery and civilization. Answering an imagined child interlocutor asking, "Why should we not just play and eat and sleep all the time?", Saleeby wrote that this failure to think would be a betrayal of history, issuing a declensionist warning in keeping with the eugenic preoccupations of the time: "If we ourselves are to live that sort of life, then all the time and struggle and labour which has

[244] C.W. Saleeby, "The Big Ball We Live On," in *The Book of Knowledge*, vol. 1 (New York City: The Grolier Society, 1911), 1.
[245] Ibid., 4.

been needed in the past for us to live at all has been thrown away, and we have spoilt it all in a moment. It tumbles down like a house of cards, and we tumble with it."[246]

The authors of the *Book* presented several cautionary tales from the history of the human and natural worlds, showing what would happen were children to stop innovating. In its promotion of a hierarchy of knowledge, the *Book* must be understood in the context of other works of children's literature published in the UK during the late nineteenth century and in the twentieth century before World War II. The most acclaimed of these, as M. Daphne Kutzer notes, promoted an unblinking ideology of imperialism, even as adult fiction published contemporaneously began to question these assumptions.[247] In the *Book*'s particular permutation of this ideology, the contrast between English curiosity and the complacency of the rest of the world took precedence. As historian of technology Michael Adas has noted, negative evaluations of non-Western scientific and technological progress have been integral to American and English ideologies of domination and colonial control; the *Book of Knowledge* re-presented this ideology for a child audience, offering negative examples of "lower" cultures while emphasizing the ultimate importance of "asking why" in becoming a fully realized human being and citizen.[248] In writing about China, Frances Epps, the editor of the "Child's Book of All

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[246] Ibid.

[247] M. Daphne Kutzer, *Empire's Children: Empire and Imperialism in Classic British Children's Books*, Garland Reference Library of the Humanities ; Children's Literature and Culture v. 2005. v. 16 (New York: Garland Pub, 2000).

[248] Michael Adas, *Dominance by Design: Technological Imperatives and America's Civilizing Mission* (Cambridge, Mass: Belknap Press of Harvard University Press, 2006); Michael Adas, *Machines as the Measure of Men: Science, Technology, And Ideologies of Western Dominance*, Cornell Studies in Comparative History (Ithaca: Cornell University Press, 1989).

Countries," described the "sameness" of China's history, pointing out that Chinese had been "making the same things, cultivating the ground in the same methods for centuries, learning the same lessons in the same language, and competing in the same examinations to fill the same Government posts." Epps wrote, "It is difficult for us who are all for progress and new ideas, and dislike standing still, to understand this steady keeping to old ways….China lost the advantage of her start of 2,000 years by standing still, going to sleep, and keeping to herself for centuries while the young Western nations were forging ahead, developing governments and education and inventions." [249] (To Epps, the Japanese were somewhat more admirable; at least when "the bold Commodore Perry" arrived, he found a "longing to expand" in the "hearts of the people," which helped "the old system…to fall at a blow."[250]) China's "backwardness" could be compared to the plight of fish, who, Saleeby writes, were left behind when the animals who became mammals left the ocean: "Life has made very little progress in the sea…the highest kinds of living things that are natural to the sea are the fishes, and even the cleverest fishes and the biggest are very stupid and humble things. They are quite cold, like the water round them; they have scarcely any sense at all, and I am quite sure that they will never come to anything more so long as they stay in the sea."[251] Saleeby's use of the word "stupid" was common; here, he argues for the mental limitations of certain species, and the resonances with Epps' assessment of the Chinese are clear.

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[249] Frances Epps, "The Chinese Empire: The Oldest Living Nation of the World," in *The Book of Knowledge*, vol. 1 (New York City: The Grolier Society, 1911), 107–108.
[250] Frances Epps, "Japan and Korea," in *The Book of Knowledge*, vol. 2 (New York City: The Grolier Society, 1911), 366.
[251] C.W. Saleeby, "How Life Came Out of the Sea," in *The Book of Knowledge*, vol. 2 (New York City: The Grolier Society, 1911), 361.

If the evolutionary stakes of failing to question were high, the *Book* also reassured children that if they *were* curious, they could overcome their feelings of powerlessness and begin to feel equal to, or better than, their elders. In a metaphor meant to resonate with child readers, Saleeby told his readers to imagine a child climbing onto his father's shoulders, where "it can see so much farther than when it is standing on the ground"; this is what learning is like. "We know today all that the men who lived before us knew, and we have also learnt something that they did not know; so that when our learning is added to theirs, it is as if we were standing on their shoulders and taking a wider view of the world than they were able to take."[252] This curious inversion of young and old could be a source of humor and empowerment for the child reader who heard about the Queen of England telling her servants to cut off all of the gas in Windsor Castle because she was afraid of being blown up by it; author Harold Begbie noted, "Every child knows that if we are careful with gas there is no danger."[253]

This theme of inversion, which ran through the *Book*, reassured children that the power of the mind could equalize differences between young, old, powerless, and powerful. The Wise Man, Arthur Mee's persona while answering questions submitted to the "Child's Book of Wonder," answers a question from a child asking how man managed to become so powerful, though tiny in comparison to the mountains and the great beasts. The Wise Man lectures the questioner that although man is "like a speck,"

[252] C.W. Saleeby, "Living Things Around Us," in *The Book of Knowledge*, vol. 1 (New York City: The Grolier Society, 1911), 63.
[253] Harold Begbie, "Where the Gas-Light Comes From," in *The Book of Knowledge*, vol. 2 (New York City: The Grolier Society, 1911), 393.

he “has a brain that enables him to triumph over the weakness of his body and the smallness of his size. He can move; he can think; he can manufacture.”[254] Likewise, Saleeby addresses questions of mortality by admitting that bodies are “sadly limited,” and “require a great deal of care.” Minds, on the other hand, are infinitely free; “every day the mind is teaching us more about the earth”: “The mind, though it makes mistakes and cannot do all we should like it to do, is far more powerful, and its eyes can see what the bodily eyes have never seen and will never see. And, though we die, the work of our minds, if it is good and real, does not die.”[255] This power of mind over matter was the power that a child could access through the *Book*, and through observation and thought.

Properly prepared for the grandeur of questioning and warned of the consequences of not trying to understand, the child reader also received instruction in the limits of the mind and the senses. Saleeby introduced his Child’s Story of the Earth department with a meditation on the importance of the senses as the “gateways of knowledge.” He privileged “the wonderful sense of hearing” and most of all “the sense of sight,” which “shows us the ground beneath our feet and the heavens above us; the sun, moon, and stars, the shooting stars, the lightning, and the sunset.”[256] The Book’s illustrations operated as extensions of natural vision in many instances; the cross-section was a common technique of its illustrations, showing interiors of the complicated industrial apparatus and majestic large-scale technologies of transportation.

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[254] Arthur Mee, “What Holds a Building Up?,” in *The Book of Knowledge*, vol. 2 (New York City: The Grolier Society, 1911), 624.
[255] C.W. Saleeby, “The Fire That Feeds Itself,” in *The Book of Knowledge*, vol. 2 (New York City: The Grolier Society, 1911), 640.
[256] Saleeby, “The Big Ball We Live On,” 1.

But while the Book promised to allow its readers to use the sense of sight to take in as much knowledge as possible of complex systems, it also warned them that a truly thinking person never overestimated his own knowledge. Mee, as the Wise Man, answered the question "Can We See Everything?" with a sermon on the merits of understanding the limits of knowledge. Quoting Socrates ("the highest knowledge a man could have was to know that he knew nothing—nothing, that is, compared with all there is to know"), Mee argued "even with actual seeing, and the best and brightest eyes, we see only a little of what is there, and usually see only its surface." In response to the question "Do we see what is not there?", Mee reminded the reader that s/he was separated from the animals by "reason," and that "too many people let their reason rust, and are at the mercy of whatever their senses report to them, without being able to judge and distinguish between mere appearances and what is real. It is less trouble just to take things 'at their surface value,' as we say, than to ask questions and try to pierce to the heart of them. That is the reason why so many people stop thinking, and why there are so few 'thinking people,' or people who use their reason—as we are meant to do."[257] As so often occurred with the *Book of Knowledge*'s departments, another department gave a concrete example of a successful person who used his reason to reach beyond the reports of the senses: George Stephenson, the illiterate son of a collier, who "loved" steam engines and worked with them as a laborer, "wanted to know more about the engine than

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[257] Arthur Mee, "Where Does Music Come From?," in *The Book of Knowledge*, vol. 2 (New York City: The Grolier Society, 1911), 510.

he already knew. He could see for himself what there was to be seen, but he wanted to know why the fire in the furnace caused the water in the boiler to change into steam, and why the steam was able to drive the engine."[258] This "wanting to know why" helped Stephenson become literate and make a success of his life. As with the story of Michael Faraday, who lifted himself up through sheer power of his own attentiveness, the biography of George Stephenson held out hope that the science-minded could transcend hierarchies through the power of individual merit.

The education in questioning that the *Book* offered was taken to its most refined level in Mee's department, where the Wise Man (Mee's name for his advice-giving persona) not only offered answers, but sometimes offered commentary on the excellence or lack thereof of the question itself. Questions that the Wise Man answered ran the gamut of sciences: "Why Does Quicksilver Run Away When We Touch It?"; "Why Does a Glow-Worm Glow?"; "Why Are Some People Color-Blind?" To a reader who asked "How do such big flowers come out of such small seeds?", the Wise Man congratulated him on the substance of the question: "This question is about something more wonderful, perhaps, than you think." The mystery of how "the seed in its tiny space is made in such a way and with such power that it is able to turn the food it gets from the air and the ground into the very kind of tree or flower that its parents were" is something unsolved, but not unsolvable. He goes on to associate the child's query with the work of science: "That is

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[258] Arthur Innes, "Men Who Made the Railways," in *The Book of Knowledge*, vol. 2 (New York City: The Grolier Society, 1911), 610.

the mystery which hundreds of men of science are studying at this hour."[259] At the same time, Mee cautioned readers against making up "mysteries"; in the Wise Man's response to the question "Where does the day begin?", he chastises the reader: "The world is full of mysteries and of wonders, and there is no need for us to puzzle ourselves by making any that do not really exist. We could quite easily make all sorts of puzzles about time and the way in which it is reckoned; but we must understand that these puzzles are not *real,* but are made entirely by ourselves—not by Nature."[260] A "good" question, on the other hand, was "How does a coat keep us warm?"; the Wise Man commended the reader on a "very good, sensible question," saying "you have used exactly the right words in asking it; and this is just a case where, because a question is properly asked, it can be easily answered."[261]

Mee's Old Man located the skill of proper questioning historically, reminding children that they although they lived in a time when people asked more scientific questions, they also had a responsibility to make sure that they kept the right to question alive. Elsewhere, in answering the question "Why does an apple fall?", Mee explained Galileo's experiments in gravity, defining Galileo as somebody who "*was thinking for himself*" (emphasis in original). Mee explained that Aristotle had declared that two balls of the same material but different mass would fall at different rates; Galileo thought differently, and faced criticism. "Nowadays, when anyone says anything like this, we

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[259] Arthur Mee, "Where Does an Apple Come From?," in *The Book of Knowledge*, vol. 4 (New York City: The Grolier Society, 1911), 1134.
[260] Arthur Mee, "Where Does the Day Begin?," in *The Book of Knowledge*, vol. 3 (New York City: The Grolier Society, 1911), 677.
[261] Ibid., 682.

always make the experiment at once, and let Nature decide," Mee wrote. "But in the old days very few men thought about the authority of Nature; they chose some great man, and made him their authority. So for nearly 2,000 years everybody believed and taught what Aristotle had said about falling weights, and in all that time no one made the experiment to find out the truth." After Galileo made the experiment, Mee added, "everybody abused the young man for daring to differ from Aristotle," and commented, "The same thing happened to many great men before Galileo, and has happened to many since. It happens now. When you children grow up to be men and women will you see that it does not happen again?"[262]

The *Book of Knowledge*'s project, intent upon presenting a total picture of the world to the young reader, implied the possibility of a seamless transition between the world of the past and the better world of the future. In its lessons about the right way to pose questions, it flattered the reader with inclusion in the fraternity of scientists and forward-thinkers, while denigrating the "stupid" or backward people who didn't care enough to "find out." Some publishers of children's literature might not have claimed the *Book* as part of their project, at least in the United States; at least one person within children's publishing thought that encyclopedias were detrimental to children's reading, as they advertised value in their completeness as a "set," which led parents who invested in the set to neglect the important duty of continually purchasing more and more books

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[262] Arthur Mee, "Why Does An Apple Fall?," in *The Book of Knowledge*, vol. 1 (New York City: The Grolier Society, 1911), 304.

for their children, lulled into a false sense of security by its presence.[263] Be this as it may, the *Book*'s concerns, approaches, and themes are echoed in other information books intended for children. In its explicit instruction in inquiry, the *Book* promoted the habit of scientific thinking as an everyday practice; in its subject matter, it sought to draw the child into a productive fascination with all things around him.

Industrial Fairy-Tales: The Child's Interest in the Everyday

A Marcus Stone painting of inventor James Watt as a young boy playing with a teakettle was a common fixture in the children's encyclopedias of the 10s, 20s, and 30s.[264] Gertrude Hartman, writing about the portrait, describes the small experiment, and then imagines the response of an "aunt" who "reprove[s] Watt from what she thought was trifling": "James Watt, I never saw such an idle boy. Why don't you take a book and employ yourself usefully? For the last hour you haven't spoken a word, but have just taken off the lid of that kettle and put it on again. Aren't you ashamed of wasting your time that way?"[265] A child reader would know that this aunt was the foolish one; this reversal is a pleasing testimony to the importance of instinctual curiosity as opposed to channeled and directed learning. The reader could glean from this story that sometimes

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[263] Helen Dean Fish, "Encouraging Children's Home Libraries," *The Publishers' Weekly* (December 7, 1929): 2662–2663.
[264] Innes, "Men Who Made the Railways," 611; Eleanor Atkinson, *The How and Why Library; Little Questions That Lead to Great Discoveries*, vol. 3 (Cleveland, O: The L.J. Bullard Co, 1934), frontispiece; *The New Wonder World: Library of Knowledge* (Chicago: Geo. L. Shuman & co, 1943), frontispiece; Gertrude Hartman, *The World We Live in and How It Came to Be: A Pictured Outline of Man's Progress from the Earliest Days to the Present* (New York: The Macmillan Company, 1931), 241.
[265] Hartman, *The World We Live in and How It Came to Be*, 240.

books weren't as good as real things, when it came to learning; the second-best option might be to read books that were about the workings of things. The picture, read with the knowledge of Watt's glorious future, is a parable about the importance of wondering.

The repeated use of this image links together an explicitly domestic and "small" world with a big, powerful industrial advance: young Watt and his teakettle proved that a child's question could change the course of the world. As C.W. Saleeby lectured his readers in the *Book of Knowledge*, "The man who thinks only rare things wonderful is stupid." He cites Pasteur ("Everything is wonderful"), and writes: "The greatest men who have ever lived and the men who have done the greatest deeds are the men who have seen the wonder in common things." Saleeby complimented childhood by associating children with these men, saying, "Children have the power of seeing the wonderful in everything, and they keep it until they go out into the hard world, or until they meet adults who tell them not to ask questions."[266] The information "stories" about industry that children read during this period presumed that children's interest in the details of the "wonderful" processes of industry was nothing less than insatiable. This presumption reinforced ideas about both childhood and industry; in these books children got a lesson in the importance of being curious about the mundane and the procedural, while also learning that American industry was all-powerful, morally irreproachable, and increasingly rational in its practices. Nathalie Op de Beeck argues, in reference to the interwar books about technology that she defines as "fairy tales of modernity," that this type of reading

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[266] C.W. Saleeby, "Air, Fire, and Water," in *The Book of Knowledge*, vol. 3 (New York City: The Grolier Society, 1911), 940.

material "acknowledge[s] cultural anxieties by buttressing ideals, and [its] superficial sunniness belies socioeconomic events."[267] The books that Op de Beeck examines, including picture books about such spectacular technologies as trains and skyscrapers, and ABC books featuring "modern" objects, are replacements for the "fairy tales" disdained by progressive educators seeking reformations of children's literature. The non-fiction books about industry that I will examine are another kind of "fairy tale," reassuring adult authors, editors, and parents about children's capacity to understand the increasingly complex processes of the modern world, while reinforcing an assessment of American material progress as fundamentally "right."

The children's books of the 1910s, 1920s, and 1930s featured many titles that began "The Story Of…" and ended with the name of an important commodity. This naming convention could also be found in encyclopedias—Henry Chase Hill's *Wonder Book of Knowledge*, for example, was composed entirely of "Stories Of" sandwiched between sections of questions and answers. Lucy Sprague Mitchell contended that these kinds of "stories "could be as adventuresome and fun as "tales of hunting, of impossible heroisms, and of war"; "the world of industry holds possibilities for adventure as thrilling as the world of high-colored romance."[268] The convention of including the word "Story" (or, occasionally, "Wonder," as in "The Wonder of Oil") in the titles of these books was a

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[267] Op de Beeck, *Suspended Animation*, 10.
[268] Mitchell, *Here and Now Story Book, Two-to Seven Year Olds; Experimental Stories Written for the Children of the City and Country School (formerly the Play School) and the Nursery School of the Bureau of Educational Experiments*, 31.

reiteration of the belief that children would find the narrative and the excitement within industrial processes; this belief was itself a kind of a self-reinforcing fairy tale.

Although these books about "industry" were rarely explicitly scientific, they drew from a prominent current in secondary science education from the teens through the thirties. The "General Science" curriculum, which educators conceived as a more appealing way to introduce younger high school students to science than the specialized discipline-based classes, operated on the basic principle that the students should be introduced to science by learning the underpinnings of their modern world. Like the "Story Of" books, "General Science" classes linked industry and the domestic, skirting difficult terminology in favor of helping students make connections between scientific principles and everyday life.[269] This was also a general principle of progressive educationists working in the younger grades, who sought to complicate the familiar as a form of scaffolding inquiry. The "Story Of" books I will examine in this chapter, which were produced for a range of reader ages, were sometimes used in school libraries, though they weren't textbooks; it seems fair to infer an indirect connection between their approach and that of the General Science movement.

Although the books I will examine in this section are titled in a similar fashion, their "stories" had different formal characteristics. Sara Ware Bassett, who wrote during the teens, produced fully-formed novels in which privileged young protagonists moved

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[269] John L. Rudolph, "Turning Science to Account: Chicago and the General Science Movement in Secondary Education, 1905–1920," *Isis* 96, no. 3 (2005): 353–389; John M. Heffron, "The Knowledge Most Worth Having: Otis W. Caldwell (1869–1947) and the Rise of the General Science Course," *Science & Education* 4, no. 3 (July 1995): 227–252.

from disinterest in commodities and industry, through a learning process or apprenticeship, and into a new commitment to "finding out." These novels were sentimental moral tales in which spoiled children grew into their birthrights as curious captains of industry. Lucy Sprague Mitchell's *Here and Now Story Book* (1921), intended for younger children and meant to be read out loud, contained shorter stories about everyday objects that emphasized the musicality of language and incorporated humor and gentle surprises. William Clayton Pryor and his wife Ellen Sloman Pryor, whose photographically illustrated Picture Books were published during the 1930s, told short stories about children learning about the origins of various commodities; the child characters are given very little background or context, and the pictures carry much of the weight of the narrative. Maud and Miska Petersham produced probably the most famous and enduring "Stories" during the 1930s— illustrated picture books telling about the evolution of commodities over time; these colorful books omit a child narrator or protagonist in favor of an omniscient narrative voice.

Their formal differences notwithstanding, this group of texts tell Stories of Industry while teaching subtextual lessons about the moral benefits of inquiry and the inherent goodness of American industry. Just as the *Book of Knowledg*e linked inquiry and evolutionary supremacy, teaching readers that to ask and to wonder was to participate in the most advanced possible mode of being human, these Stories placed readers in an empowered position in relationship to the workings of the modern world; this position carried within itself the implication that the inquiring, curious child reader was a future manager, not a future laborer. (Unless the reader was female, in which case she was a future consumer; her own knowledge would be exercised in making informed and tasteful discernments between types of goods.) In this, the Stories distinguished themselves from the industry-focused books produced for young people in the Soviet Union during the 1920s and 1930s; as Julia Mickenberg notes, those books viewed technology and industry as a means to liberation of all humanity, promising that the young person learning about the "way things work" would be part of a new future where labor would be transformed into equality and comfort for all, rather than capital for some.[270] Although the American authors' and editors' belief in the child's capacity for inquiry was certainly idealistic and romantic, the idealism remained invested in the idea of an inexhaustibly smart and curious white male reader. A prominent plot convention in these books, used to get the child protagonist into the factories where the information lies, involves a well-connected male relative who helps a boy tour a factory, visit an oil field, or see a warehouse; this convention serves to reinforce the message that the child reader is observing the world of the factory from a natural position of privilege. From this point of view, the complicated and messy world of industry could indeed appear "wonderful."

The figure of the child inquirer in these Stories of Industry models, explicitly and implicitly, the positive characteristics of those who ask. Occasionally, an overzealous application of these positive characteristics can render a plot unbelievable; some books contained child questioners whose enthusiasm for a continued lecture from an adult seems completely unrealistic. In Ellen Friel Baker's *The Wonderful Story of Industry*

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[270] Julia Mickenberg, "The New Generation and the New Russia: Modern Childhood as Collective Fantasy," *American Quarterly* 62, no. 1 (2010): 103–134.

(1930), for example, Charlie, a boy whose Uncle George spends a year asking favors from friends with factories so that his nephew can come observe them first-hand, is constantly "begging" to hear his uncle's "wonderful stories" about such topics as the history of newspapers and leather-making. This approach leads to unintentional moments of humor: after his uncle finishes talking about the footwear of knights, Baker interjects, "All this time Charlie had been listening almost breathlessly to his uncle's story and when Mr. Waters paused for a moment he said greedily, 'That is the most interesting story I ever heard, Uncle George. Please tell me more about shoes.'"[271] Or, after hearing about the chemistry of soap on the way home from visiting a soap factory, Charlie actually tells his uncle to hurry up, so that he can get home to take a bath: "I don't think I quite appreciated the value of soap before."[272] We don't know what a child reader's reaction to this story might have been, but at least one contemporary adult recognized the awkwardness and unreality of the presentation. Reviewing the book in *Progressive Education*, Clarice Evans wrote, "The politely receptive nephew…was somewhat out of keeping with the vigorous 'initiating' nephews one finds in the modern school."[273] This disconnect illustrates the way that books taking the "progressive," or at least self-consciously modern, subject matter of industrial development could at the same time

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[271] Ellen Baker, *The Wonderful Story of Industry,* (New York: Thomas Y. Crowell Company, 1930), 142.
[272] Ibid., 195.
[273] Clarice Evans, "Review: 'The Wonderful Story of Industry'," *Progressive Education*, n.d.

lapse into a stiffness of presentation, positing a unidirectional flow of information from adult to child that was at odds with progressive education's commitments.[274]

Lucy Sprague Mitchell, who was a progressive educator with classroom experience, incorporated a meta-discourse about the art of posing effective questions in her stories; like the authors of the *Book of Knowledge*, she talked about content while also talking about the *way* that a child should approach a subject in order to find out what she wanted to know. In Mitchell's "Here and Now Story," "Talking Timothy," a curious little boy named Timothy "talk[s] because he want[s] to find out about everything; then he talk[s] some more because he want[s] to tell everyone what he had found out." Timothy's curiosity makes him deeply interested in the way that his domestic life connects with the systems of the city. In the course of the story, Timothy goes outside to ask some workmen putting in a gas line what they are doing. The story investigates the fine line between curiosity and well-directed inquiry; like Arthur Mee's Wise Man, the adults in the story want Timothy to ask, but they want him to think first. The workmen praise Timothy for wanting to know what goes on under the street, but one of them, plagued by this stream of questions, finally tells him to go down in his own basement, look at the pipes, and "think" about what each of them might carry. This moment forms the basis for

[274] I did find one piece of anecdotal evidence showing that at least one child growing up at this time enjoyed this mode of "storytelling." In journalist Marianne Besser's 1960 book instructing parents in the method of "raising a scientist," a physicist interviewee, Mildred Shapiro, remembers: "[My father] used to tell me stories starting with fairy tales, progressing to Greek and Roman myths. When he ran out of these he would tell me to choose some object in the room, and he would give me an account of the procedures by which this object came into being; he would start back at the very fundamental materials and go on from there." Marianne Besser, *Growing up with Science*, 1st ed. (New York: McGraw-Hill, 1960), 84.

Timothy's turning point: he thinks and thinks, he begins to form hypotheses about each of the pipes, and even provokes his previously incurious sister into asking her own questions.[275]

Conversely, in another story, Silly Will, a boy who thinks he knows everything but actually knows nothing, illustrates the dangers of being unaware of the provenance of everyday things. After he makes fun of people who are sad because their animals have died, and says "I wouldn't depend on any animal, not I!", a magical thing happens; all of the animal-derived products in his life suddenly disappear, and their ghostly providers tell him one by one that they "take back" their gifts. He is stripped of his domestic comforts one by one; his blanket vanishes along with his pajamas, and, in a macabre turn, when he tries and fails to light a candle, he hears the faint voices of sheep saying, "I take back my fat!"[276] Silly Will illustrates the perils of ignoring interdependence; his lack of curiosity about his surroundings results in deprivation and provides a vivid object lesson for the child reader wondering why he should care about any of these origin stories.

The morality tales in Sara Ware Bassett's Stories draw from established trajectories common in children's literature of the nineteenth century, in which feckless children undergo events that transform them into proper citizens. Unlike these earlier tales, however, in Ware's stories acquiring a sense of curiosity replaces advancement

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[275] Lucy Sprague Mitchell, *Here and Now Story Book, Two-to Seven Year Olds; Experimental Stories Written for the Children of the City and Country School (formerly the Play School) and the Nursery School of the Bureau of Educational Experiments* (New York: E.P. Dutton & Company, 1921), 171–174.
[276] Ibid., 235–242.

gained through new religious or moral feeling. Thus, in the *Story of Lumber*, Dick Sherman, whose eyes are failing him, is forced to leave school for a year and join his uncle, who is a supervisor at a lumber camp. Dick's experiences in the forest teach him to stop caring about his small, provincial school life; "the world seemed so big, and there was so much to learn."[277] Dick "makes himself a veritable question-box" in his attempts to learn about lumber; "with pleasure the men listened to his queries and answered them, for they were never idle questions. If, after careful thinking, he did not understand a thing, then he asked."[278] After the year in the forest, Dick, well-loved by all of the men in the camp, goes to college; after graduation, he is instantly elevated to the position of foreman of a lumber camp of his own by the owner of the company, who recognizes his worth. In *The Story of Sugar*, Van Blake, a popular ne'er-do-well son of a western beet sugar magnate, could "pitch into any kind of sport" and "rattle off ragtime untiringly," but his lack of study skills means that the adults around him view him uneasily.[279] Blake, who has coasted his way through boarding school on the strength of his roommate's tutoring, begins to turn the corner to redemption after he witnesses an accident in which Tim, a poor boy from the town, is flattened by an automobile. Van starts to visit the younger Tim often, and part of their burgeoning relationship is that the "intellectually curious" Tim asks Van questions, because he "thought his big friend knew everything." "Whenever Tim became puzzled about facts that were being read to him or that he heard he would instantly appeal to Van," but the older boy often "was forced to blush and falter

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[277] Sara Bassett, *The Story of Lumber* (Philadelphia: The Penn Pub. Co., 1912), 60.
[278] Ibid.
[279] Sara Bassett, *The Story of Sugar* (Philadelphia: Penn Pub. Co., 1917), 22.

that he would have to look it up." Tim never forgot to follow up on his queries; "no sooner would Van be inside the gate than the shrill little voice would pipe: 'And did you find out how far away Mars is, Mr. Blake?'"[280] Redeemed by the younger boy's inexhaustible questions, Van buckles down, and learns to ask questions of his own; he eventually goes into the family business.

The Petershams' Stories don't follow a single child through the narrative, but instead insert children at particular points in the story as proxies for the child reader. So, for example, a story that includes steamboats has a picture of Clermont's successful steamboat run in 1807, with an excited child running toward the viewer with a finger pointing at the boat; in a discussion of the work of alchemists, the Petershams insert a fictional "furnace boy" whose eyes get "red from fumes" while he watches an alchemist labor.[281] The beginnings of many of the Petersham stories feature "cave kids" discovering mysterious substances such as oil and honey. These proxies serve as reminders to the child reader that at different times in history, children managed to be part of the process of discovery.

The central "finder-out" in all of these series tends to be male; any female characters that appear in the narrative serve as auxiliaries to the action, and their interest in the proceedings of the factory tour or the lecture is circumscribed. Girls are depicted as interested mostly in things that are pretty; their aesthetic reactions take the place of any

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[280] Ibid., 157–158.
[281] Maud Fuller Petersham and Miska Petersham, *The Story Book of Gold* (Philadelphia: J.C. Winston Co, 1935).

considered analysis of the implications of the material that they see in front of them. The Petershams began their story of the discovery of gold with a hypothetical little "cave girl" who sees something in a stream and decides she thinks it's pretty ("bright like the sun"), then asks her father make it into a necklace.[282] Sister Mart comments on crushed slag in Pryors' *The Steel Book*: "It's pretty again after it's crushed. I like the way it sparkles."[283] In the Pryors' *The Cotton Book*, cousin Ann consistently ties the narrative back to her dress and her doll's dress, at one point exclaiming impatiently "You haven't yet told me how my new blue dress got blue!"[284] Jean Cabot, in Bassett's *Story of Glass*, begs mostly for "stories" about glass's romantic past, while her Uncle Tom (owner of a glass factory) tells her adopted brother about the industrial procedures that create glass. At one point, Uncle Tom tells Jean of a new order that his factory has received, for glass-bottom boats; when he explains the concept to her, saying "I have heard that it is as interesting as moving pictures, and quite as thrilling, too," she replies "I hate things that writhe, and squirm, and wriggle. Imagine being so near those hideous creatures! Why, if I once should see them I should never dare to go in bathing again. I'd rather not know what's in the sea."[285] Jean's incuriousness about "what's in the sea" is particularly notable, given the contrast with Bassett's party-line approval of curiosity in male protagonists. Indeed, at the end of the book, Jean becomes Uncle Tom's housekeeper, while he grooms her

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[282] Ibid.
[283] William Clayton Pryor and Helen Sloman Pryor, *The Steel Book: A Photographic Picture-Book with a Story* (New York: Harcourt, Brace and company, 1935), 26.
[284] William Clayton Pryor and Helen Sloman Pryor, *The Cotton Book: A Photographic Picture-Book with a Story* (New York: Harcourt, Brace and Company, 1936), 74.
[285] Sara Bassett, *The Story of Glass,* (Philadelphia: The Penn Pub. Co., 1916), 191.

adopted brother to take over the factory work; Jean says "A girl—a really, truly [sic] girl, Uncle Tom, can't help wanting to keep house for somebody."[286]

In a similar failure of female curiosity, the Pryors' *The Streamline Train Book*, Nancy sits down to read a book, while her friend Ted stays by the window, finding the passing landscape more interesting: "There was a hostess on the train who worked for the railroad, just like the conductor and the brakeman. She gave the passengers magazines to look at, but Ted was still too interested in the world flying past his window to read."[287] Female interest is depicted as easily diverted by aesthetic concerns, or by such frivolous occupations as fiction or magazines, while male interest is most happily occupied by the workings of reality.

Bassett's books, with their protagonists so tightly connected with management, are the most self-consciously pro-capitalist of this group, but many examples exist of the way that these books elide problems of power and injustice while attempting to excite children's curiosity about industry. Perhaps the most common place to spot this elision is in the many books that tell the "Story" of a commodity with a most problematic labor history: cotton. Robin Bernstein points to an early twentieth-century depiction of a young African-American laborer on a Cottolene trade card, reading the image of the happy girl holding a puff of cotton as a "tender, appealing image of child labor." In contrasting this image with a Lewis Hine photograph of a white child laborer dragging an oversized sack

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[286] Ibid., 229.
[287] William Clayton Pryor and Helen Sloman Pryor, *The Streamline Train Book: A Photographic Picture-Book with a Story* (New York: Harcourt, Brace and company, 1937), 22–26.

through a field, looking undernourished and miserable, Bernstein argues that the two images show how, in the early twentieth century, white children were allowed representation as innocent and vulnerable, while African-American children were denied the right to have their suffering seen.[288] The Stories of Industry contain representations of child labor that were produced *for children*, making the blithe attitude toward the conditions of non-white child laborers all the more striking. The Petershams often included an image of a laboring child in their books' depictions of industries. In their *Story of Cotton*, African-American children labor in the fields under the watchful eye of a white overseer; in another version of this Story, a barefoot black child holding the reins of a horse looks on while his master and his friends inspect a cotton boll. This image reinforces the fiction of the plantation "family," as the text tells of "one man who took his family and his slaves to make his home on one of the islands off the coast of South Carolina."[289] The illustration on the next page, of an enslaved child playing in a bag of cotton while adults work at ginning cotton, references the visual convention of the "pickaninny" and implies that life as a black child on a plantation must have been fun; another picture of field work features a black child stretched out full-length on a pile of cotton, taking a nap. The Pryors also included a picture of a black child working in their *The Cotton Book* but described his work as "helping"; this, after the child telling the story of his visit to the plantation remarks on the convenience of the school that's right on the

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[288] Robin Bernstein, *Racial Innocence : Performing American Childhood From Slavery to Civil Rights* (New York: New York University Press, 2011), 30.
[289] Maud Fuller Petersham and Miska Petersham, *The Story Book of Things We Use: Houses, Clothes, Food, Transportation* (Philadelphia: The John C. Winston Co, 1933).

premises, and the delicious chicken dinner he had with the laborers.[290] In describing the "Wonderful Gift of King Cotton," Eleanor Atkinson, author of the encyclopedic *How and Why Library*, asks the child reader whether s/he had ever heard the song "Dixie," and then comments, ""The white men who own the cotton fields love their homes, and the cotton plant, and the song [Dixie]. So do the negroes who work in the sunny fields…You never know what a happy song it is unless you hear it sung by moonlight in a camp of negro cotton pickers, to the playing of banjos." The word "slavery" does not appear in this description, except for a passing mention of the financial hardship that cotton growers faced before the invention of the cotton gin: "A hundred years or more ago, all the cotton seeds had to be pulled from the lint by human fingers. That made cotton cost a great deal, even when the work was done by slaves." The labor that produces cotton is, literally, a picnic:

> This leisurely work in the warm, bright autumn days of the South just suits the sun-loving, happy-hearted negroes. As soon as the first bolls burst open, the negroes swarm out into the fields by thousands to pick cotton. The work lasts three or four months and they make a kind of picnic of it. They move from one plantation to another and live in camps. At night they dance and sing and play the banjo.[291]

If the "Story Of" genre implies a "finding-out" narrative that has a reassuring completeness and resolution, this happy image of the labor that produces the reader's cotton clothing reinforces that implication, while the racist story's place in an encyclopedic work of "reference" lends it the gloss of truth.

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[290] Pryor and Pryor, *The Cotton Book*, 10–13.
[291] Atkinson, *The How and Why Library; Little Questions That Lead to Great Discoveries*, 3:471–474.

Dynamics of capitalism and resource exploitation external to the United States are described in similarly simplified terms, and always favor the owner of capital. In the depiction of "African gold mines" in the Petershams' *Story of Gold*, "the black men" labor to bring gold out of the earth; there is no mention of the relationship between these "black men" and the external forces of capital that might be benefiting from their labor. In this story, Pizarro was "greedy and cruel" but the Americans who are "eager for gold" are "brave": "That's why so many California boys and girls are proud to say, 'My grandparents were Forty-Niners.'"[292] When describing the production of rubber, Atkinson wrote, "in Brazil and Africa there are many wild forests of rubber trees now, and natives gather the milk in the early morning, and hold it over their simple fires to smoke and cure it…At times some of the natives are not careful when they cure the rubber, and fail to do their work properly, and these do not get as much money for their rubber as others do, who are careful, and keep the rubber clean."[293] This gloss makes it clear that Atkinson considers that children reading her book will want information that would help them with future management.

Ann Jackson's *The Wonders of Oil* also comments on the problems of management when faced with ineffective labor. In this book, Uncle Robert, clearly on the side of management, tells the protagonist George of a wondrous system by which the supervisor can see "what progress has been made during his absence." Using a recorder

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[292] Petersham and Petersham, *The Story Book of Gold*.
[293] Atkinson, *The How and Why Library; Little Questions That Lead to Great Discoveries*, 3:542.

that marks the motion of the drilling equipment while it's in action, the supervisor "can readily see when the men were drilling, and when they were making a round trip. He can even tell when they were standing idle!"[294] The authorial voice tells the story of the intransigence of the teamsters, which, the author argues, provokes the owners into inventing the technology of the pipeline. "The teamsters found themselves with less and less work to do. They threatened the oil men with violence. But their threats had no effect." The end result of the conflict: "Patrolmen arrested many of the teamsters. Guards were stationed along the pipelines to protect men and property. The teamsters' days were over. They finally had to admit it, and turn to other ways of making their living. This is what progress always does. It forces men out of old ways of working."[295] The representation of this conflict places the child reader on the side of management, especially because the reader has been told that by his very interest in the topic, that he is part of "progress."

In Bassett's stories, capital is benevolent; as in so many aspects of her stories, Bassett used rhetoric distinctly reminiscent of the late nineteenth-century social order. The Dalton Company, for whom the lumberjacks work in *The Story of Lumber*, is a friend to its workers: "so closer and closer drew the bonds of friendship between the laborers and those for whom they labored, and peace serene as the forest itself reigned at McGregor Camp."[296] The head of the Dalton Company has, as Dick says, "the best smile I ever saw"; his uncle agrees, saying "If he ever did do a mean thing it is so long

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[294] Ann Jackson, *The Wonders of Oil,* (New York: Dodd Mead, 1940), 58.
[295] Ibid., 115.
[296] Bassett, *The Story of Lumber*, 130.

ago…that neither he nor any one else can remember it."[297] In *The Story of Glass*, the Cabots, marveling at some glass kept in a museum, praise the rich for contributing to museums; Uncle Bob says to Jean, "Remember that, too, in this day in which there are so many persons who begrudge the rich their fortunes. Remember that if there were not individuals in the world who possessed fortunes the poor would have far less opportunity to see art or treasures of every sort."[298]

Of the books surveyed in this chapter, the only one that acknowledges a problem with the evolution of the relationship between labor and capital in the "age of machinery" was progressive educator Gertrude Hartman's *The World We Live In And How it Came to Be*, which acknowledged that "this new way of living has brought many great problems which are not yet solved." Hartman wrote that "a great many people" underwent "long days of monotonous labor" in order to make the machines work. Noting that standardization of clothing, reading material, and radio shows were all "products of the machine," she warned, "Such standardized ways of living do not satisfy the freedom-seeking adventurous spirit that man has inherited through the ages." Nonetheless, the child was of the generation that needed to solve these problems: "We must, because we cannot turn back again to the old ways of living; we must look forward to new and better ways."[299]

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[297] Ibid., 189.
[298] Bassett, *The Story of Glass,*, 116.
[299] Hartman, *The World We Live in and How It Came to Be*, 314.

Generally, however, these books about industry presumed a reader who was positioned above the laborers who produced the commodities to be used; this reader should learn more and more about this process, because he would one day be in charge—either figuratively, as a member of the professional class, or literally, as a manager or innovator involved in the industries under examination.

Tree-Dwellers and Fire-Starters: Prehistory and The Birth of Inquiry

If the Stories of Industry purported to explain the frontiers of knowledge, another group of nonfiction books explained the origins of mankind and of human intelligence to child readers, foregrounding the importance of curiosity in man's advancement. As Joan Shelley Rubin writes, the interwar period's "most important nonfiction publishing trend" was "the vogue of the outline."[300] H.G. Wells' *The Outline of History*, successfully published in the US in 1920, propelled this trend, and Hendrik Willem van Loon's *The Story of Mankind* (1921), which won the Newbery Medal in 1922, showed publishers that the approach worked for young people as well. Meanwhile, American interest in prehistory, stoked since the late nineteenth century by museum exhibits of recovered fossils, strengthened during the teens and twenties through the efforts of popularizers such as the American Museum's Henry Fairfield Osborn.[301] As Roland Marchand writes, advertisers during the 1920s and 1930s used the "caveman" or "cavewoman" as a

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[300] Rubin, *The Making of Middlebrow Culture*, 210.
[301] Victoria E.M. Cain, "'The Direct Medium of the Vision': Visual Education, Virtual Witnessing and the Prehistoric Past at the American Museum of Natural History, 1890-1923," *Journal of Visual Culture* 9, no. 3 (December 1, 2010): 284 –303.

signifier for the "moral superiority of the 'natural' past over certain soft and lazy qualities of the present"; modern companies could provide consumers with the products that would reconnect them with this moral superiority.[302] For children, reading about "cavemen" seems to have been yet another education in inquiry; the "advance of humanity" toward the present-day, through ever-iterating refinements in knowledge, was considered analogous with children's own development (as recapitulation theory would hold), and so "cavepeople" were developmentally appropriate subject matter. "Early men were like children in their ways and thoughts," Florence Lansing wrote in her *Man's Long Climb*. "They feared what they did not understand….Man lived in fear of what might befall him, as children in a strange place sometimes fear the dark."[303] The child reader, equating himself with these "early men," could realize that in order to leave his fears behind and become a fully functioning member of modern society, he needed to learn more about the world.

These caveman stories show that the effect of recapitulation theory on interwar perceptions of childhood was a mixed one. While earlier theorists of childhood, such as G. Stanley Hall, followed a strict theory of recapitulation, assigning characteristics to developmental stages based on their understanding of the course of human history, the ideology underpinning these books was more complex. On the one hand, following Hall and popular applications of recapitulation, children might be supposed to identify with cavemen, as they were thought to find comfort in a small tribe, thrill to the moments of

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[302] Roland Marchand, *Advertising the American Dream: Making Way for Modernity,1920-1940* (Berkeley: University of California Press, 1985), 224–225.
[303] Marion Lansing, *Man's Long Climb* (Boston: Little Brown and company, 1933), 23.

instinctual violence, and enjoy the cavemen's connections to the outdoors and a wandering life. On the other hand, the very fact that children were reading these books, perched at the other end of history and enjoying the fruits of the modern projects of archaeology, anthropology, children's literature, and print itself, meant that they had a right—and a responsibility—to accelerate their own intellectual development beyond the caveman stage.

Henrik Van Loon's *The Story of Mankind* (1921) was the longest and most comprehensive of the books I surveyed, with extensive coverage of all eras of human history through the present day, including a chapter on "the Great War"; for the purposes of this chapter, I will survey only his initial chapters on "Prehistoric Man." W. Maxwell Reed's *The Earth for Sam: The Story of Mountains, Rivers, Dinosaurs, and Men* (1929), written by a scientist for his nephew, took an integrated geological, paleontological, and anthropological approach, and stopped at Cro-Magnons. Like Reed, Edith Walker, in her *Tales of the First Animals* (1930), took as her subject the evolution of animal life from the beginning, and the transition into the human era. Gertrude Hartman's *The World We Live In And How It Came To Be: A Pictured Outline of Man's Progress from the Earliest Days to the Present* (1931) brought readers all the way to the present day, with a final conclusion (partially cited above) naming children "Heirs of the Ages," and exhorting them to do better with the world. Marion Florence Lansing's *Man's Long Climb* (1933), took readers from the time "before men had homes," through the beginnings of agriculture, to the invention of various important tools; the book ends at the invention of the compass, when, Lansing told her readers, "the story of the Ancient World ends and the story of the Modern World begins."[304]

As in the *Book of Knowledge* and the Stories of Industry, the process of evolution and the importance of intelligence in evolutionary success are major themes of these books. Reed's *The Earth for Sam* personified evolution the most often. Both the title of his book and the whimsical drawing of a boy astride an earth that adorned its title page implied that the history of the world was a child's playground, and the world itself his toy. While the child was in this position of power, he also needed to take advantage of this power by continually moving forward, as had successful organisms of the past. Reed described evolution for a reader by talking about the way that cells divided "work," calling it "experimentation." Cautioning his reader, "Of course these groups of cells didn't get together and have a meeting and elect some one to act as president," he wrote, "Yet these groups of cells developed after millions of years into wonderful animals which could see and hear and talk. They did it very simply by just experimenting. They didn't know that they were experimenting, for they had no head and no brain."[305] Various groups of organisms that were evolutionarily successful are "energetic," as in the family of Cordaites (trees that were forerunners of sequoias and redwoods, and lived in the Carboniferous Period of the Late Paleozoic). "The Cordaites were an independent family that didn't believe in doing exactly as their ancestors had done," Reed wrote. Trees varied and changed, and "in this way a number of new kinds of trees appeared that have

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[304] Ibid., 150.
[305] W Reed, *The Earth for Sam : the Story of Mountains, Rivers, Dinosaurs and Men* (New York: Harcourt Brace, 1929), 21.

continued to grow even to the present time," including the California "big trees."[306] Reed wrote that meat-eating species should be considered smarter, because "it required more brains to catch an amphibian and conquer him than to eat plants."[307] Plesiosaurs, on the other hand, who "were obliged to return to the water in order to get food," were to be pitied; the fact that they "perished" at the end of the "Age of Reptiles" meant a failure to adapt. "Therefore," Reed wrote, "they are not our ancestors. They are merely some poor relatives who failed in the struggle for existence."[308] Walker also lauded some species and pitied others; in a poem about the Triassic Age, the final stanza was: "They grew strange coats of armor,/and they reached enormous size,/But they lost the world's supremacy,/Which is nature's greatest prize."[309]

How did "cavepeople" leave these ancient ancestors behind? These authors showed readers that what was required was to ask "why." Reed argues that the ability to "hold an object in his hands and look at it with both eyes" helped primates in the family Tarsius develop "curiosity," which led them to develop "a bigger brain": "The more he wanted to know, the more he learned, until now some of the descendents of Propliopithecus or his contemporaries know about radio, what the stars are made of, and even the origin and story of the earth."[310] In Lansing's story of the invention of settled agriculture, "Yegonwaneh," the carrier of the fire, is the one who spends time thinking about how the people could stop their "constant moving from place to place." "Most of

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[306] Ibid., 145.
[307] Ibid., 155.
[308] Ibid., 167.
[309] Edith Walker, *Tales of the First Animals* (New York: Farrar & Rinehart Inc., 1930), 58.
[310] Reed, *The Earth for Sam*, 283.

the men and women found life too hard for them to do much thinking," Lansing says. "They looked neither backward nor forward…but Yegowaneh was a little ahead of her tribe, a little wiser, a little less savage."[311] The *Wonder Book of Knowledge*, one of the *Book of Knowledge*'s imitators, told the story of the development of weaponry by positing that one individual, gifted with good genes, might have suddenly hit upon an idea: "We do not know his name. Possibly he did not even have a name, but in some way he hit upon a scheme for throwing stones farther, harder and straighter than any of his ancestors. The men and women in the Cave Colony suddenly found that one bright-eyed young fellow, with a little straighter forehead than the others, was beating them all at hunting."[312] The importance of the advanced individual in making these leaps forward was a lesson in the power of exceptional people; the reference to the "straighter forehead" implied that exceptionality might be genetic.

These books came up with several explanations for innovation and progress in "cave times." Hartman's *The World We Live In* also noted the importance of threat and danger in teaching men how to respond creatively. Man was distinguished from the animal by "his ability to think. If danger came upon him suddenly, he had to use all his ingenuity and take every advantage that was offered in order to save himself. He was living in a strange unknown world where almost anything might happen at any moment. He formed the habit of observing the things he saw. He began experimenting with things

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[311] Lansing, *Man's Long Climb*, 9.
[312] Henry Chase Hill, *The Wonder Book of Knowledge: The Marvels of Modern Industry and Invention, the Interesting Stories of Common Things, the Mysterious Processes of Nature Simply Explained* (Philadelphia: The John C. Winston Co, 1921), 75–79.

to find out whether they might be useful to him in one way or another."[313] Reed agreed: "Combat on nearly equal terms seems to sharpen the wits of all fauna. It is because in so dangerous an occupation only those survive who can think quickly."[314] However, there was also a lesson in cooperation and nurturance: Van Loon argued that mammals were the ones to advance into the realm of intelligent beings because they could learn things from their mothers. "The young mammals were given a much better chance to survive" because of this.[315] Edith Walker argued sentimentally: "In caring for their young the animals began to develop something like the soul of the man."[316] In Lansing's story of the first domestication of animals, innovation comes from kindness. Jabal, of the "tribe of Ur," loves animals, despite his tribe's hunting vocation. Lansing is quick to say that Jabal was no "weakling" or "coward," but rather "tall and strong, the best wrestler of them all"; his tribe doesn't understand his affection for the animal world, but he can't help it. Eventually, after he starts to tame some wild animals ("a wounded bear cub that snarled and showed its teeth at the approach of any of the other boys would lie still and let Jabal pull the thorns from its paw"), he begins to keep sheep and goats; the tribe finally realizes the value of his project, and he is acclaimed as "The Father of All Herdsmen."[317]

Finally, chance took a part in some discoveries, as in Van Loon's story about the "taming of fire," in which "a genius" who had been caught in a forest fire while hunting "remembered that he had almost been roasted to death by the flames"; he dragged a tree

[313] Hartman, *The World We Live in and How It Came to Be*, 44.
[314] Reed, *The Earth for Sam*, 278.
[315] Hendrik Willem Van Loon, *The Story of Mankind* (New York: Boni & Liveright, 1921), 7.
[316] Walker, *Tales of the First Animals*, 88.
[317] Lansing, *Man's Long Climb*, 16–21.

into his cave and lighted it, “which turned the cave into a cozy little room.” Van Loon went on to narrate the discovery of cooked food: “One evening a dead chicken fell into the fire. It was not rescued until it had been well roasted. Man discovered that meat tasted better when cooked and he then and there discarded one of the old habits which he had shared with the other animals and began to prepare his food.”[318]

Finally, innovators sometimes innovate out of the need to manage the less innovative people around them. Lansing’s “Man who was Always in a Hurry” invents time-keeping devices because “he was always ready to do things before other people were.” “His slaves never moved quickly enough to satisfy him. His wife was never ready when he wanted her to be. His children did not come to meals promptly. He found himself growing very cross and impatient because other people were so slow.”[319] As in Ann Jackson’s *Wonders of Oil*, in which the authority figure tells the inquiring child that pipelines were created to thwart recalcitrant teamsters, the innovator creates out of a need for dominance and control.

Many of these books made the innovating “caveman,” already a metaphorical child, into an actual child. The Petershams posited that perhaps a child might have been the first to figure out fire: “One day somebody found out how to make fire. We do not know how it happened. Perhaps some boy was rubbing two sticks together for fun, and when he had rubbed hard for a long time he saw a little flame start in the leaves or dust. And he found that if he kept on rubbing, the sticks would start another fire. The boy was

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[318] Van Loon, *The Story of Mankind*, 16.
[319] Lansing, *Man’s Long Climb*, 117.

probably scared at first. But the older people soon learned how to use this new thing, fire."[320] In Lansing's *Man's Long Climb*, it's the grandchildren of Yegowaneh (the "Wise Woman") who discover agriculture. They play with seeds and leave some in the ground; after the seeds sprout, they tell their grandmother. Lansing sees this innovation as a miracle: "So simply, through the play of little children, did the Earth Mother grant the prayer of Yegowaneh. So easily and naturally did the Wise Woman learn the wonderful secret of the seed sprouting in the ground."[321] Children in Lansing's book also discover clay cooking utensils after they make little clay pots that look like their mothers' baskets.[322] Here, new knowledge emerges from the play of children, just as it did when a young James Watt played with his teakettle.

While this story flatters the child reader, encouraging play, it is also one of the only instances in these books in which an older woman is the children's accomplice in investigation; Lansing's Yegowaneh, like a good preschool teacher, understands the significance of children's play. As mentioned above, Sally Kohlstedt has observed that children's science books published in the years before 1930 often featured fictional mothers and maiden aunts as sources of reliable information.[323] Yegowaneh seems to have much in common with these female guides of a previous era. A comparison between the gendered transfer of information between an older woman and children that is evident in Lansing's book, and the new relationship depicted in Reed's *Earth for Sam*, which

[320] Petersham and Petersham, *The Story Book of Things We Use*.
[321] Lansing, *Man's Long Climb*, 9.
[322] Ibid., 39.
[323] Sally Gregory Kohlstedt, "Parlors, Primers, and Public Schooling: Education for Science in Nineteenth-Century America," *Isis* 81, no. 3 (September 1990): 237.

posits teaching about the past as a transaction between an expert uncle and his curious nephew, shows the persistence of earlier tropes of children's nonfiction in a self-consciously modern era. Such a comparison also shows how this self-conscious modernity was manifested as the transfer of authority into the hands of male guides.

As may be clear from the indistinctness with which I have used the word "caveman," the authors tended to naturalize European prehistory as the prehistory of the whole world, reflecting their sense of the audience of their books. W. Maxwell Reed called his nephew (and, by extension, his imagined reader) "a normal white primate," and hailed his reader as white: "Let us study our own family history and learn, if we can, when and where our immediate ancestors, the European white primates first appear."[324] Reed also referred his reader to books such as *Character of Races* by American geographer and environmental determinist Ellsworth Huntington[325] if the reader wanted to know "why some men [white men] have grown so wonderfully clever in this historic period."[326] The Petershams implicitly represented "cave-men" as European, while, when talking about the South American Indians who first cultivated corn, called them "Old-time Indians."[327] Lansing conflates prehistory with theatrical gestures to imagined American Indians; she uses terms such as "The Earth Mother" and the "Happy Hunting

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[324] Reed, *The Earth for Sam*, vi, 354.
[325] Preston E. James, "Review: Ellsworth Huntington: His Life and Thought (Geoffrey J. Martin)," *Geographical Review* 64, no. 4 (October 1, 1974): 587–588.
[326] Reed, *The Earth for Sam*, 375.
[327] Maud Fuller Petersham and Miska Petersham, *The Story Book of Foods from the Field: Wheat, Corn, Rice, Sugar* (Philadelphia: John C. Winston Co, 1936).

Grounds" and the "Great Spirit" in discussing the theology of her "early people."[328] Lansing's only illustration of a black person comes in the section "How Music Came," in which "a savage" taps on a hollow log.[329] All of these elisions and misrepresentations serve to center the white child as the inheritor of progress.

The story of prehistory was the story of innovation, and for these authors, children should exit their experience with the books feeling good about being human, and ready to participate in the next phase of evolution. The conclusion to Hartman's book describes the nature of humanity in glorified terms, saying that the history of humanity is the record of how "man, the inquirer, the inventor, pushed on, overcoming obstacles, learning by experience." Referring to the inventions that she has cited in the course of the volume, Hartman points out that "each age has added something to what was known before."[330] Reed, on the other hand, although pointing out that primates managed to survive and thrive because they developed intelligence, asked the reader to consider "for nearly 1,000 million years life has survived earthquakes and glaciers by means of a very small amount of brains, and as you look around among your fellow citizens you will find that many today flourish amid the accidents and turmoil of modern life with a surprisingly small amount of that latest feature of animal evolution."[331] "The wars and suffering of human life have been caused in nearly all cases by ignorance," Reed wrote. "The more intelligent we become, the more tolerant we shall be of other people and the more we

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[328] Lansing, *Man's Long Climb*, 10.
[329] Ibid., 130.
[330] Hartman, *The World We Live in and How It Came to Be*, 340.
[331] Reed, *The Earth for Sam*, 380.

shall object to the old inherited tendency to get what we want when we want it by killing a number of our enemies and seizing their property."[332] It was left to the readers of these non-fiction tomes to transcend the caveman phase by concentrating on developing brain-power.

Conclusion: Reading to "Find Out"

In 1949, Ellen Lewis Buell, the children's books editor of the *New York Times Book Review*, wrote in the *Times* that she was happy to see a turn away from the "information book." "During the Twenties, Thirties, and early Forties these books were legion," she wrote. "We had books about trains and airplanes, books about bread and building, about geography and history." She argued that publishers were now able to emphasize a "good story" and to "recognize the fairy tale as an integral part of the child's imaginative development."[333]

What Buell's simple opposition between the "fairy tale" and the "information book" elides is the fact that the writers of "information books" did present their works as "stories." The existence of these books meant that adults believed that modern children *should* find reality more entertaining than fiction. Whether or not the books succeeded in selling the idea that the "life" of a lump of coal or the biography of James Watt could be as intriguing as the work of the Brothers Grimm, their very presence in the library or the

[332] Ibid., 385.
[333] John T. McQuiston, "Ellen L. Buell, 84, a Times Editor - New York Times," *New York Times* (New York, NY, November 1, 1989), http://www.nytimes.com/1989/11/01/obituaries/ellen-l-buell-84-a-times-editor.html; Ellen Lewis Buell, "Topics and Trends in the Season's Books for Young Readers," *New York Times (1923-Current File)*, November 13, 1949, BR3.

home sent a set of messages to children about the nature of their duties as children living in the modern world.

In her analysis of the *New England Primer*, a popular text for children in the seventeenth, eighteenth, and nineteenth centuries, Courtney Weikle-Mills argues that debates over whether children's literature "[transmits] adult authority or [validates] children's potential for self-determination" can never be resolved, partially because "these functions are not mutually exclusive." The *Primer*, Weikle-Mills argues, asked children to follow its instructions—about obedience, love of God, and prayer—quite literally; the *Primer* also asked for an active process of reading, involving affective attachment and insight.[334]

Weikle-Mills's argument is instructive in understanding the expectations that authors, editors, and promoters of information books in the interwar years had of their child readers. Viewed from one perspective, these books appear to be relentless lessons in the importance of an interest in reality—lessons that reinforced existing class hierarchies and perpetuated the fiction that white male children were more capable of understanding the modern world than others. From this view, the lesson in inquiry is a lesson in holding power; white American children were taught to ask questions about the "real world" because these questions would result in continued advantages for their elders. Adults liked to believe in their children's interest in "information" because it reassured them that

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[334] Courtney Weikle-Mills, "'My Book and Heart Shall Never Part': Reading, Printing, and Circulation in the New England Primer," in *The Oxford Handbook of Children's Literature*, ed. Julia L Mickenberg and Lynne Vallone, Oxford Handbooks (Oxford ; New York: Oxford University Press, 2011), 413.

the middle-class individual could triumph in an increasingly complex world. From another perspective, which might view this mode of reading as less coercive and more liberating, one could argue that some of these books took children's questions seriously. In advising further research and inquiry, "information books" pointed the way outwards, to adult books, factory tours, and "real-world" experts, rather than sacralizing classroom teaching or isolating the child in his or her own world of diminished agency.

Chapter 3: Thrills, Chills, and Magic: Home Chemical Laboratories and the Culture of Boyhood Science

A kids' biography of Thomas Edison, published in 1933, featured on the cover a red-cheeked and happy young Thomas Alva entrenched in a site of maximum productivity: the mobile chemical laboratory he set up for himself on a train car of the Grand Trunk Railway, where he worked selling food to passengers. We can see much visual evidence of Edison's famous industry: the picnic basket full of wares, the row of chemicals in stoppered bottles on the wall, and the pile of newspapers, which, as the book told young readers, he had edited and printed himself. The vision of Thomas's happy face, in alarming proximity to the lines indicating upward motion from the vessel into which he has poured his chemicals, is meant to reinforce this rugged American boy's devotion to "finding out." Thomas, no outcast despite his solitary pursuits, "could chew tobacco, spit as far as any of the fellows, and think up as much mischief, [but] he was happiest when alone in his laboratory."[335]

This 1933 version of the Edison mythos was emblematic of a new ideal of scientific boyhood during the interwar period. Beginning in 1918, the A.C. Gilbert Company, of New Haven, CT, the Porter Chemical Company, of Hagerstown, MD, the Lionel Company of New York City, and various smaller companies produced, marketed, and sold a wide array of science sets meant to introduce children to topics in chemistry, microscopy, biology, electricity, and physics. The marketing of these sets, their

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[335] Winifred Esther Wise, *Young Edison: The True Story of Edison's Boyhood* (Chicago, IL: Rand McNally & Co, 1933), 22.

packaging, and their textbook-length manuals all respond to popular interwar assumptions about the nature of scientific practice, the activities and interests of a "typical" childhood, the correlation between science practice and formations of masculinity, and the place of the market in education. Chemistry sets, more so than "information books" or science museums, emphasized the practice of science as a pursuit intended to sharpen natural curiosity and, at the same time, strengthen children's more worldly powers of observation, self-regulation, and entrepreneurship. Perhaps because it was intended to promote mastery, the imagined social world revolving around the chemistry set was an almost exclusively male one. Men such as A.C. Gilbert, an M.D., former Olympian, and patriotic devotee of such manly pursuits as hunting and shooting, leveraged their own masculine identities in order to sell science to boys. The "chemical magic" show, instructions for which were included with some chemistry sets, was perhaps the ultimate example of the gender dynamic of the chemistry set; in these shows, boys "fooled" those around them with chemical tricks, holding control of their paying audience through the force of modern knowledge.

This chapter places the selling of chemistry sets within the larger emergence, in the first decades of the twentieth century, of mass-market goods directed specifically at children.[336] Lisa Jacobson argues that adults of that era tended, just as adults of today, to find children's presence in the newly expanded consumer sphere "unsettling," adding that

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[336] See Daniel Thomas Cook, *The Commodification of Childhood: The Children's Clothing Industry and the Rise of the Child Consumer* (Durham: Duke University Press, 2004); Lisa Jacobson, *Raising Consumers: Children and the American Mass Market in the Early Twentieth Century* (New York: Columbia University Press, 2004).

young consumers "raised profound questions about what constituted a protected childhood in the age of mass culture and mass consumption." Not all childhood consumption, however, was perceived as an equal moral hazard. In the 1920s and 1930s, child development experts such as Angelo Patri and Sidonie Gruenberg began to see child consumption as something "benign and manageable," indicative of imagination and personality; children should be given allowances and taught how to use them. Boy consumers, especially, could channel consumptive desires into productive hobbies that might help them succeed in later life.[337] Technological hobbies expanded, with sales of parts, instruction booklets, and kits offering children and young people the chance to pursue interests in wireless, ham radio, aviation, and automobile design.[338]

With this recasting of the meaning of youthful consumption, a boy who desired a chemistry or science set was not greedy, but, instead, possessed a laudable interest in something universally respected: science. Meanwhile, a parent enabling a child's consumption of these sets was advancing a child's chances of embarking on a lucrative career—a goal that, as Roland Marchand points out, was of particular interest to the parents of the 1930s, who worried that their own diminished material circumstances

[337] Jacobson, *Raising Consumers*, 2–12.
[338] Susan J Douglas, *Inventing American Broadcasting, 1899-1922* (Baltimore: Johns Hopkins University Press, 1987); Kristen Haring, *Ham Radio's Technical Culture* (Cambridge, Mass: MIT Press, 2007); Ruth Oldenziel, "Boys and Their Toys: The Fisher Body Craftsman's Guild, 1930-1968, and the Making of a Male Technical Domain," in *Boys and Their Toys: Masculinity, Class, and Technology in America*, ed. Horowitz, Roger (New York N.Y.: Routledge, 2001), 131–168; Carroll W. Pursell, "Toys, Technology, and Sex Roles in America, 1920-1940," in *Dynamos and Virgins Revisited: Women and Technological Change in History*, ed. Trescott, Martha Moore (Metuchen, NJ: Scarecrow, 1979), 252–267.

would stunt their children's chances of success.[339] A parent enabling a child's consumption of these sets was advancing a child's chances of embarking on a good career, but also contributing to the nation's industrial advancement. Such a parent was even, as one writer argued in 1931, enhancing possibilities for world peace.[340]

In the response to children's science sets we can see the multiple ways that public discourse positioned science as "good." During this time, Americans encountered discussions of scientific activity increasingly frequently in their everyday reading, and the authority of "Science" writ large grew.[341] At the same time, certain sectors of the American population had a more complicated relationship with science, objecting on religious grounds to evolutionary theory or raising concerns that experimentation on live

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[339] Roland Marchand, *Advertising the American Dream: Making Way for Modernity,1920-1940* (Berkeley: University of California Press, 1985), 298–299.
[340] Ruth L. Frankel, "Choosing The Right Toys," *Hygeia*, December 1931, 1407. Frankel attended a meeting of the Women's International League for Peace and Freedom, at which a display table held scientific toys. "It can easily be seen that the table full of scientific toys and objects was more than a table full of valuable apparatus," she wrote. "No child, interested enough to attempt to orient himself in a timeless, measureless universe, could ever again be completely arrogant or completely convinced that the universe revolved about him. Likewise, the child who is given one of the fascinating new biology sets or a chemistry outfit is lifted far from a local point of view. Science is universal. Scientists pride themselves on working for humanity and rejoice in bestowing their discoveries on the world; so the child whose experiments lead him to the many fields of scientific adventure is likely to step beyond boundaries and apart from patriotic segregation."
[341] Marcel C LaFollette, *Making Science Our Own: Public Images of Science, 1910-1955* (Chicago: University of Chicago Press, 1990); Marcel C LaFollette, *Science on the Air: Popularizers and Personalities on Radio and Early Television* (Chicago: University of Chicago Press, 2008); Bert Hansen, *Picturing Medical Progress from Pasteur to Polio: A History of Mass Media Images and Popular Attitudes in America* (New Brunswick, N.J: Rutgers University Press, 2009); Steven Shapin, *The Scientific Life: A Moral History of a Late Modern Vocation* (Chicago: University of Chicago Press, 2008).

animals or vulnerable human populations was inhumane.[342] Children's play with chemistry sets was part of children's popular culture, as I shall demonstrate, but its existence also meant something to adults processing the meaning of science in their own lives. Chemistry sets were advertised for children and for adults; although the kids were the ones playing with science, adults interpreted this play, pointing to it with reassured satisfaction as an indicator that American children were native inhabitants in the sphere of scientific activity. At the same time, science further improved its public image by its association with the "innocence" of childhood.

As one example of this doubling of meaning, the visual appeal of these chemistry sets, while certainly directed at children, could not have been lost on the adults who would have encountered them in department stores and toy stores. Susan Stewart, in her work on the miniature, has written that adult interest in childhood is often bound up with a fascination with things miniaturized. "The world of childhood," she argues, "limited in physical scope yet fantastic in its content, presents in some ways a miniature and fictive chapter in each life history; it is a world that is part of history…but remote from the presentness of adult life."[343] The artwork on the box tops of chemistry sets established what Marchand would call a set of visual clichés, their own iconic language that was

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[342] James Colgrove, "'Science in a Democracy': The Contested Status of Vaccination in the Progressive Era and the 1920s," *Isis* 96, no. 2 (June 1, 2005): 167–191; George M. Marsden, *Fundamentalism and American Culture*, 2nd ed (New York: Oxford University Press, 2006); Susan E. Lederer, *Subjected to Science: Human Experimentation in America Before the Second World War*, Henry E. Sigerist Series in the History of Medicine (Baltimore: Johns Hopkins University Press, 1995).
[343] Susan Stewart, *On Longing: Narratives of the Miniature, the Gigantic, the Souvenir, the Collection* (Baltimore: John Hopkins University Press, 1984), 44.

meant to connect the child's work in the home lab with the grand project of industrial chemistry—work that was, as Stewart writes, remote, fantastic, and limited, while also remaining tightly linked to the adult world. The artwork on Porter's chemistry sets, whose motto during the pre-World War II years was "Experimenter Today, Scientist Tomorrow," visually invoked the supervision and guidance of the adult scientist, in a way that also implied the future incarnation of the child who used the set.[344] This visual trope underwent several variations: On some boxes, such as that housing the Chemcraft Set No. 1, the boy scientist would be framed by the twin images of the adult male scientist and a factory.[345] An advertisement in the *Chemcraft Science Magazine* pared the image down to a simple shadow, with the child's own physicality referencing something larger than himself.[346] Science toys were a miniaturization of an overwhelming force in the social world—science—into a physical package, one that could then facilitate the construction of a miniature laboratory, staffed by a child, who would in return produce more science for the world to use.

In this chapter, I will offer a brief history of the two major toy companies under examination: the A.C. Gilbert Company and the Porter Chemical Company. Then, I will outline the ways that these companies marketed their science sets to boys, tying their techniques to understandings about boys' desires and motivations. I will place boys' play

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[344] "Chemcraft Chemistry Outfit Experiment Book No. 5" (The Porter Chemical Company, Hagerstown, MD, 1934), Chemical Heritage Foundation, Object Collections, 2005.043.
[345] "Chemcraft: The Chemical Outfit, No. 1" (The Porter Chemical Company, Hagerstown, MD, n.d.), Chemical Heritage Foundation, Object Collections, GB98:09.004.
[346] "The Chemcraft Science Magazine: Official Organ of the Chemcraft Science Club, Vol. 48, No. 1" (The Porter Chemical Company, Hagerstown, MD, n.d.), Chemical Heritage Foundation, Object Collections, 2005.043.

with science sets in a social world, showing how boys used their home laboratories to advance social networks, establish authority, and connect to other "science-minded" young people across the United States. I will explore the phenomenon of the "chemical magic" show, which offered boys a chance to perform their mastery of chemical technique while learning lessons about commanding a less-sophisticated audience. Finally, I will look for the places where girls appear within the imagined world of home chemistry laboratories, showing how these appearances draw from and reinforce contemporary perceptions of girls' limited capacities for experimentation and inquiry.

The Miniature Lab in Historical Context

Just as children who wanted science sets, and the parents who indulged them, could be seen as portents of the positive advance of modernity rather than as sad indications of the inroads of consumerism, the manufacturers of science sets and other educational toys could claim positions as public servants. As Gary Cross has argued, the category of the educational toy first became popular in American markets during the teens and twenties.[347] Marketers labeled anything from the widely used construction sets to play carpet sweepers for girls as "educational." Through items placed in the industry publication *Playthings* (henceforth, *PT*) during those decades, we can trace the way that the idea of "education" became an essential part of the sales strategy of American toymakers. In 1916, in an item headlined "Inspiration," *PT* trumpeted: "What philosophy,

[347] Gary S. Cross, *Kids' Stuff: Toys and the Changing World of American Childhood* (Cambridge, Mass: Harvard University Press, 1997), 60.

science, and art are to civilization, business to man, the fireside to woman, toys are to youth. Toys are the child's WORLD!" When gazing at the toy, the anonymous author went on, the adult should realize that "Here is Science at its source; Art in its adolescence; Power at its portal!"[348] This was an intoxicating premise, for an industry looking to make a place for itself as a rational and legitimate arm of public culture.

For the relatively young American toy industry, which was coming into its own during these decades, making educational toys was a good way to claim status as inherently "American". In 1917, a writer for *Playthings*, Thomas K. Black, mused about an editorial he had read in a newspaper, which had claimed that European toy-makers tended to produce toys that "cater to the child with the whimsies, the fairyland notions of childhood," while American toymakers "quickly become practical, and in a way useful, as being educational and suggestive." Black embraced this assessment (while, of course, patriotically arguing that American toymakers also produced whimsical playthings, which the author had overlooked).[349] During World War I, Gilbert's ads in *PT* argued that while wartime meant sacrifices, "Gilbert toys are essentials. Gilbert Toys are essential instruments of Americanism. The vision, the creativeness, the initiative that Gilbert Toys develop and encourage in a boy are the very qualities of Americanism that made our soldiers the wonder of Europe, that made the world gasp in amazement at the raising and transportation of our army."[350] By claiming the ability to develop "vision, creativeness,

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[348] "Inspiration," *Playthings Magazine*, December 1916.
[349] Thomas K. Black, "The Romance of Toys," *Playthings Magazine*, June 1917, 86.
[350] The A.C. Gilbert Company, "Sacrifice! Sacrifice to the Bone for Ourselves, but Don't Sacrifice the Children's Christmas!" (Playthings Magazine, August 1918).

initiative" in boy customers, Gilbert positioned himself at the wellspring of American power; this advertising strategy painted his toy company as a public utility, rather than a profit-making enterprise.

Of course, companies manufacturing scientific toys had material, pragmatic reasons to promote the "essential" nature of their product. In the context of the early twentieth century market, educational toys like chemistry sets were seen as a way to offset the heavy dependence on fourth-quarter sales that was the bane of the holiday-dependent toy industry. Porter Chemical Company argued to *PT* readers that, unlike other toys, Chemcraft sets, which were "educational outfits," were "in demand at all times."[351] Educational and science toys were also marketed as recession-proof: in early 1920, Gilbert argued that the recent postwar economic downturn meant that people were going to want to buy toys different from "the hanky-panky toy, which comes today and is gone tomorrow." "Gilbert Toys," on the other hand, "don't just happen. They are built with the great motive of educating the tremendous army of boys throughout the world. They mean something. They are genuine."[352]

A brief outline of the histories of the major players in this market during these decades reveals that these companies tested many strategies of marketing that took advantage of the upsurge in media directed toward children during this time, while also responding to the popularity of various branches of science in the public eye. The A.C.

[351] "Chemcraft and Other Porter Products Sell at All Seasons," February 1921, Strong National Museum of Play.
[352] The A.C. Gilbert Company, "Enter the Discriminating Shopper," November 1920, Strong National Museum of Play.

Gilbert Company was perhaps the most innovative in this respect. During the first two decades of the twentieth century, the figure of the engineer occupied a prominent and heroic place in American popular culture.[353] Gilbert produced toys that responded to this interest—and devised a system of clubs to engage children with the toys. The Gilbert Institute of Engineering, founded in 1916, graduated boys as Engineer or Master Engineer, honors decided based on the "ingenuity and inventiveness" of their Erector Set models. Gilbert claimed that branches of this program were started "all over the country."[354] In 1920, the company launched a series of more specialized science outfits, including Gilbert Light Experiments, Gilbert Sound Experiments, Gilbert Mineralogy, and Gilbert Weather Bureau; these sets didn't sell enough, perhaps because of their hefty price tags, to justify their continuing production. (The Weather Bureau cost $37.50; the Civil Engineering kit was $25.[355])

Throughout the first half of the twentieth century, the A.C. Gilbert Company followed trends in children's culture in its promotional efforts, allying itself with popular cultural forms while purporting to offer educational content. In her history of the selling

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[353] John M Jordan, *Machine-Age Ideology: Social Engineering and American Liberalism, 1911-1939* (Chapel Hill: University of North Carolina Press, 1994); Edwin T Layton, *The Revolt of the Engineers; Social Responsibility and the American Engineering Profession* (Cleveland: Press of Case Western Reserve University, 1971); Cecelia Tichi, *Shifting Gears: Technology, Literature, Culture in Modernist America* (Chapel Hill: University of North Carolina Press, 1987).

[354] A Gilbert, *The Man Who Lives in Paradise : the Autobiography of A.C. Gilbert* (Forest Park Ill.: Heimburger House Pub. Co., 1990), 143.

[355] Bruce Watson, *The Man Who Changed How Boys and Toys Were Made* (New York N.Y.: Viking, 2002), 139. In 1918, Gilbert chemistry sets cost $1.50, $3.00, and $5.00; in 1940, you could buy a set for $1, $2, $3.50, $5, $10, or $15. The A.C. Gilbert Company, "Over the Top for 1918", *Playthings*, June 1918; The A.C. Gilbert Company, *It's Fun To Be A Boy Engineer...A Boy Chemist...A Boy Scientist...A Boy Magician*, 1940, 9.

of Construments sets in the UK during the interwar years, Melanie Keene argues that the manufacturer of these kits, which allowed children to make their own scientific instruments, sold the toys as a stopgap meant to fill in holes in the education system.[356] In the United States, on the other hand, A.C. Gilbert disdained to associate his products with formal schooling, telling his official biographer: "When schools became interested in our construction and educational toys, we discouraged them as much as we could…We were afraid that if kids saw our things in school, they'd think they were just as deadly dull as the rest of school and would have nothing to do with them."[357] For Gilbert, science and engineering were best done outside of school; chemists could be "self-made" in their knowledge, and didn't need to pursue success in home labs in order to please teachers.

In keeping with this philosophy, Gilbert's "curriculum" tied science into dominant trends in children's popular culture. Gilbert sponsored and hosted a radio show in the early 1930s: "Thrills of Tomorrow for Boys".[358] In 1941, the company opened a store near Madison Square Park in New York City, The Gilbert Hall of Science, which had a hybrid identity: store and museum. Gilbert was on hand at its official opening, which featured fifteen hundred boys as "guests"; Gilbert dedicated the Hall to the boys of America."[359] In the 1950s, the company sponsored a television show broadcast from the

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[356] Melanie Keene, "'Every Boy & Girl a Scientist': Instruments for Children in Interwar Britain," *Isis* 98, no. 2 (June 1, 2007): 266–289, doi:10.1086/518188.
[357] Gilbert, *The Man Who Lives in Paradise*, 136. Chemcraft, on the other hand, advertised in schoolbooks. "Chemcraft and Other Porter Products Sell at All Seasons."
[358] Al Block to Peter Weinberg, March 23, 1967, A. C. Gilbert Papers (MS 1618), Manuscripts and Archives, Yale University Library.
[359] Gilbert, *The Man Who Lives in Paradise*, 270–271.

New York Gilbert Hall of Science: "Boys' Railroad Club."[360] In the postwar era, sets included comic books illustrating uses of Gilbert sets.[361] Gilbert continued to produce sets into the 1960s, when the death of A.C., who had long been the driving force behind the company, followed by the untimely passing of his son and heir Al, spelled the end of the Gilbert product line.[362]

The Porter Chemical Company, headed by John and Harold Porter, sons of a scientist, was the first manufacturer to market a chemistry set commercially. Porter produced two sizes of chemistry set, starting in 1916, and priced them at 75 cents and a dollar.[363] In 1933, Chemcraft chemistry sets retailed for between $2.00 ("No. 2," with 31 chemicals and pieces of apparatus, housed in a box) and $15.00 ("No. 15," with 125 chemicals and pieces of apparatus, housed in a wooden cabinet that swung open to act as a laboratory).[364] Like Gilbert, the Porters sought to involve children in the company through creating networks meant to increase investment; Porter started its "Chemcraft Science Clubs" in 1918. In the 1910s, the company sold "CharacterCraft," "The

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[360] John Anderson, "A Tale of Tricks, Toys and Tracks," *Merchandising News*, March 1952. Gilbert bought the American Flyer train line in 1938.
[361] *Gilbert Toys Presents...Science Leads the Way!* (New Haven, CT: The A. C. Gilbert Company, 1959).
[362] "A.C. Gilbert Is Dead; Inventor of Erector Set," *New York Herald Tribune* (New York, NY, January 25, 1961); "A.C. Gilbert Jr., Toymaker, Dead," *The New York Times* (New York, N.Y., June 28, 1964).
[363] John Tyler, *The Chemcraft Story: The Legacy of Harold Porter* (Haworth, NJ: St. Johann Press, 2003), 2.
[364] *Chemcraft, The Chemical Outfit: No. 1 Experiment Book* (Hagerstown, MD: The Porter Chemical Co., 1933). These prices still held in 1947, with an added option: Set No. 25, for $25.00, which contained an atomic energy component. *The Chemcraft Science Club Hand Book and Catalog*, 1947.

Character Analysis Outfit," as well as other specialized sets directed at girls.[365] In the 1930s, the company sold "ScienceCraft" outfits, such as the "ultra-modern" Electro-Physics Outfit, which advertised experiments in "Static Electricity, Spectroscopy, Magnetism, Electro-Magnetism, Black Light, Principles of Television, Electrolysis and Electro-Plating."[366] The 1930s also saw the production of a range of microscopes under the ScienceCraft name, starting at $1.25 for the ScienceCraft Junior Microscope and running up to $10 for the Biology Outfit containing the "ScienceCraft professional type Research Microscope."[367] Mineralogy sets, which included samples of minerals and testing equipment for identification, cost between $1 and $20 in 1937.[368] In later years, Porter merged first with Lionel, better known for its trains, which had started producing chemistry sets in 1941[369]; then, in the sixties, Lionel-Porter teamed up with Sears, which sold Sears-branded versions of its Chemcraft sets.[370] Like Gilbert, Porter built on public fascination with science and with education in order to present its products as forward-thinking, naturally interesting to children, and vital for those boys and parents who wanted a fully modern childhood.

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[365] The Porter Chemical Company, "Chemcraft Announcement" (Playthings Magazine, January 1917).
[366] Harold M. Porter, ed., *Chemcraft Spectroscope Experiments: Observing the Colorful Spectrum of Light* (Hagerstown, MD: The Porter Chemical Company, 1937).
[367] *Home Experiments in Science and Magic*, 1937, 12.
[368] *The Chemcraft Science Magazine: Official Organ of the Chemcraft Science Club*, 1937, 29.
[369] "Merchandise, Markets, and Men," *Playthings Magazine*, July 1941.
[370] "Sears Microscope Lab" (Sears, Roebuck and Co, 1960), Chemical Heritage Foundation, Object Collections, 2005.034.001.

Visions of Chemistry: Marketing to the Child Experimenter

The child's chemistry set existed as part of a growing cultural awareness around chemistry in the interwar years—an awareness that was partially the result of historical circumstance, and partially the result of the chemistry profession's active self-promotion. The celebrity of scientists such as Marie and Pierre Curie and Louis Pasteur, the growing strength of the American chemical industry in the wake of the embargo of German factories during World War I, the publication of several popular non-fiction books glorifying scientists working in these fields (e.g., Edwin Slosson's *Creative Chemistry* [1919] and Paul de Kruif's *The Microbe Hunters* [1926]) and one work of fiction written by a Nobel Prize-winning author (Sinclair Lewis's *Arrowsmith* [1925]), all contributed to a climate of interest in chemistry and microscopy. David J. Rhees details how chemists undertook a targeted crusade in the years before and after World War I (which was nicknamed "the chemists' war") to promote this science in the public mind.[371] Chemistry was a science that combined the appeal of pure intellectual engagement and potential for social good with strong possibilities for industrial exploitation and profit ("To Make Money: Use Chemistry," an article in *The Literary Digest* in 1927 was headlined).[372] Most importantly for the toy industry's purposes, these sciences were also easily miniaturized. Chemistry sets and microscopes offered a maximal sense of "realism"—an

[371] David Rhees, "The Chemists' Crusade: The Rise of an Industrial Science in Modern America, 1907-1922" (Dissertation, University of Pennsylvania, 1987).
[372] "To Make Money: Use Chemistry," *The Literary Digest*, October 29, 1927.

effect that, everyone agreed, was what children of elementary school age wanted from their toys.

The growth of scientific interest in identifying developmental stages of childhood went hand-in-hand with the growth of industries intending to sell to children.[373] The toy industry, in particular, paid attention to these developmental stages, and *PT* often published guides for "toymen" wanting to know which toys to sell to which kids.[374] Science toys had their place in these guides. Writing in 1934, educationist Ethel Kawin advised parents that children ages ten and eleven had a "tendency to give increasing attention to objective reality." As opposed to the younger child, who would be "concerned with things as he knows them from his own experience," Kawin wrote that the older child "begins to grasp the idea that things are not merely what they seem, and he develops a genuine desire to know them and to understand them as they are." These older children "are no longer satisfied to push a button and see things move...they are interested in using and in understanding machines which transform energy; they are likely to show an interest in simple chemistry sets; they are fascinated by electric-train equipment and can now begin really to study and to understand the principles upon which such apparatus

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[373] See Cook, *The Commodification of Childhood*, 11. Developmentalism, Cook argues, "has served as the quintessential mode for the adjudication of what may be legitimized as beneficial to children"; starting in the 1920s and 1930s, the popularity of this mode of understanding childhood, which "posits predictable movement through specifiable and sequential stages of the early life course," meant that mothers were relegated to a middle position between children and the market, "softening the blow of commerce on the social and moral value of their children" by identifying the correct objects for children to consume.
[374] "Every Toy Salesman Should Know," *Playthings Magazine*, November 1919; Lester G. Herbert, "Know and Sell—The Right Toy for Each Child," *Playthings Magazine*, June 1922.

operates."[375] Supported by such pronouncements from specialists in child development, chemistry set manufacturers represented their toys as completely natural—and necessary—companions for growing modern children.

This juxtaposition between the child-world and the adult, "real" world, which children could safely enter via miniaturized toy versions of adult activities, served as a selling point for companies in the toy industry. Just as the publishers of children's books during this time were convinced that non-fiction "information" books would excite children's interest more than fairy tales, the toy industry based advertisements of science sets upon the presumption that children prized verisimilitude above all qualities. *PT* wrote in 1919: "It is a very familiar fact that if a grammar-school boy once gets into the real creative world of industry he can hardly be dragooned back to textbooks and school routine. The big thing in education is to so link up the school with the visible, bustling world as to keep the child's workman-like instincts engaged."[376] In a 1946 article, a journalist wrote of Gilbert's philosophy: "Kids demand the utmost in realism. At the Gilbert Hall of Science in New York…the men in charge never talk to young visitors about 'toys'; they talk of such things as 'structural steel engineering' and 'chemistry laboratories.'"[377] Although at least one company, Midgetlab, of St. Louis, emphasized the smallness of the lab in its slogans, it was far more common for companies selling science

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[375] Ethel Kawin, *The Wise Choice of Toys* (Chicago, Ill: The University of Chicago Press, 1938), 49–50.
[376] "Teaching Children," *Playthings Magazine*, January 1919, 198.
[377] Hannibal Coons, "Toy Tycoon," *Advertising & Selling*, November 1946.

toys to stress realness in their pitches.[378] In 1941, Lionel, introducing their first chemistry set, emphasized the verisimilitude of the set's equipment in an advertisement in *PT*: "It's not a flimsy, good-for-a-few-days plaything, but a whole research laboratory in compact miniature." The image in the ad was of the equipment of the set spread out on a table, with each piece flagged with information about its authenticity ("genuine Wedgewood mortar and pestle"; "rigid, substantial test tube rack"). [379] This approach complimented the taste and knowledge of the boy customer and his parents.

The companies also advertised the involvement of actual scientists in the development of their sets, while visually referencing the world of adult science. In 1920, Gilbert advertised: "The outfits we now show are the results of more than a year's work by Mr. William J. Horn, Ph.D of Yale University, who has concentrated all his efforts since joining our staff, to producing outfits of an intensely practical nature, with which some astonishing experiments can be performed."[380] The invocation of these scientific credentials conveyed a sense that the set itself contained an authentic connection to the world of "adult" science.

As sites for informal science instruction, the manuals included in chemistry and science sets are important indicators of the way that companies tried to "sell" boys on science activity—a sale that often included a reference to the "realness" of the fun on

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[378] "Midgetlab Chemical Outfit No. 10" (Midgetlab Company, St. Louis, MO, 1933), Chemical Heritage Foundation, Object Collections, GB98:09.004.
[379] The Lionel Corporation, "Sweeping the Country" (Playthings Magazine, September 1941).
[380] The A.C. Gilbert Company, "The 'High' Cut Out of Prices," December 1920, Strong National Museum of Play.

offer. These manuals were like miniature textbooks: Gilbert's 1920 "Gilbert Chemistry for Boys" book was 217 pages. They were often produced, or at least edited, by scientists, who lent their credibility to the packaging. A 1936 Gilbert manual's title page featured not only the assertion that the manual had been produced "under the direction of the Bethwood Research Laboratory, Bethany, CT," but also the names of two Yale PhDs, Treat Johnson and Elbert Shelton, as co-editors, along with Gilbert, whose M.D. from Yale was prominently featured.[381] A Gilbert ad that ran in the Boy Scouts' magazine *Boys' Life* in 1930 framed the manual as a direct communication between adult chemists and boys: "an *interesting* book explaining the chemist's secrets, with which boys can do the new things expert chemists have discovered."[382] In 1918, Gilbert advertised chemistry outfits on the pages of *Playthings* as including a manual "giving complete instructions in boy language";[383] despite this boast, the manuals, which packed in the history of the science, technical instruction in the running of a laboratory, and reporting on the current state of the chemical industry, seem like heavy fare.

In the prose of the manuals, a picture emerges of the selling techniques that these companies used to convince children to be interested in chemistry and microscopy—and through these techniques, the opinions these companies held of the nature of American boyhood, real or imagined. One selling method was to describe all of the worldly advancement boys could gain through a career in science. A Gilbert manual from 1936

[381] Treat Johnson, Elbert M. Shelton, and A. C Gilbert, eds., "Gilbert Chemistry for Boys" (The A. C. Gilbert Company, 1936), Chemical Heritage Foundation, Object Collections, 2006.077C.
[382] A.C. Gilbert Company, "Revealing the New Mystifying Secrets of Chemistry" (Boys' Life, December 1930).
[383] The A.C. Gilbert Company, "Over the Top for 1918," n.d., Strong National Museum of Play.

cited chemistry as "the [science] which offers the greatest opportunities of advancement, research and fame for those today who are interested in the fuller things of life."[384] Another tactic was to point to the in-the-moment enjoyment that boys might feel through their new hobby—enjoyment that might rival other, less interactive "modern" entertainments, such as going to the movies. Companies realized that their customers, as children in the age of moving pictures and pulp magazines, had other leisure opportunities, and sought to compete accordingly. In 1923, a Chemcraft manual cited an unattributed quote from a child who said, "I would rather do experiments with my CHEMCRAFT set than go to the show."[385]

Referencing the feeling of being at a "show," the companies emphasized the dynamic of concealment and dramatic revelation that young users would enjoy while in the process of experimentation. Gilbert advertised its new polarizing microscopes in 1940 by touting the instruments' new technology: "The colors have always been there, but with ordinary microscopes they remain hidden. Only with a Polarizing Microscope can your eyes pierce the veil of secrecy under which are concealed some of the world's most spectacular colors."[386] The manual for Microset, produced by the Carolyn Manufacturing Company of New York City, portrayed the feeling of using a microscope as comparable to godliness: "You from the 'high places' like the Gods of old, can look down and watch all around you, invisible life beginning, growing, and dying."

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384 Johnson, Shelton, and Gilbert, "Gilbert Chemistry for Boys," 24.
385 The Porter Chemical Company, *How to Be a Boy Chemist*, 1923, 10.
386 *It's Fun To Be A Boy Engineer...A Boy Chemist...A Boy Scientist...A Boy Magician*, 14.

Companies tried to sell children on the emotions surrounding discovery, in particular emphasizing the "thrills" of scientific activity. The Microset manual wanted the reader to continue to ask questions, promising "you will enjoy the same thrill in finding the answers, that all scientists experience—the thrill of discovery and accomplishment that keeps them studying and exploring throughout their lives."[387] A 1940 Gilbert catalog had an introductory note from A.C., who wrote:

> To our forefathers, adventure meant blazing a trail through the wilderness, fighting off Indians and wild animals, and conquering the forces of nature…Today the world's most thrilling adventures lie in the field of science—engineering, chemistry, electricity, microscopy, and other forms of scientific activity…There is as much romance in discovering the secrets of strange chemicals as the secrets of strange lands…there is as much glory in conquering the wild forces of electricity as in conquering wild tribes.[388]

These comparisons, which so strongly echoed the imperialist tropes of adventure stories popular during A.C. Gilbert's own Progressive-Era youth, moved action indoors, privileging feats of the brain over feats of brawn. The argument also stressed the easy availability of these thrills and romances: by turning away from their forefathers' patterns, boys could prove that they were still conquerors, even if modern life was not conducive to the blazing of physical trails. Moreover, Gilbert's emphasis on the "glory" available through "conquering" the "secrets" of science more firmly marked the "thrills" on offer as particularly interesting to male readers. The Gilbert motto was "Hello Boys!"; if girls hadn't gotten the message from this advertising tactic, here in the manual was another sign that they were not Gilbert's audience. Although Chemcraft tended toward a

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[387] "Microset Instructions for Model No. 2MX" (Carolyn Manufacturing Co., Inc., New York, NY, n.d.), 1, 9 , Chemical Heritage Foundation, Object Collections, 2006.069.001.
[388] *It's Fun To Be A Boy Engineer...A Boy Chemist...A Boy Scientist...A Boy Magician*, 2.

drier style in its manuals and advertising copy than Gilbert, the company did do some work to tie its products to kids' popular culture in order to increase sales. A 1937 Chemcraft catalog, printed during the Depression-era vogue for stories about crime and federal law enforcement[389], offered "The G-Man's Science Outfit" for $1.50, with a manual that "tells a story about G-Men in action and how they caught two notorious bank robbers and kidnappers…Complete instructions are given for performing 40 experiments, including those by which the G-Men were able to solve the case."[390]

A third approach to boy consumers was an appeal to the pride, marking a differentiation between those "other" children who might not like the experience of science and the reader being addressed. As in the *Book of Knowledge*'s mention of the backwards-looking Chinese, and *Earth for Sam*'s description of the sad species that had failed to innovate, these chemistry sets lectured children on the ills of incuriosity by referring to inferior "others" who failed to follow through on questions—or to have questions in the first place. The Microset manual sternly warned of the perils of dilettantism: "Some boys and girls lose interest after their first thrill. Their curiosity has been satisfied. What a pity. If only they could realize what knowledge and fascinating experiences they are missing."[391] By the postwar period, when assessments of scientific aptitude and divisions of children into "science-minded" and "non-science-minded" were

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[389] See Elliott J. Gorn, "Re-membering John Dillinger," in *The cultural turn in U.S. history : past, present, and future*, ed. James W Cook, Lawrence B Glickman, and Michael O'Malley (Chicago: University of Chicago Press, 2008), 153–184; Jonathan Munby, *Public Enemies, Public Heroes* (Chicago, IL: University of Chicago Press, 2010).
[390] *Home Experiments in Science and Magic*.
[391] "Microset Instructions for Model No. 2MX," 1, 9 .

commonplace, manuals hit harder on this point.[392] A 1960 Gilbert Physics manual offered a them-and-us vision of scientific method. On the importance of testing assumptions through observation, the author chastised: "If you are just going to believe everything you're told there is no point to experimentation. We might just as well go on believing fairy tales and practicing superstition." Columbus, the manual went on, was told he would fall off the edge of the world; "they told Robert Fulton his steamboat would never go and said Edward Jenner's vaccine would turn people to cows." The child reading the manual should strive not to be like the "uneducated and unimaginative people" who call science magic "because they can not explain it." They should be like the scientist, "who asks 'Why?' and finds he has another problem to solve and more experiments to try."[393]

A final appeal was the appeal to patriotism. "Chemistry is more closely interwoven with the industries of the world than any other science, and the country which leads in chemical industries will ultimately be the richest and most powerful," one undated Chemcraft manual explained. "It will have the fewer [sic] waste materials, it will have the best manufactured articles, its food will be the most nourishing and the cheapest, and it will possess the secrets of the most powerful explosives, the hardest steels and the mightiest engines."[394] This appeal to patriotism would become far more common in World War II and the postwar era, when, for example, participants in the first Westinghouse Science Talent Search wrote essays on the importance of science in

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392 See Chapter Four of this dissertation for more on this postwar trend.
393 "Gilbert Physics Instruction Book" (The A. C. Gilbert Company, New Haven, CT, 1960), 2, Chemical Heritage Foundation, Object Collections, 2003.040.
394 "Chemcraft Experiment Book No. 2" (The Porter Chemical Company, Hagerstown, MD, n.d.), 2, Chemical Heritage Foundation, Object Collections, GB98:09.003.

defending the United States from attack, or "Rocket Boy" Homer Hickam reported feeling like he and other high school students were "being launched in reply" to Sputnik.[395] Viewing the rhetoric about the scientific vocation and patriotism that was present in these chemistry sets, we can see the foreshadowing of these postwar appeals to young people's sense of duty.

All of these appeals assumed that consumers of the chemistry set wanted to feel important, connected to the adult world, and in touch with the physical objects around them. These approaches to "selling" the boy consumer reflected new adult beliefs about the developmental characteristics of children, contemporary realities of privileged middle-class childhood, and progressive, object-oriented understandings about the nature of education.

Chemistry in the Home: The Hobby as Social Endeavor

Where did the science practiced with the use of these chemistry sets and microscopes take place, and how did the families and friends of these young scientists react to their new interests? Boys interested in chemistry used their "toys" in a variety of ways, acquiring authority and new freedoms inside the family, strengthening identities as members of a peer group, and trying on entrepreneurial attitudes. At the same time, in their pricing, their assumptions about the circumstances of children's lives, and the lessons they taught about the entrepreneurial value of curiosity, these sets participated in

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[395] *Youth Looks at Science and War* (Washington, D.C. and New York: Science Service and Penguin, 1942); Homer H. Hickam, *Rocket Boys: A Memoir* (New York: Delacorte Press, 1998), 140.

an ongoing definition of science play as an expected activity of a protected, middle-class child. Like the child patrons of the Brooklyn Children's Museum, whose parents bought them microscopes and took them to the country to find insects to examine, child chemists were privileged to have the space, money, and time to ask questions that could be answered in the laboratory.

Changes in the spatial arrangements of the middle-class American family home made dedicated spaces for science possible. "Children's rooms" became a common feature of American family homes only in the period 1890-1930.[396] By the 1920s and 1930s, it was the fashion to decorate boys' rooms with military motifs, and to outfit these spaces with accoutrements intended to develop future careers. Girls' rooms were not themed in the same way.[397] Less historical work has been done on the extra-bedroom spaces that boys were given to practice their hobbies.[398] The home-space known as the laboratory, and the scientific "research" that a boy carried out in this space, became a part of the house that was both physical and symbolic. The lab, and the absorption in science that it signified, was where a young man could establish his difference from the rest of his family: older and more responsible than younger siblings, while at the same time more forward-thinking and informed than his parents.

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[396] Jessica H Foy and Thomas J Schlereth, eds., *American Home Life, 1880-1930: A Social History of Spaces and Services* (Knoxville, TN: University of Tennessee, 1992), 75.
[397] Ibid., 88.
[398] Kristen Haring's study of ham radio culture does attend to the way that families allocated spaces within the home for radio hobbyists both young and old, though she focuses on the mid-century period; I have been unable to find work on the history of the in-home chemistry lab in the United States. Haring, *Ham Radio's Technical Culture*.

Toy companies gave advice in the form of recommended procedures for marking the boundaries of this space. A 1937 Lionel-Porter glass blowing manual advised that chemists pick a well-lighted place, close to running water and a sink, and added "Gas and electrical connections will add to the usefulness and convenience of your 'lab.'" This manual also advised readers on proper procedures for making eight different kinds of lab benches, the shelves that might go above them, a water reservoir, and lamp-shades to cast the right kind of light for "night experimenting."[399]

Some evidence regarding the actual locations of home labs can be found in the letters that Chemcraft got from "Chief Scientists" leading Chemcraft Clubs across the country. Chemcraft Scientists wrote in that they had "a clubhouse laboratory" (James Rodgers, Grove City, PA); had been given "a fifteen square foot space in our basement" (Louis Schlitz, St. Paul, MN)[400]; had "partly partitioned off the basement with [a] bulletin board, case for apparatus, a regular desk and a table large enough to accommodate three or four members" (Alois Dettlaff, Cudahy, WI); were "making plans for a larger and better equipped lab on the roof of our house" (William Hudson, New York, NY)[401]; and had "received permission from our country [*sic*] commissioners to use the voting house in our district as our club headquarters" (Joe R. Mahr, Jr., McKees Rocks, PA).[402]

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[399] "Lionel-Porter Glass Blowing Manual" (The Lionel Corporation, Hagerstown, MD, 1937), 15, 28, Chemical Heritage Foundation, Object Collections, 2005.079.
[400] *Home Experiments in Science and Magic*, 16.
[401] "Club News," *The Chemcraft Science Magazine*, July 1939, 4–5.
[402] "Club News," *The Chemcraft Science Magazine*, December 1939, 20.

How much did parents know, or worry, about the experiments going on in these basements and clubhouses? After all, not all of the work that happened in these spaces was motivated by the "right" kind of curiosity. Manuals and official publicity rarely referred to the more destructive results of some experiments, but boys who grew up during this time have fond memories of a certain degree of mischief. As engineer James Waters (b. 1925) told an interviewer, although his father bought him a chemistry set, "I did a few experiments, but I was more interested in making something that went 'poof'!"[403] Warren Schlinger (b. 1923), a longtime chemist for Texaco, described his own childhood chemistry work with his group of high school friends: "We'd exchange ideas and perform various chemical experiments, making incendiary devices and so forth, as kids do!"[404]

Companies took a few missteps in this respect—for example, in 1950, Gilbert admitted to an interviewer that the earlier Gilbert sets had contained what the article called "a certain chemical" that, in Gilbert's words, "when placed in a test tube with certain other compounds, it would give off a tiny, almost imperceptible flash." Gilbert went on, "The only way a boy could possibly be hurt by it was to hold the tube against his eye…which is just what two or three of them did do." Despite Dr. Johnson's entreaties that the chemical was necessary for learning, the company stopped including it in sets. The article went on, "Gilbert chemistry sets now contain as many as 148 items,

[403] James L. Waters interview by Arnold Thackray and Arthur Daemmrich, August 21, 2002, 7, Oral History Transcript # 0262, Philadelphia: Chemical Heritage Foundation.
[404] Warren G. Schlinger interview by Arnold Thackray, July 24, 2002, 5, Oral History Transcript # 0259, Philadelphia: Chemical Heritage Foundation.

none of which, singly or in compound, can create the slightest hazard for the most active-minded boy."[405]

In order to dissuade boys from dangerous activities, manuals tried to link "carefulness" with science as it was done professionally, furthering the perceived connection between the home experience and a career in science, and seizing the opportunity to teach the values of restraint, precision, and forethought. A 1940s-era Chemcraft manual advertised prominently that the set contained "No Dangerous Poisons or Explosive Chemicals."[406] In its "introduction," the manual said: "Chemistry is sometimes looked upon as a dangerous profession, but this is not the case. Contrary to an old popular idea, a chemical reaction does not necessarily result in an explosion." Having put such fears aside in the category of aged superstition, the manual went on, "Chemicals, as a class, are not intended for use as a food and should not be eaten, but very few of them are violent poisons. CHEMCRAFT in particular, does not contain any dangerous poisons."[407] An undated Chemcraft manual reasoned with its readers: "If you should eat a cake of laundry soap it would make you very sick, and the same is true of some of the chemicals in this outfit, even though none of them is dangerous to life in small quantities." The manual then juxtaposed the foolish child who would eat that laundry soap with the careful scientist: "Chemistry is a science of systematic procedure and control. Everything is done for a definite reason. Do not combine any other reagents, substances or materials with the chemicals contained in this Chemcraft Outfit. Do not

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[405] Dillon Roberts, "He Supplies Santa Claus," *Saga Magazine*, December 1950, 83.
[406] "Chemcraft Experiment Book No. 2," 1.
[407] Ibid.

find fault with Chemcraft because of incorrect results that will follow chemical combinations other than those specifically stated in this Book." Finally, the manual made clear its own common-sense differentiation between the rational reader and the younger sibling or friend who might wish to play with this set: "Chemcraft is not recommended for children who are unable to read and understand this statement."[408] Here, potential danger was turned into a chance for the child to distinguish himself as capable of handling responsibility.

By the 1950s, in a striking departure from the earlier depiction of the child as independent experimenter, toy companies began to recommend parental supervision. Parental advice manuals in the postwar years, influenced by the growing consensus around permissive parenting, had begun to recommend that parents partake in their children's pastimes as a way of providing instruction and support[409]; the new sections of chemistry set manuals that were addressed to parents assumed that the older generation would want to know what was going on in the chemistry lab. By 1952, a Gilbert chemistry manual included a special introductory section: "To the Parents." "The manufacturer of this set designed it for boys and girls from seventh and eighth grade to high school age who are qualified to read and understand the descriptive matter and the

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[408] Ibid., 2.

[409] See chapters 4 and 5 and the conclusion of this dissertation for expansion on the topic of permissiveness and science play. Henry Jenkins, "Dennis the Menace: 'All-American Handful'," in *The Revolution Wasn't Televised: Sixties Television and Social Conflict*, ed. Lynn Spigel and Michael Curtin (New York: Routledge, 1997), 119–138; Lynn Spigel, *Welcome to the Dreamhouse: Popular Media and Postwar Suburbs* (Durham, NC: Duke University Press, 2001); Martha Wolfenstein, "The Emergence of Fun Morality," *Journal of Social Issues* 7, no. 4 (1951): 15–25, doi:10.1111/j.1540-4560.1951.tb02249.x.

specific directions for performing the many experiments," the manual cautioned. "Parents are urged to supervise and direct the experimentation of their children. Many experiments may result in failure unless a good technique is developed and it is, therefore, urgent that parents supervise the first experiments undertaken."[410] In 1942, a Lionel manual included an "Important Notice to Parents," which reiterated the idea that the set should only be used by "boys and girls old enough to read and understand this book and to observe common household rules of caution; "it is only prudent to state," the manual added, "that under any other circumstances, all experiments should be conducted under a parent's supervision."[411] A "Handy Andy" chemistry set produced by Skil-Craft around 1955 featured a prominent graphic element: a "seal of approval" from Parents' Magazine.[412] This set's manual also recommended that users ask parents before using even basic household articles like milk and baking powder.[413]

These postwar worries are all the more striking because collaboration between parents and children in experimentation was not an expected factor in kids' home science endeavors during the 20s, 30s, and 40s; far more common were cross-peer initiatives, exemplified by the broad network of Chemcraft Science Clubs. In 1940, for example, Richard R. Bailey, of Ocala, FL, wrote in to the Chemcraft Science Club national

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[410] "Gilbert Chemistry Outfit" (The A. C. Gilbert Company, New Haven, CT, 1952), 4, Chemical Heritage Foundation, Object Collections.
[411] Lee Yorgey Davidheiser, ed., "Lionel Chem-Lab: A Manual of Experiments" (The Lionel Corporation, New York, NY, 1942), 9, Chemical Heritage Foundation, Object Collections, 2006.069.022.
[412] "Handy Andy Junior Chemistry Lab," n.d., Chemical Heritage Foundation, Object Collections.
[413] "Handy Andy Basic Chemistry Set" (Skil-Craft Corporation, Chicago, IL, 1955), 12, Chemical Heritage Foundation, Object Collections, 2005.047.

magazine to report on the doings of his club, which had taken the name "The Pasteur Science Club." The Pasteurians were "experimenting on spiders and Florida moss," and had big plans for the future: "We are planning very soon to dissect a rat while under the influence of ether. During this dissection we intend taking out one kidney and fix the incision to the best of our knowledge. If he lives we will take a record of his actions."[414] The front of an undated Chemcraft set depicts the activities of a group such as Bailey's, with ill-begotten attempts at vivisection redacted. Here, a group of boys in coats and ties works with Porter-labeled chemicals in what seems to be an impromptu clubhouse. The presence of a benevolent moon outside the window indicates that the boys are here on their leisure time, and this, coupled with the chiaroscuro shading of the boys' faces, reads as magical and mysterious, echoing some of the instruction manuals' focus on the alchemical past of this science. Two boys do the experimenting, while two others read booklets (perhaps instruction manuals?) A diploma on the wall may indicate membership in the Chemcraft Science Club, or may simply be meant to point to the boys' interest in external markers of achievement. This was an idealized vision of science, as well as of youth; here, camaraderie and individual effort mingled to create a portrait of dedicated pure inquiry.[415]

Science clubs were a way for the toy companies to encourage the peer activity that the set boxes depicted; these organizations also offered companies a way to keep track of their patrons and encourage their investment in a corporate brand. The Porter

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[414] "Club News," *The Chemcraft Science Magazine*, June 1940, 4.
[415] "Chemcraft, the Chemical Outfit," n.d., Chemical Heritage Foundation, Object Collections, 2005.001.

Chemical Company started the Chemcraft Science Club in 1918. Clubs were sent the *Chemcraft Science Magazine*, which featured club news, articles about famous scientists, Q&As about chemistry, and order blanks for all of the Porter supplies. Like child members of other national "clubs" sponsored by corporations, such as fans of Little Orphan Annie or Tom Mix, Chemcraft Science Club members could identify each other through indicators of membership. In 1937, members of the Clubs were sent badges, "to be worn in plain view at all times," "to show that you are interested in the progress of the world through the development of science." Senior members got a password, "written in invisible ink on your membership card."[416]

The Porter Chemical Company advertised the Science Clubs heavily, and used the information they received from members in product planning and advertisements. In 1917, the Porter Chemical Company placed an ad in *Playthings* touting the sales record of the past year—"95 per cent of the stores SOLD ENTIRELY OUT"—and promising that "stock carried over will be moved early this year by the 20,000 members of the Chemcraft Chemist Club; boys and girls who are pushing CHEMCRAFT all the time."[417] Chief Chemist Harry K. Phillips, of the Pine Tree Chemcraft Chemist Club, appeared in an advertisement in *Playthings* in 1922, admonishing the buyers reading the publication: "If you want to sell something nine out of ten boys and girls are interested in, sell CHEMCRAFT. It's the only GOOD chemical set there is; gives the biggest value for the

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[416] "The Chemcraft Science Club," *The Chemcraft Science Magazine*, December 1937.
[417] The Porter Chemical Company, "Chemcraft Announcement." As far as I can tell, the use of the construction "boys and girls" in Chemcraft's advertising to toy buyers was intended to indicate the broadness of Chemcraft's fan base; the clubs writing into the Chemcraft magazine seemed never to include girls as members.

money, and it's real chemistry!"[418] Phillips appeared in his laboratory, striking a casual pose, and looking self-assured and happy. A 1922 Chemcraft advertisement with a photo collage of "chemical laboratories owned by boys and girls" boasted "Over 10,000 boys and girls are in the Chemcraft Chemist Club—everyone a walking, talking advertisement for CHEMCRAFT and the store that sells these sets."[419]

Porter was not alone in using clubs as ways to build a base of buyers for its products. In 1940, a Gilbert catalog suggested that a Boys' Engineering and Science Club needed as many different types of Gilbert toys as possible, framing the club as a way for the younger generation to pool its access to parental largesse. "Here's how to go about it," the catalog counseled. "You and the other boys look over all the toys described in this book. Then one boy asks his Dad for an Erector set for Christmas…another boy puts a Gilbert Chemistry set on his Christmas list and so on until you have a complete assortment of everything you want….Why not talk this over with the fellows today and make your plans right now?"[420] Chemcraft also promoted the idea of joint club ownership of equipment, printing a letter from a Chemcraft Club (the "American Druggist Science Club," of Jersey City, N.J., Hastings Hutchins, Chief Scientist) that jointly owned a No. 2 set, "but have added chemicals and supplies until now our set would probably contain the

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[418] The Porter Chemical Company, "Harry K. Phillips Has A Message for Every Toy Buyer," March 1922, Strong National Museum of Play.
[419] The Porter Chemical Company, "The Fastest and Easiest Selling Chemical Set on the Market!," February 1922, Strong National Museum of Play.
[420] *It's Fun To Be A Boy Engineer...A Boy Chemist...A Boy Scientist...A Boy Magician*, 3.

same things that are in a No. 25 set."[421] Indeed, reports on the quantity and quality of equipment were a frequent subject of these letters to Chemcraft.

Companies selling chemistry sets often played upon children's emotions of envy and the hierarchies of their peer groups in pitching their products. Lisa Jacobson writes that advertisers who wanted to pitch products to boys during this time often spoke of trying to win over the "gang leader," considered to be the most charismatic of the boys in a particular neighborhood; Susan J. Matt adds that a legitimization of children's feelings of envy, and companies' appropriation of these feelings as a selling point in advertising, were key aspects of the growth of consumer culture for children during this time.[422] Peer approbation, and a place as "gang leader," was a big part of the "thrills" that Gilbert science sets promised their young buyers. Referring to the company's desire to "invest every branch of engineering, science, etc" with "thrilling interest for boys," a journalist wrote that "Mr. Gilbert has found that this can usually be done best by teaching the young experimenters and experts how to mystify their friends by performing various magic feats."[423] In an advertisement for his early 1920s science sets, Gilbert wrote, "The boy who knows about different types of engineering—electrical, chemical, structural, etc.—the kinds that are covered by Gilbert Toys, is the type of boy who will be a leader among his fellow boy friends. He is the boy whom the rest of the boys look up to, and they only do it because they appreciate that he has a knowledge of different things which

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[421] "Club News," 4.
[422] Jacobson, *Raising Consumers*, 119; Susan J. Matt, "Children's Envy and the Emergence of the Modern Consumer Ethic, 1890-1930," *Journal of Social History* 36, no. 2 (Winter 2002): 283–302.
[423] "Fine Tribute to A.C. Gilbert by American Magazine," *Toys and Novelties*, December 1923.

they don't understand."[424] Sometimes ownership of a set would be enough to incite this type of envy—no need to possess difficult scientific knowledge. Advertising Gilbert's telephone and electrical sets in 1940, catalog copy touted the sets as "among the finest achievements of the Gilbert Hall of Science—sets that you will be proud to own and that will make you the envy of every boy in your crowd."[425]

Companies pitched chemistry clubs as a way to learn group dynamics and managerial strategies, as well as science. An early Chemcraft Chemist Club bulletin made the argument that "a well-organized chemistry club, with an interesting program of activities, will be of great value to the members not only in increasing and broadening their knowledge of chemistry, but also in teaching the fundamentals of group activity and parliamentary law."[426] Chemcraft suggested that the bylaws of clubs provide for a point system, which would allow members to gain points for such activities as "making a trip to some industrial plant or laboratory and reporting to the club" (10 points), "knowing the names of ten great chemists" (10 points), or "making a great chemical discovery (as recognized by the club)" (25 to 50 points).[427] William Rogan, Chief Scientist of the Beaver Science Club of Bangor, ME, wrote to the Chemcraft Science Magazine in 1939 that his club had instituted a rank system. Members started as "pledges", moved to "second class", "first class", and then "veteran experimenter." Rogan added: "When a

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[424] Watson, *The Man Who Changed How Boys and Toys Were Made*, 129.
[425] *It's Fun To Be A Boy Engineer...A Boy Chemist...A Boy Scientist...A Boy Magician*, 14.
[426] "Chemcraft Chemist and Handbook of Chemistry" (The Porter Chemical Company, Hagerstown, MD), 1, Chemical Heritage Foundation, Object Collections, GB98:09.054, Chemistry Set Paper Ephemera.
[427] Ibid., 4.

person has achieved or reached the highest possible rank, he or she is given a party or banquet in his or her honor with 'after dinner' speakers on subjects of science"—a banquet reminiscent of similar functions held by adult social clubs such as the Rotarians or the Elks Club during this period.[428] The magazine sent to members of the Chemcraft Science Clubs offered managerial advice to the Chief Scientist. "Why not use January for the re-organization of your club and material?" a typical editorial asked. "Appoint a committee to work with you in laying out a program of study and activity for the month."[429]

Some clubs even made money with their chemical activities. The Yonkers Science Club, headed by chief scientist Donald Rhyns, made ink and sold it, "at five cents a bottle. The money collected is being used to purchase new equipment."[430] A common money-making endeavor was testing water; James Rodgers wrote to the *Chemcraft Science Magazine* in 1937 that his club was making enough money from testing water in its members' neighborhood to buy "a complete volume on chemistry and chemical training."[431] The fact that these Chemcraft clubs channeled the money from

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[428] "Club News," 5.
[429] "The Chemcraft Science Magazine: Official Organ of the Chemcraft Science Club, Vol. 48, No. 1."
[430] Ibid., 2.
[431] "The Chemcraft Science Club," 5. Not all young scientists earned their equipment through honest enterprise. The parents of Philip Eaton (b. 1936), later a professor of chemistry at the University of Chicago, realized this when young Philip, infatuated with his basement lab, started "borrowing" money from his father on the sly to order equipment that he wanted. This resulted in a year-long lab shutdown and what Eaton later termed "a valuable lesson in honesty—even if I was pursuing thievery in a higher interest." Philip E. Eaton interview by James G. Traynham, January 22, 1997, 2, Oral History Transcript # 0152, Philadelphia: Chemical Heritage Foundation.

these endeavors back into science meant that their entrepreneurial spirit could be seen as constructive, forward-thinking, and rational, rather than acquisitive or greedy. Gilbert also provided an annual monetary prize for chemistry achievement; in a 1935 *Boys' Life* ad, Stanley Stewart, of Waycross, GA, was depicted in the midst of demonstrating his "Green Fairy Fire" experiment, with three friends looking on. The ad informed the boy reader that Stanley had received a $100 prize from Gilbert, adding that other "Gilbert boy chemists" had won prizes of money from other unnamed sources: "One boy received $150 for perfecting a candle that burns with a blue flame. Another developed his own formula for making soap, sells it and earns big money."[432] While later models of financial compensation for children's scientific work, such as the scholarships given by the Westinghouse Science Talent Search, were tied to the child's continuation of scientific learning, these prizes were external to the formal education system; instead, they were indications of the young chemist's future earning power, and immediate sources of excitement.

Chemical Magic: Stagecraft, Empowerment, and Mastery

One more money-making endeavor that the young chemist could undertake, with or without his club, was the "chemical magic" show. The scientific magic show would have been familiar to the young consumers buying chemistry sets; entertainments including the electric "wonder show," the vaudevilleian mesmerist, and the magician

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[432] A.C. Gilbert Company, "Gilbert Boy Chemists Lead in Thrilling Scientific Discoveries" (Boys' Life, December 1935).

mingled science and the supernatural in late nineteenth- and early twentieth-century popular culture.[433] More than any of the other activities suggested by chemistry set manufacturers, "chemical magic" shows how strongly the makers of chemistry sets meant to ally their users with a modern set of beliefs and commitments. Along with other historians working on the changing status of the supernatural in modernity, Maureen Perkins argues that the decline of belief in magic in Western cultures was intertwined with a new investment in rational individualism.[434] The chemistry sets' prescriptions for "chemical magic" shows cast the boy experimenter as the knowing individual at the center of a web of illusions meant to entertain and mystify his friends.

These chemical magic shows, suggested and scripted by the manuals produced by toy companies, served as training grounds for boys who wanted to learn how to command a crowd. A.C. Gilbert credited his boyhood magic hobby with teaching him habits of perfectionism and persistence; he often pointed to a boyhood incident, in which he had attended a magic show and been allowed on stage to perform some of his own illusions, as the genesis of his own seemingly boundless self-confidence.[435] Toy companies took the cultural phenomenon of the magic show and recast it with young people as showmen rather than spectators, offering the boy customer a chance to be the fooler, instead of the fooled. In their performances, the boy chemists would show their friends and family how

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[433] Fred Nadis, *Wonder Shows: Performing Science, Magic, and Religion in America* (New Brunswick, N.J: Rutgers University Press, 2005).
[434] Maureen Perkins, *The Reform of Time: Magic and Modernity* (London ; Sterling, Va: Pluto Press, 2001).
[435] Gorton Adams, "Magic and More Magic," *4-H Horizons*, April 1939.

great the differential between their knowledge and the knowledge of those who remained outside the laboratory had grown.

Most toy company brochures promoting "Chemical Magic" took a historical view of the practice, describing the origins of chemistry in alchemy and emphasizing the idea that the modern boy in the know could use the superstitions of the past for profit. In a Chemcraft *Chemical Magic* manual of 1937, the capsule history of alchemy at the beginning of the book noted: "In those days people were very superstitious, and so the alchemists who had learned to bring about such wonderful [chemical] changes in materials came to be regarded as wizards or magicians." But, the manual continued, the modern reader should give the people of the past the benefit of the doubt: "Numerous achievements of present-day scientists seem like miracles of magic until we understand the scientific principles on which they depend."[436]

However understandable the enjoyment of mystification might be, boys performing as "chemical magicians" should know that these tricks didn't constitute actual science. Chemcraft's magic sets drew a clear line between the tricks contained within and "true" chemistry: "The things which can be done with the contents of this outfit are not strictly chemical experiments, as are those done with CHEMCRAFT sets, but are especially developed 'stunts' or tricks of chemical magic having a puzzling and sometimes startling effect."[437] Many tricks suggested in chemical magic books involved

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[436] "Chemcraft Chemical Magic" (The Porter Chemical Company, Hagerstown, MD, 1937), 2, Chemical Heritage Foundation, Object Collections, GB98:09.003.
[437] The Porter Chemical Company, *How to Be a Boy Chemist*, 14.

colors: changing water to different colors; coating paper with chemicals and then writing on it with water; creating different kinds of "sympathetic ink" ("such inks have frequently been used by spies in time of war for conveying military secrets through enemy territory"[438]). Manuals also offered transformations of household objects, so that a kid could create "elastic" eggs or chicken bones through soaking them in vinegar, or make "disappointing matches" painted in sodium silicate that would strike and then almost immediately go out.[439] "Diabolical Odors" was a promising subsection in one manual, offering instructions for making a "disagreeable odor" (sulphur), "a magic odor that will revive fainting persons," or "the odor of violets," which seems less than "diabolical" (unless an uncanny simulation could be regarded as inherently devilish).

Stagecraft was an important part of the instruction offered by these manuals, which gave readers lessons in controlling an audience. The Chemcraft manual of 1937 suggested that the reader "make-up as an Alchemist" to "add very much to the interest and impressiveness of your entertainment," not least because "it will make the show appear more professional and help the performers to keep from laughing while enacting their mystic roles."[440] This coaching on presentation was also about commanding a stage presence. "Always speak SLOWLY and IMPRESSIVELY with DRAMATIC pauses at the proper places," Chemcraft counseled. "Ignore any questions, remarks, or other attempts to interrupt you."[441] At the beginning of the show, the "alchemist" was

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438 "Chemcraft Chemical Magic," 6.
439 Ibid., 7.
440 Ibid., 19.
441 Ibid., 22. Emphasis in original.

counseled to "speak a word of caution": "Know ye that the spirits of the Alchemists of Old, by whose aid I these wonders do perform, are proud spirits and permit no ridicule or unbelief. If therefore, be there any amongst you that is an unbeliever in the mysteries of science, I beg that he now withdraw, lest ill results betide him here."[442] This injunction was meant to set up the presenter so that any future interference from the audience could be dealt with sternly, perhaps by the use of a sound effect to indicate the displeasure of the spirits.

Manuals also addressed issues of management, offering suggestions for ways that boys could direct the friends who would help put on magic shows. Chemcraft suggested that the head "alchemist" "appoint one individual to have complete charge of publicity."[443] Despite this delegation, the boy in charge must ride herd on his compatriots: "Everyone connected with the active production and management of the show should sell his share of the tickets. Have everyone go after this matter and encourage them to sell all that they possibly can."[444] Gilbert included a poster in his Magic Sets, which could be filled out with the name of the boy magician and, presumably, used to increase ticket sales.[445]

Showmanship, as an integral part of science, reinforced divisions between the "head Alchemist" and those who watched his magical demonstrations. But the single reference to a non-white person in all of the manuals that I examined clarifies these

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[442] Ibid., 25.
[443] Ibid., 19.
[444] Ibid., 24.
[445] Watson, *The Man Who Changed How Boys and Toys Were Made*, 78.

divisions even further, making it evident that the white boy at the center of the stage could use historical power relationships to evoke a further illusion of his mastery. The 1937 Chemcraft manual, reprinted several times in later years[446], suggests that the assistant be costumed as "an Ethiopian slave," with "face and arms blackened with burned cork which will wash off easily when the performance is concluded." When the Alchemist was to address the Slave, he should refer to him as "Slave." However, "if you prefer, the blackening of the face and arms can be omitted and the Assistant can be called 'Apprentice' instead of slave. By all means assign him a fantastic name such as Allah, Kola, Rota or any other foreign-sounding word." Clarifying the normative expectations of the author, despite the presence of this alternative suggestion, the rest of the instructions refer to this assistant as "slave."[447] By stripping the relationship between the "alchemist" and the "slave" of context, the "chemical magic" instruction booklets skirted American history, while reinforcing once again the expectation that the boys putting on the show would be white.

By providing these suggestions for effective stagecraft, the manuals instructed boys in the control of an audience, placing science within a larger lesson about performance and authority. Both Gilbert and Chemcraft saw chemistry sets as rational entertainments that fit into their vision of boyhood as a time that young men would spend

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[446] By 1956, a Chemcraft manual that included a shortened version of the "chemical magic" instructions omitted the section on the "slave." Harold M. Porter, "Porter Chemcraft Junior Experiment Manual" (The Porter Chemical Company, Hagerstown, MD, 1956), Chemical Heritage Foundation, Object Collections, GB98:09.004.
[447] *Chemcraft Chemical Magic: Mystifying Magical Demonstrations* (Hagerstown, MD: Porter Chemical Company, 1937), 119.

cementing social bonds, learning to direct "active-mindedness" into productive curiosity, and acquiring habits of entrepreneurship and management.

Girls on the Side: Chemistry Sets as Inherently Male

The empty space in the Gilbert Magic Set poster makes it extremely clear that the magician in question must be male. An important aspect of the cultural work done by home chemistry sets and manuals was the way they excluded female members of the family—sisters—from the identity of "young scientist." As historian Margaret Rossiter has written, professionalization of science during the late nineteenth and early twentieth century had the net effect of excluding women from the scientific professions; women trained in science, even those who had received PhDs, often ended up working as laboratory assistants, "computers" crunching data for projects run by men, or short-term employees. In chemistry, Rossiter wrote, the demands on the industry during World War I, when American companies had to take over the work formerly done by German industry, were so great that some women had a chance to enter industrial chemistry for the first time; however, in a foreshadowing of what happened to female defense workers after World War II, when the war was over most of these women resigned their positions.[448] Historian Kimberly Tolley adds that the post-World War I era was a time when science education in schools moved away from nature study and toward the physical sciences, a move accompanied by the exclusion of girls from "serious" science

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[448] Margaret W. Rossiter, *Women Scientists in America: Struggles and Strategies To1940* (Baltimore: Johns Hopkins University Press, 1982), 119–120.

(a phenomenon she names "Physics for Boys").[449] In its visualization of the way that home chemistry took place, the toy industry relegated sisters to similar roles: observers, helpers, and admirers.

Toy industry publications wrestled with the question of gender roles, not wanting to tread on current mores, while also hoping to reach as wide an audience of customers as possible. In 1921, *Playthings* ran an article titled "Proposing, A New Field for Toys—Sell Toys to the Girl!" To justify what might seem to the reader a purely commercial interest in this expansion, the article went on, "All of us realize that girls and women of today, for better or worse, are moving into masculine fields, doing what has heretofore been men's work. But all of us do not realize that thousands, no, millions, of little girls are invading the play field of the little boys." The author posited that girls allowed to use boys' toys might be "trained for the business world so that they will not be helpless if there is not to be a domestic life," and mused that "even if the little girl never directly knows the business world, she will be a far better helpmate to her husband if she has been broadened by real boys' toys."[450] Better to accomplish this "broadening" by chance than by design, however; *Advertising and Selling* reported in 1946 about A.C. Gilbert's approach to advertising: "Gilbert's advertising is addressed solely to boys, not to parents or to boys and girls. Girls don't mind this; boys would shy away from anything advertised for boys and girls as sissy stuff."[451]

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[449] Kimberley Tolley, *The Science Education of American Girls: A Historical Perspective* (New York: RoutledgeFalmer, 2003). See chapter 8, "Physics for Boys."
[450] "Proposing, A New Field for Toys—Sell Toys to the Girl!," *Playthings Magazine*, June 1921.
[451] Coons, "Toy Tycoon."

Companies making chemistry sets sometimes produced kits made specifically for girls; an example was Porter's attempt to reach girls during the twenties, SachetCraft, which you could use to make perfumed pillows ("delights the girls").[452] *Playthings* wrote in 1920 that "an article for girls with which they could do something practical and amuse themselves at the same time has long been a problem, and 'Sachet Craft' seems ready to supply the answer."[453] Gilbert produced a nursing kit during World War One, which contained "a complete uniform, illustrated primer, and first aid equipment."[454] A Gilbert set from the 1950s contained the only instance of an illustration that I found in which two girls appeared together, without any male presence; this was the Lab Technician set.[455] As I will discuss in chapter 4, postwar shortages of trained scientists and technicians led some to call for a greater effort to educate girls in STEM fields; this Lab Technician set answers this call, while placing girls in the less glamorous position of helper or "bottle-washer." Inside its pink covers, the manual that accompanied this set was simply a manual from another Gilbert set, reprinted verbatim, without altered copy for girls. This fact might argue for Gilbert's gender blindness, if not for the sexism of the set's cover; as it is, it seems as though Gilbert and those who wrote his manuals just didn't know how they should talk to girls.

In the groups of children depicted on set boxes or in manuals, girls took the position of spectators, watching with interest and admiration as their brothers interacted

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452 "Chemcraft and Other Porter Products Sell at All Seasons."
453 "The New Products of the Porter Chemical Company," *Playthings Magazine*, July 1920.
454 "Merchandise, Markets, and Men," *Playthings Magazine*, June 1917.
455 "Gilbert Lab Technician Set for Girls," n.d., Chemical Heritage Foundation, Object Collections, 2005.129.

with the components of the chemistry sets. Tolley writes that textbooks published for high schoolers during the 1950s contained few images of women or girls, and the images that they did contain were often of homemakers or nurses. Evidence from these sets and manuals shows that these informal educational tools enforced similar gender binaries in the twenties, thirties and forties, visually depicting expectations about the social relationships that these sets would promote within child peer groups. Ruth Oldenziel, writing about the Fisher Body Craftsman's Guild, an organization allied with General Motors that sponsored contests for boy engineers from 1930-1968, argues that the masculinization of technology during this time must be understood as part of the evolution of consumer culture; such organizations as the Guild made "a world in which men are considered the active producers and women the passive consumers of technology."[456] Just as the girls in "information books" were interested in science insofar as science could produce pretty things, many of the images of home chemistry labs that include girls cast the boys in the role of "showman" or "actor," while the girls are approving and pleased onlookers. The back cover of a Lionel-Porter manual first published in 1937 depicted a lab scene that was typical of one mode of approach to picturing girls: the token girl, allowed seemingly because of her singularity.[457] In a 1928 advertisement for Chemcraft sets, included inside a Chemcraft manual, illustrations depicting the bigger, more expensive sets feature high-school-age boys with girls, in

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[456] Oldenziel, Ruth, "Boys and Their Toys: The Fisher Body Craftsman's Guild, 1930-1968, and the Making of a Male Technical Domain," 142.
[457] "Lionel-Porter Glass Blowing Manual."

which the boys appear to demonstrate or gesture toward the set.[458] On the cover of an undated, but probably 1950s-era, Gilbert set specifically intended to instruct kids on the chemistry of plastic and glass, the brother-sister pair features a division of labor echoed in rhetoric about gendered production and consumption in the adult world: the boy pours material into a mold, while the girl holds the toy cars that have resulted from his labors.[459]

A 1946 Lionel promotional comic, *Lionel Chemistry Magic*, offers a chance to see how this company imagined its patrons would interact differently with its products, according to their gender. This comic featured a brother and sister, Tony and Cynthia, and their adventures with a Lionel chemistry set. In about a third of the comic's scenarios, it's Cynthia who saves the day by dying a pirate flag, making some blue paint for Tony's watercolor project, predicting the weather through a homemade cobalt chloride barometer, making new silver polish for her mom, and starching Tony's shirt. Cynthia also makes herself a "flower garden" out of chemicals. But, by and large, it's Tony who takes the initiative in their activities. Tony busts Cynthia for putting fingerprints on the bathroom wall; Tony shows Cynthia how to make "trick" matches to frustrate their pipe-smoking dad, how to make a fire extinguisher, and how to etch a nameplate for their puppy. A football-helmet-wearing Tony tests liver for iron to make sure that his mom isn't "tryin' to put something over" by making him eat it to get "big

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458 *Chemcraft, The Chemical Outfit: No. 5 Experiment Book* (Hagerstown, MD: The Porter Chemical Co., 1928).
459 "Gilbert Chemistry of Plastic and Glass," n.d., Chemical Heritage Foundation, Object Collections, 2005.011.

and strong", and replaces a stone he knocks out of place while playing baseball by mixing together cement from his Lionel kit. Tony shows a kindly sea captain how he can use his Lionel set to distill sea water, and makes smelling salts for his mother when she feels faint.[460]

Tony's activities with the chemistry set assist the adults around him, sometimes helping resolve dangerous situations, as with the example of the fire extinguisher, while Cynthia uses the chemistry set to do household chores better. This gendered division reflects the way that chemistry was increasingly taught in schools, with "domestic science" classes moving into prominence as a way to educate girls, while boys took the more "serious" classes that might lead to a career in industry or the academy.

Conclusion: The Chemistry Set as Culture

Chemistry's properties—its mysterious nature, its presence in the everyday object and the home, its potential to confer power upon those who might master it, and its shrinkability—rendered it uniquely suited for packaging for children's home use. During the interwar years, manufacturers of chemistry sets offered parents a vision of their children's modern futures, while telling boys that chemistry could provide status, thrills, and feelings of mastery. Through these sets, the home became a location where science happened, and the boy stepped ever more firmly into his expected role as the home's scientist-in-residence.

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[460] The Lionel Corporation, *Lionel Chemistry Magic* (New York, NY: The Lionel Corporation, 1946).

The boy's chemistry laboratory was particularly significant in its departure from previous models of in-home science education. As Sally Kohlstedt argues, during the eighteenth and nineteenth century the parlor and the home library in middle- and upper-class homes were "[sites] for scientific demonstrations, for cabinets of natural history specimens, and for discussions of the newest scientific books"; these interior spaces were locations where younger and female family members might encounter science in a domestic setting, absorbing a fascination with natural history, astronomy, or experimentation from their older male relatives.[461] The shift from this model to that of the home chemistry labs described in this chapter is a transition that moves the location of cutting-edge home science from the older generation to the younger. The exclusivity of the boys' "science clubs," which were meant as a site for independent investigations undisturbed by adult guidance, reflected a new cultural belief in the appropriateness of separate youth activities. Returning to Natalie Angier's observation about twenty-first-century American culture—"childhood is the one time of life when all members of an age cohort are expected to appreciate science"[462] —this shift seems particularly significant. Marketing and packaging of chemistry sets appealed to adult eyes, showing the joy of childhood investigation, and the idea of the chemistry set appealed to adults who liked to think of their children as "modern"; along the way, science was increasingly associated solely with youth.

[461] Sally Gregory Kohlstedt, "Parlors, Primers, and Public Schooling: Education for Science in Nineteenth-Century America," *Isis* 81, no. 3 (September 1990): 430.
[462] Natalie Angier, *The Canon: a Whirligig Tour of the Beautiful Basics of Science* (Boston: Houghton Mifflin Company, 2007), 1–3.

The history of the selling of chemistry sets during the interwar years provides an interesting prequel to the Cold War history of worries over science performance and a lack of "manpower." Adults who grew up with the interwar culture of chemistry sets, such as science fiction author Robert Heinlein, wondered how childhood enthusiasm for science had been lost, pointing nostalgically to their own enthusiastic boyhood participation in experimentation, and contrasting this attitude unfavorably with the peer-oriented, popular-culture-obsessed youth of the present day.[463] The history of the interwar promotion of chemistry sets reveals that the history is more complex than such worries would indicate; even in the supposedly pure interwar years, manufacturers relied on peer networks, appeals from popular culture, and an acquisitive materialism to promote science practice.

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[463] William H. Patterson, *Robert A. Heinlein: In Dialogue with His Century: Volume 1 (1907-1948): Learning Curve*, First Edition (Tor Books, 2010), 28.

Chapter 4: "How They Get That Way": The Social Meanings of "Science Talent" in the Cold War

In March 1956, Caryl P. Haskins, biophysicist and president of the Carnegie Institution of Washington, addressed the forty assembled finalists of the fifteenth annual Westinghouse Science Talent Search (STS) before their final awards banquet.[464] As the thirty-two boys and eight girls, seniors in high school at the tail end of a five-day, all-expenses-paid trip to Washington, DC known as the Science Talent Institute, waited to find out whether or not they had won one of the Talent Search's top prizes, Haskins told them that they were entering into scientific careers at a particularly confusing time.[465] "There is a deep and important paradox at the root of the scientific effort which every real scientist feels instinctively but which has been far too little known publicly," Haskins argued. He proceeded to tie this paradox to the students' lives, saying that he was sure they would be a generation that would be affected by it like no other.

Echoing rhetoric which he was sure was quite familiar to this particular group of young adults, who had spent the past few days visiting sites of government-funded scientific research including the Naval Ordnance Laboratory and the Walter Reed Army Institute of Research, Haskins acknowledged that the students were "entering the ranks of

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[464] Caryl P. Haskins, "Address", March 5, 1956, Smithsonian Institution Archives, Record Unit 7091, Box 330, Folder 5; Carla Baranauckas, "Caryl Haskins, 93, Ant Expert And Authority in Many Fields," *The New York Times*, October 13, 2001, sec. U.S., http://www.nytimes.com/2001/10/13/us/caryl-haskins-93-ant-expert-and-authority-in-many-fields.html.

[465] Science Service, "Fifteenth Annual Science Talent Search," n.d., Smithsonian Institution Archives, Record Unit 7091, Box 330, Folder 5; Science Clubs of America, "The Winners and Honorable Mentions in the 15th Annual Science Talent Search," 1956, Smithsonian Institution Archives, Record Unit 7091, Box 402, Folder 49.

one of the most outstanding 'warrior' groups in our nation." The young men and women were assuming a "pragmatic function" as the producers of the technology that would be necessary to keep America safe in the postwar world, and to maintain the "perilous balance of power" required for peace. Of course, the very fact that the finalists had been rewarded with this trip to the seat of power, and had met with so many important scientists and officials, indicated that important adults in government and industry valued them. This feeling of recognition was an investment that was calculated to return dividends, in the form of increased commitment to technical and scientific careers.

However, Haskins pleaded with the students not to be distracted by these "powerful pragmatic attributes of science," pointing out that Kepler, Boyle, Darwin, and Einstein were not propelled by specific social or material goals, but by "motives of discovery, of increasing our knowledge of the world, of elucidating truth and beauty as we find it, of making that truth and that beauty known to others." Although the STS finalists would find themselves in great demand, if they were to lose sight of the "spiritual and intellectual" driving force behind their work, "the lights will go out, and the joy of the work, as well as its ultimate value, will be seriously impaired."[466] To all of the work that they had already performed, then, would be added the labor of holding onto the original sense of curiosity that had propelled them into inquiry in the first place.

[466] When Haskins died in 2001, his New York *Times* obituary noted that during his tenure at the Carnegie Institution he insisted the organization reject federal grants, because he wanted scientists to retain the ability to investigate whatever subject they found most intriguing. Baranauckas, "Caryl Haskins, 93, Ant Expert And Authority in Many Fields."

This chapter will show how the Westinghouse Science Talent Search, conducted by the non-profit Science Service, looked for "science-minded" kids who had pursued science out of joy, but whose efforts had made them into "warriors." The Science Talent Search, which put high school seniors through a series of tests and selected forty that it considered to be the best in the country, meant to seek out teenagers who could both provide scientific "manpower" to a nation that desperately needed it and serve as a guiding light to other children wondering whether science could be for them. While the finalists and winners of the Science Talent Search were older than other subjects of this study, they were perceived as products of scientific childhoods, and the tastes, hobbies, and habits of their younger days were often the object of scrutiny.

The historiography of postwar science and education revolves around anxieties of recruitment, arguing that the Cold War, the advent of nuclear weaponry, and the "space race" meant that adults sought to interest children in science in order to ensure a supply of young scientists for future national supremacy.[467] However, the dynamic of "recruitment" was also one that incorporated a strong critique of the surrounding culture, and anxieties around the meaning of childhood. Adults calling for "recruitment" sought to restore what they perceived as a lost cultural climate in which children who were

[467] John L Rudolph, *Scientists in the Classroom: The Cold War Reconstruction of American Science Education*, 1st ed (New York: Palgrave, 2002); Andrew Hartman, *Education and the Cold War: The Battle for the American School*, 1st ed (New York: Palgrave Macmillan, 2008); Barbara Barksdale Clowse, *Brainpower for the Cold War: The Sputnik Crisis and National Defense Education Act of 1958*, Contributions to the Study of Education no.3 (Westport, Conn: Greenwood Press, 1981).

interested in science—and managed to develop the independence, creativity, and single-mindedness perceived to be associated with scientific activity—would be rewarded.

While prewar promoters of science as kids' culture assumed that the match between science and American children was a natural one, and celebrated the curious young museum visitor, reader, and basement experimenter, during the postwar era the archetypal young science obsessive suddenly seemed both hard to find and increasingly precious. Larger changes in the symbolic value of childhood may account for some of this shift. While early twentieth-century Americans looked to childhood as a symbol of the progress of the nation, relying on the language of evolutionary theory to envision children as representative of the past or the future, midcentury Americans used discussions of American childhood and youth to address contemporary questions about the development of individuals within societies. As Lynn Spigel puts it, concerns about childhood in the postwar era were "typically articulated in terms of psychological discourses of personality development in relation to larger national questions about authoritarianism and freedom."[468]

In keeping with this shift, promotion of science play in the postwar era focused on the benefits of science in helping children maintain an individualistic point of view in the face of a conformist society. The Science Talent Search advanced a vision of serious-minded, idealistic, creative youth that stood in stark contrast to the juvenile delinquent or the peer-obsessed teenager commonly bemoaned in the postwar era. Adult promoters of

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[468] Lynn Spigel, *Welcome to the Dreamhouse: Popular Media and Postwar Suburbs* (Durham, NC: Duke University Press, 2001), 224.

science believed that the very independence that science play bequeathed children would also render them strangers to their own culture. The STS was determined to show that its "finds" were not neurotic, isolated, or strange; in its representation of young scientists, it directly responded to the new pop-cultural figure of the alienated young intellectual.[469] Margaret Mead and Rhoda Metraux's 1957 study of a sample of high-school students' negative attitudes toward scientists was often cited in the popular press as evidence for the disconnect between the government's goals in terms of science recruitment and the "normal" student's feelings about scientists.[470] Psychologists David C. Beardslee and Donald D. O'Dowd followed the Mead and Metraux study in 1961 with similar research conducted in a college setting, which found that undergraduates also perceived scientists as "unsociable, introverted, and possessing few, if any, friends" and "believed to have a relatively unhappy home life and a wife who is not pretty" (students said "I wouldn't care to double-date with a scientist" and "maybe it's not a good idea for him [the scientist] to be married"). As in the Mead and Metraux study, Beardslee and O'Dowd found in their research that the women surveyed did not name "scientist" as a favorable occupation for a future husband.[471] The underlying concerns of these studies were with the stifling

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[469] See Aaron S. Lecklider, "Inventing the Egghead: The Paradoxes of Brainpower in Cold War American Culture," *Journal of American Studies* (2010): 1–21, doi:10.1017/S0021875810000010.
[470] Mead, Margaret and Metraux, Rhoda, "Image of the Scientist Among High-School Students: A Pilot Study," *Science*, August 30, 1957; "Where Do Our Young People Get Such Crazy Ideas About What Scientists Do?," *Saturday Evening Post*, November 30, 1957.
[471] David C. Beardslee and Donald D. O'Dowd, "The College-Student Image of the Scientist," *Science* 133, no. 3457, New Series (March 31, 1961): 997. The gap between perceptions of "intellectual" scientists and "intelligent" engineers (in Richard Hofstadter's terms) can be seen in the students' evaluations of engineers, who got higher scores on the descriptors "clean cut," "plays poker," and "has good taste." Additionally, the engineer was "believed more likely to have

influence of peer opinion on the potential young scientist, who might not even reach the point of committing to a scientific path, out of lack of desire to be thought strange, unappealing, or unsociable.

Activities such as the Science Talent Search were meant to encourage and nourish the fragile "embryo scientist," who was perceived as under threat from anti-intellectual school environments, uncomprehending peers, and the prevailing conformist drift of postwar culture. In looking for examples of students who had survived this climate of what Science Service director Watson Davis called "complacent ignorance and negativeness [sic]"[472] and come out on the other end with a commitment to a life of scientific activity, the scientists and journalists in charge of the Science Talent Search were looking for—and also constructing—a model of youthful balance that could resolve several tensions around public perceptions of science in the postwar era. Just as the young readers and attic experimenters of the interwar period brought modern methods of inquiry into the home, reinforcing parental comfort with the advance of industry, the joyful warriors of the Science Talent Search would resolve cultural conflicts: between a model of education that demanded rigor and one that asked for "life-adjustment"; between the precious commodity of individual interest and the "manpower" demands of the state; and between the intellectual and the social dimensions of science.

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a pretty wife." (998) A later similar study: W.W. Hagerty, "Students' Images of Scientists and Engineers," *BioScience* 14, no. 3 (March 1, 1964): 20-23.
[472] Watson Davis, "Science Clubs and the Future" (presented at the Science Teachers of Cleveland, OH, Cleveland, OH, October 25, 1948), 3–4.

The "creative" young scientist, as located and represented by the STS, led a life that was outside of the mainstream, and admirable for that reason. American Studies scholar Leerom Medovoi posits that in the postwar era, the much-discussed rebellious adolescent (the juvenile delinquent, the Beat) offered "a figure who represented the autonomous character of American identity," a safe compromise between sociopathic independence and a stultifying conformity.[473] "Embryo scientists" (as the STS finalists were sometimes called), by virtue of their investment in what was perceived as an unpopular pursuit among their peers, were also rebels—of a productive type. Sociologist David Riesman identified the "inner-directed" as a vanishing breed in his 1950 work *The Lonely Crowd*; his description of the qualities inherent to the "inner-directed"—a single-minded work ethic, an adherence to goals originating from within, a stubborn persistence and sense of responsibility—had much in common with the Science Talent Search's desiderata. In his 1956 study of students "lost to science," carried out for the National Science Foundation, Columbia's assistant dean Charles Cole made this connection explicit: "[The scientist] is perhaps the best example of Riesman's 'inner-directed' personality…either because of his make-up or as a result of his work, the scientist tends to be reflective and self-reliant."[474] A young scientist would certainly have to have a strong gyroscope (in Riesman's terms) to have pursued such a vigorous, diverse, and independently planned scientific life as the STS demanded of its finalists.

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[473] Leerom Medovoi, *Rebels: Youth and the Cold War Origins of Identity* (Duke University Press, 2005), 23.
[474] Charles Chester Cole, *Encouraging Scientific Talent ; a Study of America's Able Students Who Are Lost to College and of Ways of Attracting Them to College and Science Careers* (New York: College Entrance Examination Board, 1956), 11.

At the same time, however, the STS wanted its prize students to be sociable and cooperative, and to exhibit qualities of "leadership." Although the supporters of the STS would certainly not align themselves with the so-called "life-adjustment" curriculum that was the focus of much outrage in the postwar era, they regularly adopted pieces of its rhetoric, calling for STS finalists to be "well-rounded" and integrated into their communities. By representing the STS finalists as containing the best of the intellectual and social worlds, the Science Service and other supporters of the STS tried to paint strenuous scientific effort as a normal, admirable, and sustainable aspect of an American childhood. The STS criteria of independent effort, self-driven inquiry, ceaseless curiosity, and easy sociability was a complex model derived on contested ground, entering into postwar public debate over the meaning of science, education, childhood, and human nature. The STS project was a salvage effort, a public relations project and a science experiment. The STS cast itself as an exemplary site of science recruitment and generator of prestige—one that sought to create a new peer culture based around science, while reassuring the public of the simultaneous genius and normalcy of scientifically talented youth.

In this chapter, I will provide context for the Talent Search by outlining changes and conflicts in the profession of American science in the postwar era. I will describe how the Science Service, an entity constituted in the interwar years, transitioned into the postwar era, and what the Science Talent Search meant in the context of their mission. Then I will show how the Science Talent Search was, itself, an experiment, with a contested place within a larger body of postwar research into the life-course of scientific researchers. Finally, I will describe the way that the Science Service represented the Science Talent Institute as an engine of discovery and represented the STS finalists as having had exemplary scientific childhoods.

American Science at a Crossroads: Adult Context, Children's Lives

As a profession, American science in the postwar era underwent several significant structural transitions. After the success of the Manhattan Project and other wartime efforts, scientists found themselves simultaneously in demand and under suspicion. Such events as the 1947 establishment of the United States Atomic Energy Commission, the 1950 founding of the National Science Foundation, and the 1951 establishment of the President's Science Advisory Committee brought scientists in close contact with government decision-makers and gave science a welcome measure of political clout and governmental financial support.[475] As Stuart Leslie notes, the decade following World War II saw the Department of Defense move into position as the biggest underwriter of American science; while public monies expended for defense research and development were fifty times greater during World War Two than before, these levels were again matched by the end of the Korean War and then climbed even further after the flight of Sputnik in 1957.[476] Some scientists worried that this level of government support would result in, as Harlow Shapley (astronomer, Harvard professor, and sometime judge

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[475] Zuoyue Wang, *In Sputnik's Shadow: The President's Science Advisory Committee and Cold War America* (New Brunswick, N.J: Rutgers University Press, 2008).
[476] Stuart W Leslie, *The Cold War and American Science: The Military-Industrial-Academic Complex at MIT and Stanford* (New York: Columbia University Press, 1993), 1.

for the STS) termed it, "domination by the military"—or, put more bluntly by mathematician Norbert Wiener, scientists were in danger of becoming "the milk cows of power."[477] In the postwar political climate, many left-leaning scientists, believing in the key scientific values of intellectual freedom and international cooperation, found themselves in conflict with the government's agenda.[478] Other scientists bemoaned the effects of the new level of financial support on research, believing that the ensuing bureaucracy burdened science, imposed too many obligations, and rendered it inflexible.[479]

As for public perceptions of science, in an age when science had seemingly accrued much prestige, scientists and science promoters such as the Science Service were uneasy with several aspects of science's place in postwar culture. These included the representation of consumer technologies, such as cars, refrigerators, and fabrics, as the entirety of "science"; negative perceptions of the figure of "the scientist"; and a troubling development that could be seen as related to both of these trends: an increased unwillingness to financially support basic research.

Scientists and allies worried that the representation of "science" in popular media reduced science to its fruits without discussing the fundamental questions leading to these

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[477] Shapley quoted in Daniel J. Kevles, *The Physicists: The History of a Scientific Community in Modern America*, 1st ed. (New York: Knopf, 1978), 355; Wiener quoted in Steven Shapin, *The Scientific Life: A Moral History of a Late Modern Vocation* (Chicago: University of Chicago Press, 2008), 82.
[478] Jessica Wang, *American Science in an Age of Anxiety: Scientists, Anticommunism, and the Cold War* (Chapel Hill, NC: University of North Carolina Press, 1999).
[479] David Kaiser, "The Postwar Suburbanization of American Physics," *American Quarterly* 56, no. 4 (December 2004): 862, http://www.jstor.org.ezproxy.lib.utexas.edu/stable/c112514; Shapin, *The Scientific Life*, 80–83.

advances. Peter J. Kuznick's analysis of scientists' critiques of the 1939 World's Fair shows that these worries began before the war. Kuznick argues that left-wing scientists in the immediate prewar period, as well as allies (including the Science Service's Watson Davis), criticized this public celebration of "science" as one focused on industrial marvels and handy gadgets, and omitting serious discussion of science's social utility or the scientific method.[480] John C. Burnham identifies the postwar period as a time in which advances in medicine and psychology were increasingly boiled down in the popular press to bite-sized facts and easily applicable, uncomplicated pieces of "advice for everyday life."[481] In the 1950s, science grew in power as a popular visual aesthetic. Christopher Frayling notes that when Disney's "Tomorrowland" segment of its weekly show featured a tracking shot of the "Science Department" that was supposedly in-house at Disney, the "Department" was, in fact, a simulation; the "models of rockets, drawing boards…people in lab coats" were in fact a set populated with extras.[482]

If "science" was increasingly visible in the popular media through simulation and synecdoche, the "scientist" fared little better, emerging as an ambiguous figure portrayed as alienated, elitist, and incomprehensible. Individual scientists were increasingly visible; the architect of the Manhattan Project, J. Robert Oppenheimer, was a household name, and exponents of popular scientific efforts, such as rocket scientist Wernher von Braun,

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[480] Peter J. Kuznick, "Losing the World of Tomorrow: The Battle Over the Presentation of Science at the 1939 New York World's Fair," *American Quarterly* 46, no. 3 (1994): 341–373, doi:10.2307/2713269.
[481] John C. Burnham, *How Superstition Won and Science Lost: Popularization of Science and Health in the United States* (New Brunswick: Rutgers University Press, 1987).
[482] Christopher Frayling, *Mad, Bad and Dangerous?: The Scientist and the Cinema* (London: Reaktion, 2005), 91–92.

showed up in prominent media outlets such as Disney's weekly television show.[483] Because of the success of large-scale wartime projects, and because of such medical breakthroughs as penicillin and the polio vaccine, scientists' work was nominally more prestigious than ever. At the same time, in 1957-58, a Rockefeller Foundation-funded survey found that 40% of the American public thought scientists to be "odd and peculiar people."[484] The movie theatres were full of films featuring atomic monsters, human mutations, aliens uncovered by ill-considered forays into space, and, most of all, "mad" scientists. David Skal observes that many of the horror film images of "creatures with bulging brain cases" echoed the postwar political smear "egghead": "The[re was an] idea that there was something malevolent about the brain itself, the expression/exaggeration of the brain."[485] Marcel LaFollette found in her survey of coverage of science in popular magazines from 1910-1955 that criticism of science increased as research grew and was more commonly publicly funded. Fears about espionage and memories of Nazi doctors' programs of human experimentation fueled calls for regulation as science lost some of its moral authority.[486] Engineer and historian John Lienhard wrote in his memoirs of those

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[483] See, for example, the memoir of West Virginia resident Homer H. Hickam, who saw Wernher von Braun interviewed on television and became increasingly interested in rocketry as a result. Homer H Hickam, *Rocket Boys: A Memoir* (New York: Delacorte Press, 1998).
[484] Shapin, *The Scientific Life*, 78.
[485] Interview with Skal cited in Frayling, *Mad, Bad and Dangerous?*, 203. See also Skal, *Screams of Reason: Mad Science and Modern Culture* (New York: W.W. Norton and Co, 1998), in particular chapter 4, "A-Bombs, B Pictures, and C Cups." For more on the figure of the "egghead" in American culture, see Lecklider, "Inventing the Egghead."
[486] Marcel C LaFollette, *Making Science Our Own: Public Images of Science, 1910-1955* (Chicago: University of Chicago Press, 1990), 128–129; 138-139.

years: “If we had been celebrants of genius in the early twentieth century, genius now seemed poised to turn upon us….the bloom of Modern was off the rose.”[487]

Public focus on the fruits of science, coupled with these uneasy feelings toward the figure of the intellectual/scientist, amounted to what scientists and other onlookers saw as a troubling public incomprehension of the importance of pure (basic) research. In 1963, in his *Anti-Intellectualism in American Life*, historian Richard Hofstadter compared the American love for the inventor Thomas Edison to the public obscurity of nineteenth-century physicist, mathematician, and chemist Josiah Willard Gibbs, “whose work was celebrated in Europe” but who was unable to find any public fame in the United States. Hofstadter used this example to prove his argument that Americans prized intelligence (which he defined as inventiveness and pragmatism) while ignoring intellect (theoretical acumen).[488] Many scientists, who felt pressured by the new sources of research money to produce certain results, made personal and impassioned arguments for scientific freedom. Historian of science Steven Shapin argues that “a large body of emotionally charged twentieth-century American commentary identified the capacity to produce genuine scientific knowledge with the virtues of the free-acting individual.”[489] Pragmatic entreaties to support pure research were also common. In his 1945 report to the President on a “Program for Postwar Scientific Research,” *Science: The Endless Frontier*, engineer and Presidential science advisor Vannevar Bush stressed the need to fund research

[487] John H. Lienhard, *Inventing Modern: Growing up with X-Rays, Skyscrapers, and Tailfins* (Oxford University Press, USA, 2005), 248.
[488] Richard Hofstadter, *Anti-intellectualism in American Life* (New York: Vintage Books, 1963), 25–26.
[489] Shapin, *The Scientific Life*, 173.

"performed without thought of practical ends," arguing, "Basic research leads to new knowledge. It provides scientific capital. It creates the fund from which the practical applications of knowledge must be drawn." This was an issue of national security, Bush argued, since "a nation which depends upon others for its new basic scientific knowledge will be slow in its industrial progress and weak in its competitive position in world trade, regardless of its mechanical skill."[490] Despite this practical argument in support of funding for basic research, Daniel Kevles points to several pieces of evidence bespeaking a 1950s climate hostile toward these kinds of investigation, including the famous observation by Eisenhower's Secretary of Defense Charles E. Wilson, who cut the Defense Department's funding for research and development: "Basic research is when you don't know what you are doing."[491]

Worries about scientific "manpower," an aspect of the postwar scientific landscape that directly affected the climate of worry over young scientists' lives, can be identified as early as the 1910s and 1920s but expanded greatly in the immediate postwar era.[492] In the 1945 *Science: The Endless Frontier* report, the Committee on Discovery and Development of Scientific Talent (of which the Science Service's Watson Davis was a member[493]) condemned the Selective Service's policy of recruiting most graduate and

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[490] Vannevar Bush, *Science, the Endless Frontier: a Report to the President on a Program for Postwar Scientific Research* (Washington: National Science Foundation, 1960), 18–19.
[491] Wilson quoted in Daniel S. Greenberg, *The Politics of Pure Science* (New York: New American Library, 1968), 273, cited in Kevles, *The Physicists*, 383.
[492] Shapin, *The Scientific Life*, 101.
[493] Along with James B. Conant of Harvard; Robert E. Doherty, president, Carnegie Institute of Technology; and Harlow Shapley of the Harvard College Observatory (among others). Bush,

undergraduate students of science into the services, without consideration as to the future. The committee reported the concerns of scientists inside and outside the academy. Dr. Charles L. Parsons, of the American Chemical Society, argued "today, we are drying up prosperity at its source…Public opinion of the future will view with amazement the waste of scientists in World War II." Dr. Charles Allen Thomas, director of the Monsanto Chemical Company's research laboratories, believed "scientific suicide faces America unless immediate and adequate steps are taken to train replacements for technical men going into the armed services."[494] The Korean War meant a new expansion of scientific manpower fears as the military and the contractors who served it struggled to fill the nation's military needs. The National Manpower Council, formed in 1951, held conferences and issued reports throughout the 1950s on topics relating to the workforce, including education, public policy, and democracy.[495]

As "manpower" recurred again and again as a topic of concern in the 1940s and 1950s, science education took a central place in the conflict over the future of progressive education that defined the educational scene during the postwar era.[496] Meanwhile, life-adjustment curricula moved into schools, and science and engineering education were depicted as victims of an education system devoid of rigor and rationality. Critics like

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Science, the Endless Frontier: a Report to the President on a Program for Postwar Scientific Research. Complete list of committee members on p .136.
[494] Ibid., 159.
[495] Joel H. Spring, *The Sorting Machine: National Educational Policy Since 1945*, Educational Policy, Planning, and Theory (New York: McKay, 1976), 83–86.
[496] Lawrence A. Cremin, *The Transformation of the School; Progressivism in American Education, 1876-1957* (New York: Vintage Books, 1964); Hartman, *Education and the Cold War*.

Navy admiral Hyman Rickover attacked schools' inability to "save" smart students who wanted to undertake the hard intellectual work of science research.[497] Especially after Sputnik, American public opinion took the American student's unfamiliarity with science as a prime example of everything that was wrong with American schools, as in a series of *Life* articles that contrasted the happy life of a Chicago high-schooler (dances, dates) with the serious commitments of his Soviet equivalent—commitments which involved laboratory work and extensive studying.

In the United States, the science-minded young person, yearning for serious fare, was a tragic figure, betrayed by his elders.[498] Novelist Sloan Wilson's article in this series, "It's Time To Close Our Carnival," posited what he saw as a typical scenario:

> Many a brilliant youngster finds that his school has assumed the aspects of a carnival. In one room pretty girls practice twirling batons. The sound of cheers is heard from the football field. The safe-driving class circles the block in new automobiles lent by an enterprising dealer. Upstairs funny Mr. Smith sits wearily on a stool in the chemistry lab trying to explain to a few boys that science can be fun, but who pays any attention to him?[499]

Partially as a result of this outrage, as John Rudolph shows, scientists succeeded in garnering public funding for curriculum reform efforts in the 1960s.[500]

Changes in the scientific profession during the postwar era, as well as a cultural climate that scientists perceived as unstable and inhospitable, led to a far greater interest within the profession in the experience of youth. The Science Service's work with the

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[497] Hyman Rickover, *Education and Freedom.*, [1st ed.] (New York: Dutton, 1959).
[498] "Schoolboys Point Up A U.S. Weakness," *Life Magazine*, March 24, 1958; "Crisis in Education," *Life Magazine*, March 24, 1958; "The Waste of Fine Minds," *Life Magazine*, April 7, 1958.
[499] Sloan Wilson, "It's Time To Close Our Carnival," *Life Magazine*, March 24, 1958, 37.
[500] Rudolph, *Scientists in the Classroom*.

Science Talent Search, which often drew upon the resources of established scientists as lecturers or mentors, participated in these debates within the scientific profession about education and culture; in its efforts to encourage youth, the Service attempted to create a new youth culture, in which curiosity would be rewarded.

The Science Service: Progressive Commitments in the Postwar Era

The Science Talent Search was conducted and publicized by the Science Service, an organization that maintained a public-spirited belief in the possibilities of social improvement through science—a characteristic attitude of the Progressive era and the interwar period—into the more anxious, competitive postwar era. As an organization steered by scientists and journalists, and staffed by journalists with scientific educations, the Science Service represented a strong belief in the merits of extracurricular scientific education, and a commitment to science's public visibility.

The Service's origins were in the early years of the century, when E.W. Scripps, the newspaper magnate, began to patronize the work of William E. Ritter, a zoologist and marine biologist. The two men formed a lasting friendship based on their mutual interest in the question of public education and its relationship to democratic ideals. Ritter believed in the benefits of public knowledge of science, which he defined both as familiarity with the facts born of the scientific enterprise and as ability to use the structures of thought inherent to scientific process. Scripps, a strong-minded self-professed "damned old crank," had a commitment to truthful reporting about "all things of human concern," which he believed would strengthen democracy and promote civic reform.[501] In 1921, the Science Service was launched as a not-for-profit corporation, with enough financial support from Scripps to ensure that it would not find itself, as its first editor termed it, "under the control of any clique, class or commercial interest…[or] the organ of any one association."[502] The Science Service drew its trustees from the national Academy of Science, the National Research Council, the American Association for the Advancement of Science, the E.W. Scripps estate, and the journalistic profession; the final count of the governing board was ten scientists and five journalists, a makeup intended to signal to scientists that the Science Service deserved their respect.[503] Edwin E. Slosson, who had a PhD in chemistry and was a committed science popularizer and the author of the popular books *Creative Chemistry* (1919) and *Easy Lessons in Einstein* (1920), was named as the first editor.[504]

The main remit of the Science Service in its early years was to produce and to place accurate popular scientific writing in newspapers around the United States. At the beginning of its efforts, it sent a mailing once a week to participating newspapers,

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[501] Marcel C LaFollette, *Science on the Air: Popularizers and Personalities on Radio and Early Television* (Chicago: University of Chicago Press, 2008), 46–47; W. E. Ritter, "Science Service as One Expression of EW Scripps's Philosophy of Life," *Science News Letter*, 1926; E. W. Scripps, *Damned Old Crank, a Self-portrait of E. W. Scripps Drawn from His Unpublished Writings*, 1st ed. (New York: Harper, 1951).

[502] Edwin E. Slosson, "A New Agency for the Popularization of Science," *Science* 53, no. 1371, New Series (April 8, 1921): 322.

[503] Watson Davis, "The Rise of Science Understanding," *Science*, September 3, 1948, 241; Slosson, "A New Agency for the Popularization of Science," 321; LaFollette, *Science on the Air*, 59.

[504] LaFollette, *Science on the Air*, 55. On Slosson's philosophy of popular science, see David Rhees, "A New Voice for Science: Science Service Under Edwin E. Slosson, 1921-1929" (University of North Carolina at Chapel Hill, 1979), in particular part III: "The Popular Science of Edwin E. Slosson."

consisting of packaged stories with a "By Science Service" byline.[505] Beginning in 1922, the Service produced a weekly magazine called *Science News Letter*, which was meant to aggregate the Service's coverage in one periodical for the use of individuals and schools.[506] The Service also produced a radio show, eventually called "Adventures in Science," which mixed recent headlines of scientific interest with interviews with scientists.

After Slosson's death in 1929, and a brief interim period, Watson Davis, a civil engineer-turned-journalist who had been working at the Service as managing editor since 1923, was appointed director. He retained this position from 1933-1966, and was a key figure in the organization, promotion, and longevity of the Science Talent Search. During his tenure at Science Service, Davis wrote and lectured widely on such topics as the nature of scientific progress, the manpower crisis, and the meaning of "science popularization," and he was in demand as an expert on the topic of science's presence in public life.[507] Despite what Bruce V. Lewenstein and others identify as a prevailing postwar trend toward coverage that would promote "science appreciation," rather than an understanding of scientific method or a deeper engagement with the questions that

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[505] Davis, "The Rise of Science Understanding," 241. By 1948, circulation was "a couple of hundred newspapers and other publications with a readership of about 10,000,000."

[506] LaFollette, *Science on the Air*, 61. In 1948, Davis reported that the Science News Letter had a circulation of 50,000. Davis, "The Rise of Science Understanding," 243.

[507] See, for a very few examples: Watson Davis, "Critical Shortage," *Science News Letter*, August 25, 1945; Watson Davis, "The Frontiers of Science Are Still Endless" (presented at the Commencement, Bronx High School of Science, Bronx, NY, June 25, 1946); Watson Davis, "Science and Libraries Today" (presented at the New Jersey Library Association, Buck Hill Falls, PA, March 20, 1947); Watson Davis, "Science, Education, and the Press" (presented at the Southern Interscholastic Press Association, Washington, D.C, April 25, 1947).

provoke research, Davis's own ideological commitments were to the older Progressive idea of science understanding as a promoter of the democratic process.[508] In 1948, for example, he wrote, "If the great mass of the people, through accurate and interesting accounts of the successes and failures of science, can glimpse and understand that essence of science, its trying, testing, and trying again, if they build their own convictions that this is a good, sensible, successful, and useful method, then there is hope that they will apply it more widely to everyday life, to our human relations, to running our businesses, to our governments, to everything that we do."[509] Besides retaining these humanistic commitments, Davis was also an internationalist, and under his leadership Science Service cooperated with the State Department, offering assistance to its book translation program; worked with UNESCO to help science popularization efforts in other countries; and saw its reports published in cities abroad.[510]

In his writings Davis argued that the Science Service was a creature of its time, called forth by what he identified as a unique period of scientific and technological innovation. Davis dated this period to World War I, since which, he argued, the public had undergone "an intellectual burst of realization that this is a scientific world in which

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[508] B. V. Lewenstein, "The Meaning of 'Public Understanding of Science' in the United States After World War II," *Public Understanding of Science* 1, no. 1 (1992): 45–68.
[509] Davis, "The Rise of Science Understanding," 241.
[510] Ibid., 244; Watson Davis to Pierre Auger, October 25, 1951, Smithsonian Institution Archives, Record Unit 7091, Box 305, Folder 1; "UNESCO International Meeting of Science Club Leaders," July 15, 1949, Smithsonian Institution Archives, Record Unit 7091, Box 446, Folder 33. The finding aid for the Smithsonian's Science Service records, authored by Marcel LaFollette, mentions that Davis was also a proponent of the dissemination of Interlingua, an international scientific language (Record Unit 7091, Science Service, Records, 1902-1965; Smithsonian Institution Archives).

we live—a slow-moving explosion that was touched off by the airplane, the radio, appreciation of sanitation and immunization, snatching of nitrogen from the air, the chemical revolution, and a score of other scientific achievements." According to Davis, the Science Service was necessary because "today *is* different from yesterday"—what had been a steady stream of comprehensible innovations had become a flood of ever-more specialized new knowledge. However, he had trust and faith in the American public, arguing, "Every year there is a new audience, eager and receptive if their inquisitiveness is not rubbed off by dull, didactic teaching….We like to believe that there is now more opportunity to understand than ever before."[511]

The Science Service's multiple programs directed particularly at young people, of which the Science Talent Search was one, were all founded in the postwar era. Davis saw what he identified as the increased degree of scientific progress as a reason why young people needed more and more help in their attempts to know science. In a 1948 speech to a group of science teachers in Cleveland, OH, Davis used evolutionary language from an earlier era to promote the idea of enriching the science curriculum using after-school activities such as science clubs: "Today it is recognized that science education must be accelerated if growing boys and girls are to recapitulate the scientific history of the human race in the few years between entering school and getting to or through college."[512] Davis also saw support of what he called "the youth interest in science" as an

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[511] Davis, "The Rise of Science Understanding," 239.
[512] Davis, "Science Clubs and the Future," 3–4.

integral part of "science diffusion."[513] He described the National Science Fair as part of a "great movement to explain and dramatize science to the people through the activities of young scientists in the schools."[514] In a speech to science teachers of Cleveland, he wrote, "If Johnny and Mary have such fun with science in their science clubs, there may be some hope that older folk will tumble to the fact, as thousands upon thousands have already done, that science is a good hobby."[515]

Under Davis's direction, the Science Service began a series of mail-order materials aimed at young people. In 1940, the Science Service initiated the mail order "THINGS of Science" program, in which teachers or students received each month a sample of a material in a little blue box. The materials could be natural or man-made, and arrived along with explanatory text and suggested experiments.[516] Other Science Service publications were specifically targeted to young scientists, such as *Scientific Instruments You Can Make* (by Helen M. Davis, Watson Davis' wife), *Science Exhibits* (also by Helen Davis), and *Thousands of Science Projects* (by Margaret E. Patterson and Joseph H. Karus). These drew upon the bank of projects produced for STS and National Science Fairs, and listed titles of past projects along with suggestions for shaping project

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[513] Davis, "The Rise of Science Understanding," 6.
[514] Watson Davis, "Memorandum on National Science Fair," November 1949, 4, Smithsonian Institution Archives, Record Unit 7091, Box 446, Folder 37.
[515] Davis, "Science Clubs and the Future," 4.
[516] Watson Davis, "Science Teaching and Science Clubs Now and Postwar," *School Science and Mathematics* (March 1945): 259.

goals and making equipment. The student (or teacher) could also order a box of slides of National Science Fair exhibits, along with related commentary.[517]

The Science Clubs of America, the umbrella organization that the Service created in 1941 in order to facilitate existing clubs founded by science teachers, was probably the Science Service youth effort that had the largest membership.[518] In 1958, the Science Service claimed that 400,000 young people showed their exhibits at Service-assisted Fairs annually.[519] In the Science News Letter, short reports on the doings of the science clubs offered small portraits of group interests and efforts. With names like the "Atomettes" (Newtown Sq, PA), "The Curiosity Club" (Normandy, FL), "Explorer's Society" (Alexandria, VA), and the "Riley High Mad Scientists" (South Bend, IN), the clubs reported taking field trips to industrial sites and farms, giving "magic shows" in school cafeterias, and creating small museums in school lobbies.[520]

The idea for the Science Talent Search, perhaps the most prestigious of the Service's youth projects, came about after Davis met G. Edward Pendray, an employee of Westinghouse Electric Corporation, when both were in the process of planning for the

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[517] "Science Service Aids to Youth," n.d., Smithsonian Institution Archives, Record Unit 7091, Box 401, Folder 35.

[518] Davis, "Science Teaching and Science Clubs Now and Postwar," 260. Davis wrote in this 1944 speech that Science Clubs of America contained 6,000 clubs, with about 150,000 individual members.

[519] Science Service, "Encouraging Science Talent...The National Science Youth Program," 1958, Smithsonian Institution Archives, Record Unit 7091, Box 401, Folder 35.

[520] "Aiding Young Scientists," *Science News Letter*, October 16, 1948, 246.

1939 World's Fair.[521] Westinghouse hired Pendray, a science journalist, author of science fiction, and president of the American Rocket Society, as an advertising and public relations assistant in 1936, offering him a large budget and creative latitude. Westinghouse's chairman of the board, Andrew W. Robertson, believed that the company needed to enhance its public reputation as forward-looking. In answer to this mandate, among other ideas, Pendray thought up the publicity stunt of burying a time capsule at the 1939-1940 World's Fair.[522] During the Fair, several thousand boys and girls had the chance to show their science fair projects in a building sponsored by Westinghouse.[523] The idea for the Science Talent Search emerged from Davis and Pendray's collaboration on this event.

The difference between the National Science Fair and the Science Talent Search, as Davis and the Science Service saw it, was the difference between a democratic and meritocratic vision of science education. Sevan Terzian sums up the two modes of thought about postwar American science education as containing two opposing rationales: "Science education for democratic citizenship and informed evaluation of

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[521] Joseph Berger, *The Young Scientists: America's Future and the Winning of the Westinghouse* (Reading, Mass: Addison-Wesley, 1994), 17.

[522] Tom K Phares and Westinghouse Electric Corporation, *Seeking-and finding-science talent : a 50-year history of the Westinghouse science talent search* ([Pittsburgh?]: Westinghouse Electric Corp., 1990), 3; Stanley Edgar Hyman and St. Clair McKelway, "The Time Capsule," *The New Yorker*, December 5, 1952.

[523] The fair was organized by the American Institute of the City of New York, and the student exhibits were developed through the Science and Engineering Clubs. Sevan G. Terzian, "The 1939-1940 New York World's Fair and the Transformation of the American Science Extracurriculum," *Science Education* 93, no. 5 (September 2009): 892–914, doi:10.1002/sce.20329. In other Westinghouse projects, the Westinghouse Educational Foundation sponsored a summer institute program for teachers at MIT in 1949, and the George Westinghouse Science Writing Awards (co-sponsored with the AAAS) starting in 1945 (Rudolph, *Scientists in the Classroom*, 61).

consumer products…a practical curriculum that applied theoretical principles to aspects of daily living" or "rigorous, discipline-based courses with the brightest students who had been carefully selected on the basis of their academic achievements and intellectual promise."[524] Terzian identifies the Science Service's youth programs as embodying both democratic and meritocratic modes. Davis and the Science Service saw the Science Clubs of America, and the National Science Fair, as the "grassroots" from which scientists might emerge. Many Science Talent Search finalists were participants in Science Clubs of America, while some were previous finalists or winners at the National Science Fair.[525] In the meantime, through science clubs, "millions…who do not and should not become scientists and engineers, experience science as a hobby, to their personal benefit and to the enrichment of our national policy."[526] On the other hand, the Science Talent Search was meant to find the future stars of research. In journalist Joseph

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[524] Sevan Terzian, "'Adventures in Science': Casting Scientifically Talented Youth as National Resources on American Radio, 1942-1958," *Paedagogica Historica* 44, no. 3 (June 2008): 310–311, doi:10.1080/00309230802041575.
[525] See mentions of contestants with this history in Science Service, "Supplementary Information for the Seventh Annual Science Talent Search," January 22, 1948, Smithsonian Institution Archives, Record Unit 7091, Box 394, Folder 7; Science Service, "Supplementary Information for the Twelfth Annual Science Talent Search," 1953, Smithsonian Institution Archives, Record Unit 7091, Box 401, Folder 5; Science Service, "Supplementary Information for the Seventeenth Annual Science Talent Search," February 1958, Smithsonian Institution Archives, Record Unit 7091, Box 401, Folder 39; Science Service, "Young Scientists Series," February 6, 1958, Smithsonian Institution Archives, Record Unit 7091, Box 401, Folder 39; Science Service, "Science Service Citations Go to Seventeen Students," n.d., Smithsonian Institution Archives, Record Unit 7091, Box 401, Folder 39.
[526] Watson Davis, "The Interpretation of Science Through Press, Schools, and Radio," *The Engineers' Bulletin*, February 1952.

Berger's 1994 history of the Westinghouse, he writes, "[The contest's] goal was not simply to choose the best project but to locate the best potential scientists."[527]

"Seeking—and Finding—Science Talent": The Talent Search as Contested Experiment

Presenting a plaque to Marion Cecile Joswick, one of the 1945 STS finalists, at Brooklyn Manual Training High School, Science Service employee Margaret Patterson described Joswick as the kind of person of which "our world has great need": "People who will try new things; people who have faith in themselves to persevere long enough to accomplish them in spite of any difficulties; people who are willing after one 'mission accomplished' to go on to another more challenging." The Science Service, Patterson said, was "firmly convinced that such people exist," and that it was possible to find them while they were still young, and "help them become more completely the people this world sorely needs."[528] In the Science Service's vision, children with "science talent" who had managed, despite the educational and cultural odds, to make it to their senior year having developed an interest in science, were national resources to be protected at all costs. "Our great problem is to see that these potential scientists of tomorrow have a chance to show their worth," Watson Davis told an audience of science teachers in 1948. "We must see that they are not submerged in complacent ignorance and negativeness [sic]."[529]

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[527] Berger, *The Young Scientists*, 18.
[528] Margaret E. Patterson, "Presentation of Science Talent Search Plaque to Miss Marion Cecile Joswick" (Brooklyn, NY, n.d.), 1.
[529] Davis, "Science Clubs and the Future," 3–4.

In arguing that the Science Talent Search could find the kinds of students who had already proven themselves to have "scientist" qualities, the Science Service was also making arguments about what it meant to be a scientist, and the place of independent and challenging "work" in a young person's life. The Science Service, the Westinghouse Educational Foundation, and the scientists who supported the Search were constructing a vision of what it meant to be an "embryo scientist" (as educationist Robert Douglas MacCurdy, who wrote his dissertation about the characteristics of successful Science Talent Search contestants, called them) in the postwar United States.[530]

In constructing the elements that went into the Talent Search, the adults running the Search were themselves curious. They wanted to know how—in the words of the psychologist Harold Edgerton, who served as a judge and authored the Search's science examination in the postwar years—these students had "got that way." The Talent Search was, to them, a grand experiment, with the successful finalists serving as raw material. They saw themselves as scientists, as Davis wrote in 1950 about the process of selecting for science talent: "There is promise that traits [of "science talent"] can be discovered and analyzed much as the chemist assays promising ore for its chemical elements."[531]

If the staff of the Service were investigators, the students were, as Patterson called them, "experimental animals on which to try our tools."[532] Perhaps because these students

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[530] Robert MacCurdy, "Characteristics and Backgrounds of Superior Science Students," *School Review* (1956): 67.
[531] Watson Davis, "The Next Half Century's Human Talents Will Be Assayed to Fit People to Best Life Work," *Science Page*, February 29, 1950, 1.
[532] Patterson, "Presentation of Science Talent Search Plaque to Miss Marion Cecile Joswick."

were themselves scientists, the Science Talent Search personnel felt no qualms in informing them of their position as lab rats, and, in fact, tried to incite their scientific spirit in appealing to them to respond to surveys and contribute their experiences to the database of STS knowledge. In his introduction to the STS' "alumni" magazine, the *Science Talent Searchlight*, Edgerton told the students that they were "guinea pigs"; "you are being watched carefully: not to pry into your life as an individual, but to find out more about scientists and how they grow."[533] The pun of the magazine's name was meant to emphasize the degree to which the designation of students as STS winners would put them under scrutiny.

The final actor in the metaphor of "STS as experiment" was Westinghouse, framed as a patron of forward-thinking research in its underwriting of the Search. In supporting the Search, Davis argued, Westinghouse was committing to the future, in the same way as it might by supporting basic research. The current work of young scientists might seem unfocused or exploratory, but their future potential was unlimited: "This is an excellent example of the support of 'pure' research by industry, because the chance of Westinghouse adding to its staff any of these talented young people is probably in about the same ratio as the likelihood of using some of the fundamental researches in its laboratory."[534]

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[533] Harold A. Edgerton, "Again The Searchlight Swings Your Way," *Science Talent Searchlight*, February 1948.
[534] *Youth Looks at Science and War* (Washington, D.C. and New York: Science Service and Penguin, 1942), iv.

This "science experiment" of the STS was rooted in the wartime and postwar ascendency of the field of psychology, which gained ever more influence in government bureaucracies, universities, and the public consciousness during this time.[535] Terence Ball argues that from 1930 to 1950, the creation of New Deal agencies (largely staffed by social scientists), the labor involved in mobilizing the American armed forces and crafting homefront policies for World War II, and the advent of a cold war that was in many ways a "war of ideas and ideologies, of psychology and propaganda," all combined to create a climate in which social science came to greater prominence.[536] During the Cold War, social scientists could be found working for all branches of the military, intelligence agencies, departments of the government, civilian advisory groups, and private foundations.[537]

During the 1940s and 1950s, psychologists Steuart Henderson Britt and Harold Edgerton held a large amount of influence in the selection of the Science Talent Search finalists and winners. Britt and Edgerton wrote the Science Aptitude Examination, which was a major component of the STS selection process, and served as two members of the committee of judges that evaluated the finalists. (During the early years of the STS, astronomer Harlow Shapley was the third member of the committee; starting in the

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[535] Ellen Herman, *The Romance of American Psychology: Political Culture in the Age of Experts* (Berkeley: University of California Press, 1995).
[536] Terence Ball, "The Politics of Social Science in Postwar America," in *Recasting America: Culture and Politics in the Age of Cold War*, ed. Lary May (Chicago: University of Chicago Press, 1989), 82.
[537] Mark Solovey, "Cold War Social Science: Specter, Reality, or Useful Concept?," in *Cold War Social Science: Knowledge Production, Liberal Democracy, and Human Nature*, ed. Mark Solovey and Hamilton Cravens (Basingstoke: Palgrave Macmillan, 2012), 1–2.

1950s, his place was taken by Rex Buxton, a psychiatrist from New York City.[538]) Both holding PhDs in psychology, Britt and Edgerton were shaped by their experiences working for the government during World War II; both were also employed in the private sector later in their lives, consulting with businesses about consumer and employee behavior. Britt enlisted in the Navy during the war, employed to select and train personnel; after the war, he worked in advertising, and as a marketing consultant.[539] Edgerton, who identified himself as an "industrial psychologist," worked for universities, for the U.S. Employment Service, and for a range of corporations in his capacity as a consultant.[540]

Britt and Edgerton were looking to understand the phenomenon of "science talent," and they used the data from the STS to publish several surveys of their findings.[541] Other psychologists and educational theorists also used the STS winners and finalists as raw material: Robert MacCurdy's 1954 dissertation, for example, surveyed

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[538] Harold A. Edgerton, "Harold A Edgerton, PhD: A Career in Industrial and Measurement Psychology," *Industrial & Organizational Psychology, Inc.*, accessed June 20, 2012, http://www.siop.org/presidents/Edgerton.aspx.
[539] "Steuart Henderson Britt (1907-1979) Papers, 1927-1980." Finding aid at the Northwestern University Archives, Evanston, IL.
[540] Edgerton, "Harold A Edgerton, PhD: A Career in Industrial and Measurement Psychology."
[541] Harold A. Edgerton and Steuart Henderson Britt, "The First Annual Science Talent Search," *American Scientist* 31, no. 1 (January 1, 1943): 55–68; Harold A. Edgerton and Steuart Henderson Britt, "The Third Annual Science Talent Search," *Science* 99, no. 2573 (April 21, 1944): 319–320; Harold A. Edgerton and Steuart Henderson Britt, "Sex Differences in the Science Talent Test," *Science* 100, no. 2592 (September 1, 1944): 192–193; Harold A. Edgerton and Steuart Henderson Britt, "The Science Talent Search in Relation to Educational and Economic Indices," *School and Society* 63, no. 1628 (March 9, 1946): 172–175; Harold A. Edgerton, Steuart Henderson Britt, and Ralph D. Norman, "Later Achievements of Male Contestants in the First Annual Science Talent Search," *American Scientist* 36, no. 3 (July 1, 1948): 403–414.

the STS winners and finalists of 1952 and 1953.[542] Edgerton's student Ralph David Norman wrote a dissertation surveying the winners from 1941-1947, asking about their membership in honorary societies, their grades in college, publications, patents, and proficiency in using specialized devices or apparatus.[543] Despite the volume of work produced on the STS winners, however, the project faced criticism from within the scientific community, where others were investigating the question of "how they got that way" and answering it differently.

Describing the Scientific Childhood: Problems and Perils of Difference

The "experiment" of the Science Talent Search was part of a larger postwar push for research into the scientific vocation, and in particular its relationship to the nature of human creativity. In his presidential address to the American Psychological Association in 1950, J.P. Guilford identified creativity as a field of research the neglect of which had been "appalling." He acknowledged that research into intelligence—and particularly intelligence testing—in the previous decades had been widespread, but argued that creativity was an entirely different subject, one which had been ignored by behaviorist psychology focused on a stimulus-response model of human actions.[544] The relationship

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[542] Robert Douglas MacCurdy, "Characteristics of superior science students and some factors that were found in their background." (Ed.D, Boston University, 1954).
[543] Ralph David Norman, "A Study of Scientifically Talented Boys, With Special Reference to the Early Validity of Selections Made in the First Science Talent Search," *Abstracts of Doctoral Dissertations* 52 (n.d.): 233–238.
[544] J. P. Guilford, "Creativity," *American Psychologist* 5, no. 9 (September 1950): 446, doi:10.1037/h0063487. On the history of this shift in the field of psychology, see Bernard J. Baars, *The Cognitive Revolution in Psychology* (New York: Guilford Press, 1986); Howard Gardner, *The Mind's New Science: a History of the Cognitive Revolution* (New York: Basic

between individual human creativity and the normative demands of larger society was a quintessential preoccupation of postwar psychology. Interest in creativity was a form of "Cold War resistance to the triple ills of social conformity, intellectual fragmentation, and authoritarian rule," as Michael Bycroft argues.[545]

Concerns about enhancing human creativity often intersected with the debate over parent-child relationships that had become ever more prominent as the baby boom reached its peak. Henry Jenkins writes that by the 1950s, permissiveness had become "the dominant discourse about childhood within postwar American society," with books and magazines intended for parental consumption addressing every aspect of the new approach to parent-child relationships.[546] Popular culture intended for children, including television programs, films, records, and literature, changed in response to this new climate, while manufacturers of toys and children's furnishings incorporated the appeal of "developing creativity" into their advertising.[547] Jenkins rightly points out that

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Books, 1987); John D. Greenwood, "Understanding the 'cognitive Revolution' in Psychology," *Journal of the History of the Behavioral Sciences* 35, no. 1 (Winter99 1999): 1–22; George Mandler, "Origins of the Cognitive (r)evolution," *Journal of the History of the Behavioral Sciences* 38, no. 4 (Fall 2002): 339–353, doi:10:1002/jhbs.10066.

[545] Michael Bycroft, "Psychology, Psychologists, and the Creativity Movement: The Lives of Method Inside and Outside the Cold War," in *Cold War Social Science: Knowledge Production, Liberal Democracy, and Human Nature*, ed. Mark Solovey and Hamilton Cravens (Basingstoke: Palgrave Macmillan, 2012), 199.

[546] Henry Jenkins, "Dennis the Menace: 'All-American Handful'," in *The Revolution Wasn't Televised: Sixties Television and Social Conflict*, ed. Lynn Spigel and Michael Curtin (New York: Routledge, 1997), 119.

[547] See psychoanalyst Martha Wolfenstein's contemporaneous analysis of the trend away from recommendations of discipline and toward the promotion of "fun morality" over several decades of the Infant Care bulletin of the United States Children's Bureau. Martha Wolfenstein, "The Emergence of Fun Morality," *Journal of Social Issues* 7, no. 4 (1951): 15–25. On ideals of creativity in postwar children's toys and furniture, see Amy F. Ogata, "Creative Playthings: Educational Toys and Postwar American Culture," *Winterthur Portfolio* 39, no. 2/3 (June 1,

although the education reforms of the 1950s "are often represented as a repudiation of permissive educational and childrearing practices," there were continuities between science promotion and permissiveness: both believed in unleashing the child's curiosity and imagination. In the end, as I shall demonstrate, the ideal young scientist was depicted as an ideal (and paradoxical) combination of creativity and self-discipline.

As postwar psychology's new interest in the individual and creative in human thinking expanded, the question of how scientists think and work was central. In his address, while considering the "social importance of creativity," Guilford mentioned scientists and engineers as his first example, citing the need for creative leaders second.[548] Jamie Cohen-Cole suggests that humanistic cognitive researchers trying to move the theory of how people think beyond a simple stimulus-response behaviorist model looked to scientific thinking as a model subject. Cohen-Cole argues that cognitive scientists "looked for human nature by holding an image of what they were looking for in their minds…the image they held was none other than their own self-image."[549] This observation must be kept in mind when evaluating the arguments made by scientists about the conditions of childhoods of scientists. The reflexive nature of the project meant that many investigators and outside observers from the broader scientific community felt quite strongly about the findings, and, as we shall see, expressed themselves accordingly.

2004): 129–156; Amy F. Ogata, "Building Imagination in Postwar American Children's Rooms," *Studies in the Decorative Arts* 16, no. 1 (2008): 126–142.

[548] Guilford, "Creativity," 446.

[549] Jamie Cohen-Cole, "The Reflexivity of Cognitive Science: The Scientist as Model of Human Nature," *History of the Human Sciences* 18 (2005): 126.

The Science Service and those associated with the Science Talent Search often used the word "creative" to describe the type of young scientist they were seeking, conflating the term "creative scientist" with the type of scientist who would produce original basic research. Even on the occasion of the first STS, which took place nine years before Guilford's address to the APA, Edgerton and Britt were employing the term "creative" to describe the ideal STS finalist. By the 1950s, the question of "creativity" had become a common point of discussion at the Science Talent Institute, which took for granted the mandate that it was trying to encourage future researchers of the highest (creative) caliber. The 1957 Caryl Haskins banquet speech with which I opened this chapter, in which Haskins spoke about the need for "joy" in the scientific process, was an example of the way that the STS figured itself as a guard of the precious and unquantifiable emotions related to connection and intuition. In another example of the centrality of this concept to the STS, in 1961, Glenn Seaborg gave the final banquet speech at the STS Institute, and titled it "Making the Creative Scientist."[550] Some STS finalists internalized this rhetoric, as in 1956, Robert Moore, a winner from Silver Spring, MD, told the Science Service for their publicity materials: "One cannot be a research scientist by rote, but he or she must be creative. Intuition and curiosity seem to be as essential to a scientist as they are to an artist or composer."[551] Despite the use of the terms "creative" and "original," however, Edgerton and Britt did not necessarily align

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[550] Glenn T. Seaborg, "Making the Creative Scientist," *The Science News Letter* 79, no. 11 (March 18, 1961): 170–172, doi:10.2307/3943316.
[551] Science Talent Institute, "Maryland, Illinois, and Georgia Boys Take Top Talent Search Honors," March 5, 1956, Smithsonian Institution Archives, Record Unit 7091, Box 330, Folder 5.

themselves with their colleagues in their understanding of what it meant to be "creative" as a young scientist.

A range of psychologists, theorists of education, and sociologists applied themselves to the project of understanding the scientific vocation in the 1950s, and many of their projects looked at the factors in the childhood of scientists that might enhance or discourage creativity and shape a future vocation in science. The University of Utah hosted seven conferences between 1955 and 1971 that attracted many of the most prominent researchers within the creativity movement in psychology; the first three of these were devoted to "identification of scientific talent," while subsequent conferences addressed the concept of creativity more broadly, asking how creative people worked, wondering what their backgrounds were, and investigating the function of creativity in particular occupations and fields.[552] The conferences on the identification of scientific creativity were funded by the National Science Foundation.[553] Psychologist Anne Roe, an attendee and member of the steering committee of the University of Utah conferences, published perhaps the most public work of analysis of scientists and their vocational choices in 1953, *The Making of a Scientist.* This work surveyed sixty-four male biologists, physicists, and social scientists, all judged to have been professionally successful, using interviews and projective personality and intelligence tests.[554] Other

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[552] Bycroft, "Psychology, Psychologists, and the Creativity Movement: The Lives of Method Inside and Outside the Cold War," 199.
[553] Calvin W. Taylor, "The 1955 and 1957 Research Conferences: The Identification of Creative Scientific Talent," *American Psychologist* 14 (1959): 100.
[554] Specifically, the Rorschach Method and the Thematic Apperception Test. Anne Roe, *The Making of a Scientist* (New York: Dodd, Mead, 1953), 7.

studies that addressed the childhood and youth of scientists included the 1955 volume by Paul Brandwein, a science teacher at Forest Hills High School, in Queens (a large comprehensive high school that sent many students to the STS); the NSF-funded survey of science students "lost to college," by Columbia assistant dean Charles Cole, published in 1956; and a study of undergraduates at liberal arts colleges, published in 1952.[555] In addition, in his work on the "Unsolved Problems of the Scientific Career," Lawrence Kubie, a psychiatrist at Yale, who had corresponded with Roe while she was in the process of compiling her work, proposed several hypotheses about the psychology and lives of young scientists that were mostly based on his own experience and his knowledge of other scientists throughout the life cycle.[556]

In their reports, researchers evaluated the place of family, school, and peer culture in the young person's growth as a scientist and a creative person. The researchers looking at the place of family life in young scientists' intellectual biographies used this evidence to make arguments that the new permissive parenting would eventually yield intellectual stimulation. Several researchers mentioned Adorno et al's *The Authoritarian Personality*

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[555] Paul Franz Brandwein, *The Gifted Student as Future Scientist; the High School Student and His Commitment to Science* (New York: Harcourt, Brace, 1955); Cole, *Encouraging Scientific Talent ; a Study of America's Able Students Who Are Lost to College and of Ways of Attracting Them to College and Science Careers*; R. H Knapp and Wesleyan University (Middletown, Conn.), *Origins of American Scientists; a Study Made Under the Direction of a Committee of the Faculty of Wesleyan University* (Chicago: University of Chicago Press for Wesleyan University, Middletown, Conn, 1952).

[556] Lawrence S. Kubie, "Some Unsolved Problems of the Scientific Career (Part 1)," *American Scientist* 41, no. 4 (October 1, 1953): 596–613; Lawrence S. Kubie, "Some Unsolved Problems of the Scientific Career (Part 2)," *American Scientist* 42, no. 1 (January 1, 1954): 104–112; Lawrence S. Kubie, "The Fostering of Creative Scientific Productivity," *Daedalus* 91, no. 2 (April 1, 1962): 294–309.

(1950), which Cohen-Cole names as an influential text for creativity researchers. As Adorno and his co-authors theorized that excessive discipline in the home created rigidity and dogmatism, those investigating the roots of scientific creativity thought that a permissive, encouraging atmosphere might allow for flexibility and innovation in thought. For example, Maury H. Chorness, of the Air Force Personnel and Training Research Center, reported to the Utah conference that predictors of family environments promoting creativity included the way that parents reacted when their children used household items as toys; the "level of interest or irritability manifested by parents in hobby items or toys found underfoot"; and the degree to which parents were good at thinking up things for children to do during inclement weather.[557]

Tellingly, although they credited the actions of parents with encouraging scientific creativity, the researchers generally evaded any implication that an aptitude for science might be inherited, with Paul Brandwein going so far as to avoid the use of the term "science talent" because "there exists the notion that the core of these talents is to some extent hereditary."[558] In this, the postwar commitment to the idea of the meritocracy is evident. In Cole's list of hypothetical students "lost," for example, many have inherent talent, but are unrecognized in their families or communities:

> An automobile worker's son in Detroit will discover that his family hasn't enough money for him to go to the college that has admitted him. A brilliant Negro youth

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[557] Maury H. Chorness, "An Interim Report on Creativity Research," in *Scientific Creativity, Its Recognition and Development. Selected Papers from the Proceedings of the First, Second* (New York: Wiley, 1963), 290.
[558] Brandwein, *The Gifted Student as Future Scientist; the High School Student and His Commitment to Science*, 2.

> in Georgia who is advised not to take the college preparatory course will never bother to apply to college. The death of her father will prevent a Kansas farm girl with an interest in mathematics from going on with her education. A 17-year-old in the top tenth of his class in Arkansas will never develop his budding interest in science because his school teaches no mathematics. A bright boy born on the wrong side of the tracks in New Jersey will be forced to go to work for his father the day after high school commencement.[559]

This list recognizes social, educational, and financial obstacles to scientific careers, but casts them as structural, rather than genetic.

The dangers of authoritarianism, evident in the family setting, extended to the classroom. Paul Brandwein thought that teachers who created autocratic laboratory environments tended to lose students; "when a permissive (not coercive, autocratic, or laissez-faire) attitude prevailed, there was a noticeable growth in the ability of youngsters to work effectively."[560] Authority, Brandwein argued, was poison to the budding scientist, who needed to cultivate an attitude he called "questing":

> The general acceptance of authority in a given field of scholarship without question and without ascertaining the reliability and validity of the authority is not characteristic of questing; the belief that all is well in this best of all possible worlds is not questing…Questing arises in a dissatisfaction. Questing…results in curiosity.[561]

Roe described what she saw as a climate in schools that squelched intellectual curiosity; many of the scientifically able students might have conflicts with authority figures, as "many of them are brighter than their teachers, and can think up a lot of things that are

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[559] Cole, *Encouraging Scientific Talent ; a Study of America's Able Students Who Are Lost to College and of Ways of Attracting Them to College and Science Careers*, 57.
[560] Brandwein, *The Gifted Student as Future Scientist; the High School Student and His Commitment to Science*, 52.
[561] Ibid., 10–11.

very difficult for teachers to cope with."[562] Getzels and Jackson had warned about the fate of "divergent" students: "Divergent fantasy is often called 'rebellious' rather than *germinal*; unconventional career choice is often labeled 'unrealistic' rather than *courageous*."[563]

If, in the findings of these researchers, young scientists could be hurt or helped by parents and teachers, their special hell was their peers. "Social integration or isolation" was a problem for many of Roe's respondents. Roe found that both biologists and physical scientists exhibited this pattern: "the rather shy boy, sometimes with intense special interests, usually intellectual or mechanical, who plays with one or two like-minded companions rather than with a gang, and who does not start dating until well on into college years."[564] Roe speculated that many of the respondents had maintained their childhood curiosity and developed it in intellectual directions *because* they had failed to develop socially or physically; "it is evident that a boy who cannot, for some reason (e.g. physical disability, or an immediately older brother) compete effectively in sports can gain at least some status by surpassing the other boys in school work."[565] Roe worried that this strategy might cause gender trouble; she thought scientific boys were sensitive,

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[562] Anne Roe, "Personal Problems and Science," in *Scientific Creativity, Its Recognition and Development. Selected Papers from the Proceedings of the First, Second*, ed. Calvin W Taylor and Frank Barron (New York: Wiley, 1963), 134–136.

[563] J.W. Getzels and P.W. Jackson, "The Highly Intelligent and the Highly Creative Adolescent: A Summary of Some Research Findings," in *Scientific Creativity, Its Recognition and Development. Selected Papers from the Proceedings of the First, Second*, ed. Calvin W Taylor and Frank Barron (New York: Wiley, 1963), 172.

[564] Roe, *The Making of a Scientist*, 92. Social scientists, however, were more active on the dating scene; Roe said of their interviews on the subject "I have a decided impression, not only of much more dating, but also of much freer sexual activity generally."

[565] Ibid., 235.

and worried that they might "be derogated by athletic boys, who are likely to be the big shots in high school." Meanwhile, "many intelligent girls never learn to reconcile their type of intelligence and their femininity."[566] Kubie thought that people who became scientists might typically have developed neurotic tendencies early in life that thwarted some aspect of aggression and sexual development. "If…[the young scientist] is intellectually stimulated by one or another of the emotionally significant adults of his life, he is likely to turn away from athletics and the social life which he finds difficult to more bookish activities"; the turn would become more and more pronounced as the scientist moved through his youth, as the "life of the mind" would take precedence. "Because of the extra drain of the laboratory on the student's time, the young man who sets out to become a scientist spends his adolescence putting every emotional egg in the intellectual basket to a greater extent than is true for most other intellectuals."[567]

The concern on the part of these scientists for their younger counterparts sometimes departed from objectivity and veered into bitter reflection. Near the end of his paper on the personality of scientific researchers, psychologist Raymond B. Cattell argued that the paucity of "pure research" coming from American science was due to the "cult of the extrovert" in American schools. Admitting that he was "seasoning the dish with definite personal value judgments," Cattell wrote, "Whereas the schools for at least two generations have cherished the ideal of the extrovert, almost as if it were synonymous with mental health, the evidence is overwhelming that the creative person is

[566] Roe, "Personal Problems and Science," 136.
[567] Kubie, "Some Unsolved Problems of the Scientific Career (Part 1)," 598–599.

an introvert." This "cult" came along with "worship of conformity, fads, and fashions," "low regard for intellectual activity" and a "preference for the witty over the wise, the casual over the exact, and the verbal, emotional, and superficial over the thoughtful, objective, and penetrating."[568]

At least one researcher at the Utah conference recreated the conditions that were believed to stifle scientific creativity, in order to observe the negative influence of peers more closely. E. Paul Torrance surveyed peer attitudes toward creative children, using an experiment in which he gave groups of children a collection of science toys and told them to find out which principles the toys were meant to illustrate. He found that by sixth grade, "groups have developed a varied repertoire for controlling their most creative members," including "open aggression and hostility, criticism, rejection and/or ignoring, the use of organizational machinery to limit scope of operation and to impose sanctions, exaltation to a position of power involving 'paper work' and administrative responsibility, and the like," while the creative children developed adaptations including "compliance, counter-aggressiveness, indomitable persistence, apparent ignoring of criticism, clowning, silence and apathy or preoccupation, inconsistent performance, filling the gaps when others falter, solitary activity, and the like."[569]

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[568] Raymond B. Cattell, "The Personality and Motivations of the Researcher from Measurements of Contemporaries and from Biography," in *Scientific Creativity, Its Recognition and Development. Selected Papers from the Proceedings of the First, Second*, ed. Calvin W Taylor and Frank Barron (New York: Wiley, 1963), 129–130.
[569] E. Paul Torrance, "Explorations in Creative Thinking in the Early School Years: A Progress Report," in *Scientific Creativity, Its Recognition and Development. Selected Papers from the*

In their experimental design, observations, and hypotheses, researchers looking at children's interest in science agreed that young scientists faced an inhospitable social milieu. If Mead and Metraux had found in their evidence that high schoolers disdained adult scientists, here was proof that the "embryo" scientists were themselves the targets of scorn. The Science Talent Search was partially founded as a method of shifting this culture; in its selection of young scientists, however, it hoped to find the "well-rounded" student who had managed to get good grades in school and could take a test that relied on verbal ability.

Aptitude in Action: The Science Talent Search and its Discontents

In 1945, Paul Brandwein wrote to the letters department of *Science* with a critique: "The 'Science' Talent Search is in its fourth year. As a teacher of science…the writer has regularly brought it to the attention of all science students, has complied with the rules of the contest and has sent the papers of the contestants to the examination committee. During these years, the writer has shared with others the feeling that this may not be a science talent search." Brandwein criticized the certainty with which the sponsors of the STS had promoted the outcome as definitive in the determination of what it meant to have "science talent." The centrality of the written Science Aptitude Examination to the process was one of his major criticisms; he asked, "Is it possible that students who can not succeed in the written examination and who were successful in the

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Proceedings of the First, Second, ed. Calvin W Taylor and Frank Barron (New York: Wiley, 1963), 182.

other parts, if given the publicity and opportunities afforded the winners, might make equally good scientists?" As it stood, he said, "the present Science Talent Search could well be called 'Scholarships For Good Students with Present Interests in Science.'"[570]

The process of selection of the forty "winners" each year was composed of what Britt and Edgerton called "hurdles." The order of these "hurdles" changed from year to year, but included submission of a completed Science Aptitude Examination, a Personal Data Blank (which asked the teachers "in the best position to judge the fitness of the student for the further study of science" to assess the student in categories such as "Attitude-Purpose-Ambition"; "Scientific Attitude"; "Work Habits"; "Resourcefulness"; and "Social Skills"); an essay; and complete school transcripts.[571] Edgerton reported that about 2,000 to 4,000 high school seniors entered the contest yearly; 300 were listed as "Honorable Mentions," and 40 won a "Washington Trip" and were designated "Winners," and then underwent an interview with the Board of Judges.[572] This interview was the basis on which the judges picked scholarship winners out of the pool of forty winner/finalists. Each student was interviewed separately, and asked standardized

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570 Paul F. Brandwein, "The 'Science' Talent Search," *Science* 101, no. 2614, New Series (February 2, 1945): 117.
571 "Personal Data Blank: The First Annual Science Talent Search" (Science Service, Inc., 1942), G. Edward Pendray Papers, Princeton University Archives, Box 40, Folder 3.
572 Edgerton, "Harold A Edgerton, PhD: A Career in Industrial and Measurement Psychology." In 1942 and 1943, the first two years of the contest, a combined total of 6,656 students entered. Harold A. Edgerton, "Science Talent: Its Early Identification and Later Development," *The Journal of Experimental Education* 34:3 (April 1, 1966): 90.

questions meant to assess the strength of the student's preparation for a science career, as well as the student's desire ("drive") to have such a career.[573]

Despite the Science Service's continual emphasis on the "creativity" of the science students they sought, the Science Aptitude Examination itself included no questions that would test the students on the novelty of their thoughts (factors which Guilford cited as important in the creative mind in his 1950 address).[574] Edgerton used the word "aptitude" to describe the examination, joining the postwar trend toward use of standardized "aptitude" testing as a way of fairly assessing merit of college applicants. So, for example, Edgerton wrote in the Science Service publication *Science News Letter* in 1942 that the test was designed not put "a heavy premium on previous knowledge of science," but rather to "select those who have the aptitude to study science in colleges and universities."[575] Edgerton, who composed tests designed to assess aptitudes in various populations throughout his career, created twenty-nine versions of the Science Aptitude Examination; because the test was released to the public after being administered each year, every year's test needed to be new. Edgerton wrote, in what some might perceive as an admission, "Basically it was an academic aptitude test dressed in science clothing."[576]

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[573] Harold A. Edgerton, "How Science Talent Winners Were Chosen Told by Judge," *The Science News Letter* 42, no. 4 (July 25, 1942): 55.
[574] Guilford, "Creativity," 452.
[575] Edgerton, "How Science Talent Winners Were Chosen Told by Judge," 54.
[576] Edgerton, "Harold A Edgerton, PhD: A Career in Industrial and Measurement Psychology."

Within the discourse surrounding education reform in the 1940s and 1950s, Andrew Hartman identifies a strain of counter-progressive critique that held up an "intellectually 'hard'….manly, non-relativist intellectual life" as necessary for the world of the Cold War.[577] In the public interpretation of the reasons why American children weren't choosing science as a vocation, the diagnosis of "laziness" was often made; for example, in the *Saturday Evening Post*'s coverage of Mead and Metraux's survey, their editorial writer argued, "Too many young Americans today do not want very hard, responsible work, with little prospect of a comfortable income."[578] In the construction and presentation of the Science Talent Search, and of the Science Aptitude Examination in particular, the Science Service emphasized the difficulty and strenuousness of the process. Addressing Marion Cecile Joswick's classmates, Margaret Patterson colorfully described the dropouts of the first STS—the 12,000 students who requested information about the Search and then failed to complete the "hurdles": "[They] gagged on the examination, found their teachers unwilling to recommend them, were conscious of a sagging scholastic record or just couldn't think of 1,000 words to write about their work in science."[579] In 1956, the Service's press release about the STS noted, "in the past 15 years 204,771 high school seniors have taken the Science Talent Search aptitude test. Of this number only 40,926 have been able to complete all the requirements of the Search."[580] The Science News-Letter reprinted sections of the yearly Examination in

[577] Hartman, *Education and the Cold War*, 5.
[578] "Where Do Our Young People Get Such Crazy Ideas About What Scientists Do?".
[579] Patterson, "Presentation of Science Talent Search Plaque to Miss Marion Cecile Joswick."
[580] Science Service, "Science Talent Search Winners Invited for Scholarship Finals," January 24, 1956, Smithsonian Institution Archives, Record Unit 7091, Box 330, Folder 5.

several issues, calling it "science's super-quiz of the year." The accompanying article, which ran several years in a row with slightly altered text, told the reader that the quiz was meant to be frustrating: "Don't expect to make a perfect score. No one of the thousands of boys and girls who have taken Science Talent Search examinations has ever made a perfect score. They are not expected to do so. Neither are you."[581]

The difficulty of the test was represented as a mechanism meant to identify "science talent" in particular: "The test is made quite difficult intentionally in order to eliminate the persons who do not have perseverance to finish a job….The high school seniors were not required to take the test. They could walk out on it—and many of them did, thus withdrawing from the competition."[582] There was a reason for this, the *News Letter* said: "This ability to finish what is started is a prime requisite for solving scientific problems, whether they be in atomic energy, disease control, industrial technology or in everyday life. Sometimes those who quit have reasoning ability, but it isn't useful to them unless they use it."[583]

After the first year, the Science Aptitude Examination's format settled into a three-part structure. The first section had fifty multiple-choice questions. Despite Henderson and Britt's contention that the test would measure aptitude, rather than knowledge, there can be no misunderstanding the fact that these questions tested prior

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[581] "Test Your Science Ability With Sample Problems," *The Science News Letter*, January 29, 1949, 73.
[582] "Quiz for Science Ability," *Science Page*, February 29, 1950, 1.
[583] "Test Your Science Ability With Sample Problems," 78.

knowledge of vocabulary, taxonomy, scientific equipment, and the history of science.[584] The second section, with fifty questions, provided paragraphs drawn from scientific literature, meant to be unfamiliar to the student, which were spread across disciplines. These paragraphs were meant to provoke students to use discrimination and selection in processing new types of knowledge.[585] For each paragraph, about half of the multiple-choice questions could potentially be answered based on reading comprehension; some asked the student to pick an inference that was fair to make based on the information contained in the paragraph, and some asked for an application of given mathematical formulae to another situation. The third section, also comprising about forty to fifty questions, was meant to test knowledge attained through means other than reading. Some of these questions were designed to measure mechanical ability, as in the diagram of a toy steam engine, with multiple-choice questions about the action of the mechanism.[586] The Science Service reported that the scores ranged from 10 to 15 points (with a single

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[584] "Test Your Science Ability With Sample Problems."

[585] For example, in the 1943 test, the paragraphs were about the following topics: ants as vectors of disease; the relative visibility of stars and planets; the dental formulae used to classify the teeth of vertebrates; the meaning of operationism in the scientific method; the theory of panspermia and the possibility of spontaneous generation of life; the nature of conditioned responses; the anatomical features of the skin; the life cycle of molds; Archimedes' principle; the action of cumulonimbus clouds in precipitation; the circulation system and the liver; and the anatomy of vertebrate embryos. "The Second Annual Science Talent Search Science Aptitude Examination" (Science Service, 1943), G. Edward Pendray Papers, Princeton University Archives, Box 40, Folder 3.

[586] "Quiz for Science Ability," 1.

point being awarded for each of 140-150 correct questions), to 110 to 120. Boys, on average, scored 12 points better than girls.[587]

The test provoked criticism from several quarters—most notably, from working scientists. In 1947, Frank Jewett, physicist, past president of Bell Labs, and then head of the National Academy of Sciences, sent Davis a humorous letter about his attempt to take the Science Aptitude Examination. "Am horrified to find that…I have no aptitude whatever for science—think I'd better carve out a career in the butter and egg business!!" Jewett thought "If promise of capacity as a research man is a goal I suspect the boy would pass high in two or three sectors and fail miserably in all else. If he did well in a variety of sectors I should guess his career in science would be something where a walking encyclopedia was sought….Possibly I'm too flippant in my ignorance but this sort of test would have been Greek to me in the days when I was picking out men for Bell Tel. Lab."[588] Davis took this criticism seriously, writing to his assistant in a note marked "URGENT": "Give me reprints that explain that if you do not make 100 on the STS test you are not a dumb-bell."[589] Replying to Jewett, he was careful to explain, "No one is supposed to make a perfect score on the Science Aptitude Examination" and that the test "is only part of the selection technique." Most of all, he wrote, "You have, of course, put your finger on the essential question which has been uppermost in our minds: can STS

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[587] Fletcher G. Watson, "Analysis of a Science Talent Search Examination," *The Science Teacher* (November 1954): 274–276.
[588] Frank Jewett to Watson Davis, March 6, 1947, Smithsonian Institution Archives, Record Unit 7091, Box 289, Folder 3.
[589] "Notes on Response to Jewett Re: Science Talent Search Tests," n.d., Smithsonian Institution Archives, Record Unit 7091, Box 289, Folder 3.

select creative scientists?" Davis added, saying "Our attempt is only six years old and we are confident that we have selected some who will be good scientists, judged by what they have done in undergraduate and graduate work."[590]

If Jewett thought that the test favored "walking encyclopedias," others believed that the test would select for the well-rounded intellectual, as opposed to the scientific obsessive. Banesh Hoffmann, a physicist employed at Queens College, responded in the *American Scientist* to an earlier article in which Edgerton and Britt had described the "hurdles" of the selection process. Hoffmann, who in 1956 confronted the Educational Testing Service with a strong critique of the SAT, was later to write a whole-hearted manifesto against the growth of standardized tests, *The Tyranny of Testing*. His major critique of the SAT and other tests was that they confounded the more intelligent students, who would find them confusing and poorly constructed.[591] Hoffmann thought that the reading comprehension questions in the Science Aptitude Examination would not measure scientific ability, and suggested that if the test had been administered to a non-self-selected group of students (as opposed to the self-identified "future scientists" applying to STS), "would not one expect to find the future patent attorneys, the future authors of first rate detective stories, and other literary persons with clear heads edging out many of the genuine scientists in direct competition?" Hoffmann thought that the test, and the whole process, favored "the polymath at the expense of the specialist," and

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[590] Watson Davis to Frank Jewett, March 14, 1947, Smithsonian Institution Archives, Record Unit 7091, Box 289, Folder 3.
[591] Banesh Hoffmann, *The Tyranny of Testing* (New York: Crowell-Collier Press, 1962); Nicholas Lemann, *The Big Test: The Secret History of the American Meritocracy*, 1st ed (New York: Farrar, Straus and Giroux, 1999), 99–101.

described the successful student in the STS, cuttingly, as “very clever.” However, he pointed out, “it is an important fact that many very clever people are not scientists, whereas some very great scientists are, on the whole, rather childish and do not sparkle in their more superficial mental processes.”[592]

The 1,000-word project report, or the essay, was the one place where students could control the representation of what the Science Service called their “ability to approach a problem with the originality of thinking that is essential to research.” In 1942 and 1943, the essay had a theme (“How Science Can Help Win the War” and “Science’s Next Great Step Ahead”); after 1943, the essay topic settled on “My Scientific Project”. A minimum of two scientists read the students’ project reports or essays. Students, the introductory material counseled, should steer clear from writing autobiographical essays or historical reports; they should realize that “fancy writing has no place in science…there has been great writing in the sciences but it is the greatness of strength and simplicity.”[593] The project should shine because of its “originality” of conception and execution, rather than because the student was a “fancy” writer or had done a lot of historical research. In planning their projects, students should choose adequately sized problems, for which they had the equipment required to carry out the research. The instructions on attaining “originality” were somewhat vague. Although the Service reassured students that “we realize that students may not have training or apparatus to do

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[592] Banesh Hoffmann, “Some Remarks Concerning the First Annual ‘Science Talent Search’,” *American Scientist* 31, no. 3 (July 1, 1943): 255–265.
[593] “Seniors of 1959,” n.d., Smithsonian Institution Archives, Record Unit 7091, Box 401, Folder 35.

work that is entirely original," they added, "if you repeat the experiments of someone else, try to have some originality about it. If you build a piece of equipment, indicate the parts that you designed. If you follow plans of others, show what you have been able to do in addition to your own work. Thus you demonstrate research ability as well as skill in following directions."[594]

The Personal Data Blank allows us to see what Britt, Edgerton, and the Science Service thought "science talent" would look like from the vantage point of the teacher. In the *Science News-Letter*, Edgerton wrote, "While there has been a classic picture of the scientist as a 'lone wolf,' a modern version is an individual able to think for himself, to lead others, and to work cooperatively. A scientist must be a well-rounded human being."[595] Edgerton and Britt, like the "management man" seeking scientific personnel for the company lab who found himself so maligned in William Whyte's *Organization Man*, sought "well-rounded" scientists who could work collectively.[596] Edgerton and Britt asked teachers about students' "Independence": the student should have a "purpose and a program," be a "self-starter," and should not "always follow 'the way it was done by others.'" They wondered about "Reliability": the student should "attend to details, finish his work on time, stick to the task until it is finished, work steadily at an assigned job"; he should be able to be "trusted with money, property, and confidential information." They asked teachers to rate the student's rationality: "Is he objective about most situations or

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[594] Science Clubs of America, "How You Can Search for Science Talent," 1957, Smithsonian Institution Archives, Record Unit 7091, Box 401, Folder 40.
[595] Edgerton, "How Science Talent Winners Were Chosen Told by Judge," 54.
[596] William Hollingsworth Whyte, *The Organization Man*, A Clarion Book (New York: Simon and Schuster, 1972), 212.

does he react emotionally?" At the same time as he possessed these attributes related to character, the student should also shine in the personality department, or "have the ability to direct others, to gain the whole-hearted cooperation of students and associates, to make a favorable impression on persons he meets."[597] The final "hurdle" of the STS was an interview with the judges' committee. The interviewers were given a form to rate the trip winners on selected traits from 0 to 15; traits rated were "Academic Background; Social and Personal Competence; Interests, Hobbies, and Activities; and Motivation."[598]

The test, and the selection methodology, was not uncontroversial, and the objections mounted to it echo larger controversies over the evolution of the scientific profession. The "personal data blank" bothered Hoffmann the most; he asked "Cannot a great scientist be lazy, shy, uncooperative, and utterly irresponsible?" He posited, "A boy who spends all his time in the fields watching birds may neglect his other activities to such an extent as to appear lazy and good for nothing. He may be very shy and awkward in company. He may be uncooperative when it comes to the usual activities of his colleagues. And he may truant [sic] and behave in other ways suggestive of serious irresponsibility. Yet all with a definite purpose in view." Hoffmann wanted to allow the child scientist latitude to be strange, and to operate outside of the typical organizations of childhood and youth: "Must a scientist be a socialite before he can achieve greatness—in science?...Must he be able to take on responsibility? After all, is it scientists we are trying to select, or boy scouts [sic]?" Hoffmann found this problem to be a serious one, given

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[597] "Personal Data Blank: The First Annual Science Talent Search."
[598] Edgerton and Britt, "The First Annual Science Talent Search," 65.

the STS' claim to prestige: "Should the system spread so as to become the only regular channel through which young scientific talent is officially recognized it would entail serious dangers for the future of American science."[599]

Despite these worries about their methodology, and despite the Science Service's strenuous efforts to depict the finalists as well-rounded and socially well-adjusted, the majority of the finalists, as assessed by the educationist Robert MacCurdy, aligned more strongly with the qualities that Roe, Hoffmann, and other researchers found in their own studies. MacCurdy assessed "personality, attitudes and opinions, activities, and interests" of the STS winners, and found that the students "have a strong curiosity about the cause of everything." They were "curious, rational, persistent, intellectually complex." However, they were "not gregarious."[600] STS finalists "spend more time in church than in prearranged dates with members of the opposite sex. Many indicate a lack of interest in participating in, or in watching, games of chance or athletics." Self-reported interests were "solitary, or nearly so": "They like to read science and to study their courses for school. Nearly all like to take nature walks and play chess. In their workshops nearly all like mechanical activities; they like to tinker with, and repair, mechanical things; do photography; and build radios and 'hi-fi' sets. They are frequently trying to invent things. They do not enjoy being spectators and watching people perform in the theater or on television as much as do their contemporaries in general education."[601]

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[599] Hoffmann, "Some Remarks Concerning the First Annual 'Science Talent Search'."
[600] MacCurdy, "Characteristics and Backgrounds of Superior Science Students," 69.
[601] Ibid.

Edgerton and Britt were allowed to read Hoffmann's article and respond to it in the same issue, and defended themselves on several points of procedure; more than anything, however, they responded to the "favors the polymath" critique by arguing, "the interdependence of all scientific areas is becoming increasingly apparent…most of our outstanding mathematicians, physicists, engineers, and other scientists are 'well-rounded' human beings who are reasonably at home in areas of science in addition to their own particular field of specialization."[602] But most of all, in responding to criticism, Edgerton and Britt pointed to results: the success of the finalists proved, in their minds, that the STS was looking for the right kinds of young people.

The Glass Slipper and the Deserving Winners: Cinderellas at the Science Talent Institute

In 1945, the Science Service's Margaret Patterson told the audience at Marion Joswick's high school that she was impressed by the likeability of the first group of Science Talent Search finalists. "We were quite prepared when we invited the first 40 to Washington, to greet a group of 'brains' with very little else to make them attractive," she said, "but we were pleasantly surprised…to find them just about the nicest people you could hope to meet—and thoroughly human." The students were "well-rounded in their interests," though given to falling into discussions about science during any spare time in the program. They were "absent-minded" (Patterson described a Brooklyn "lad" who continually lost his train tickets; "he is now making a splendid record at Harvard");

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[602] Harold A. Edgerton and Steuart Henderson Britt, "Further Remarks Regarding the Science Talent Search," *American Scientist* 31, no. 3 (Summer 1943): 264.

determined (she pointed to a West Coast boy who executed elaborate travel plans in order to carry out his dream of seeing New York City); and modest and self-deprecating (she indicated a boy refugee from Germany who ordered a whole broiled lobster and picked at the outer shell until asking the waiter for another, since there was "no meat" on that one; "he is now at Harvard and the research he does is as secret from us as the interior of the lobster was to him in those days").[603]

In its representation of the events of the Science Talent Institute and the students who attended, the Science Service slipped between describing the STS finalists as resolutely "ordinary"—curious, self-motivated, and independent, to be sure, but also sociable and leaders among their peers—and stunningly special. Steven Shapin argues that the postwar period saw the development of a discourse around what he called the "moral equivalence" of the scientist: if, in the first half of the twentieth century, scientists had been perceived as special (priests, saints, or magicians), in the postwar period, some scientists worked to demystify their calling, describing it as a job like any other in the service of normalizing their profession. So, for example, Glenn Seaborg told young audiences (including, in 1961, those at the Science Talent Institute banquet):"There is plenty of room in scientific research for those who are not in the genius category."[604] The stakes of representing the scientific vocation in this manner were obvious: if the finalists of the Science Talent Search were "human," others could hope to repeat their accomplishments; since part of the rationale for conducting the Search in the first place

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[603] Patterson, "Presentation of Science Talent Search Plaque to Miss Marion Cecile Joswick."
[604] Shapin, *The Scientific Life*, 77; Seaborg, "Making the Creative Scientist."

had to do with encouraging others to follow suit, and with representing science as an accessible and fun vocation, then this normalization of the young scientist was instrumental in achieving these goals.

On the other hand, the Science Service had a stake in representing the finalists as exceptional. If the process of "hurdling" the STS barrier was to retain its prestige, the students who found success would have to be impressive. Nicholas Lemann uses the metaphor of the "glass slipper" to show how the Scholastic Aptitude Test was believed in the postwar era to have magical powers to identify those who could excel—regardless of background—as members of the American elite; the Cinderellas who fit the "slipper" would be whisked into the upper echelons of the meritocracy.[605] In its representations of the Science Talent Institute and the STS finalists, the Science Service spun a scientific fairy tale, in which merit was recognized and effort rewarded.

The finalists who went to Washington were treated to a whirlwind program of lectures, visits to laboratories, conversations with scientists, project exhibits, judges' interviews, and media appearances. The Science Talent Institute experience was, the testimony of STS finalists shows, both exhilarating and exhausting. Paul Cloke '47 wrote humorously to the new STSers in the *Searchlight*: "If you can't find time to see Washington during the day, you can always see it after 11:30 pm; the STI has ended its session by then."[606]

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[605] Lemann, *The Big Test*, 17.
[606] Paul Cloke, "New STSers," *Science Talent Searchlight*, February 1948, 32.

Unlike the National Science Fair, which moved from city to city each year, the Science Talent Institute was always held in Washington, DC, a location that underscored the growing postwar ties between research science and the government, and reinforced the expectation that STS finalists and winners would become part of the elite scientific establishment. The STI's host city also meant that the Science Service could bring the finalists together with politicians and show them through the halls of power; this allowed for many good photo opportunities. In a tradition that was to be repeated with every Science Talent Search in later years, the assembled group of finalists met and was photographed with the President (or, as with Henry Wallace, described as a "scientist-statesman," the Vice-President).[607]

In 1955, a Science Service press release reported that "young scientists [are] to play host to members of Congress" from their respective districts, at a Congressional Dinner.[608] Many of the field trips on the program were to national laboratories, and program speakers were often drawn from Washington, DC's roster of prominent scientists employed by the government. Speakers in 1952, for example, included Dr. M.H. Trytten, the director of the Office of Scientific Personnel at the National Research Council, and Dr. Alan T. Waterman, the director of the National Science Foundation.[609] At least one year, the STS finalists were asked to give expert testimony before Congress;

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[607] Karl T. Compton, "Young Scientists and War," *The Science News Letter* 45, no. 12 (March 18, 1944): 181, doi:10.2307/3920872.
[608] Science Talent Institute, "Shortage Feared in Medical Research Manpower, Talent Search Told," February 26, 1955, Smithsonian Institution Archives, Record Unit 7091, Box 330, Folder 55.
[609] "Program for the Eleventh Annual Science Talent Search," March 28, 1952, Smithsonian Institution Archives, Record Unit 7091, Box 399, Folder 10.

in 1946, a group of STS finalists testified before a subcommittee of the Committee on Military Affairs, advocating for the establishment of the National Science Foundation (the Kilgore-Magnuson bill, S. 1850) and the Atomic Energy Commission (the McMahon bill, S. 1717). The students submitted a prepared statement that began "The 40 of us…believe that government and science are essentially interrelated. Any nation desiring to remain strong and influential must be scientifically progressive to assure scientific progress and to assure the people maximum benefits from such progress." Over the course of the testimony, STS trip winners offered their opinions on such matters as college admission; popularization of science; and the utility of social science.[610]

The Science Talent Institute programs regularly contained designated periods of time for the students to connect with older, accomplished scientists. The program always called this an opportunity for "winners to meet and engage in scientific conversation with leading scientists"—an opportunity that would lead to another photo opportunity, this one less rigidly posed, and more evocative of fellowship and intense conversations.[611]

The last day of the five-day Institute was devoted to "prime time," in which students could visit what the Science Service called "foremost men and women of

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[610] "Hearings Before a Subcommittee of the Committee on Military Affairs, United States Senate, Seventy-Ninth Congress, Second Session, Pursuant to S. Res. 107 (78th Congress) and S. Res. 146 (79th Congress), Authorizing a Study of the Possibilities of Better Mobilizing the National Resources of the United States. Part 6, Testimony of Science Talent Search Finalists." (Government Printing Office, March 5, 1946), Smithsonian Institution Archives, Record Unit 7091, Box 446, Folder 12.

[611] "Program for the Eleventh Annual Science Talent Search"; "Quizzing the Judge," *Science News Letter*, March 6, 1948; "A Group of the Fourth Science Talent Search Winners...," *Chemistry*, April 1945.

research" working around the Washington, DC area.[612] (In a cute twist of words, another press release called them "the country's leading grown-up scientists."[613]) In 1956, a press release said, finalist Daniel Ch'en, of Eugene, OR, "will discuss the Chapman-Stormen Current Ring and general problems with Dr. Harry Vestine of the Department of Terrestrial Magnetism, Carnegie Institute of Washington"; Thomas O'Brien, of Rochester, MN, "will discuss problems of medicine in relation to space flight with Dr. Walton L. Jones of the U.S. Navy Bureau of Medicine and Surgery."[614]

The final group of people with whom the STSers were encouraged to network were the other STSers. The program regularly listed former STS winners or finalists, who spoke to the "new STSers" about their experiences in college and the early phases of their careers. In 1952, for example, Mr. and Mrs. Richard Milburn, both of whom won STS prizes in 1945, addressed the assembled finalists on the topic "Developing Careers in Science."[615] Reading the *Science Talent Searchlight*, it becomes evident that the STSers arrived at a group identity during their time in Washington. Alumni call each other "Science Kiddies" and "fellow embryos"; salutations like "Dear Gang" abound; letters are sprinkled with reports of other STSers bumped into around campus and entreaties to make it to the reunions held in New York, Chicago, and Boston around Christmas time. In 1948, Eugene F. Haugh '47 enthused: "It surely is grand to belong to a gang like this;

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[612] Science Talent Institute, "President Greets Young Talent Search Winners Today," 1955, Smithsonian Institution Archives, Record Unit 7091, Box 330, Folder 5.
[613] Science Service, "Forty Top Young Scientists Arrive in Nation's Capital," February 23, 1955, Smithsonian Institution Archives, Record Unit 7091, Box 330, Folder 5.
[614] Science Talent Institute, "Teen-Age Scientists of Tomorrow Learn to Chart Scientific Course," March 2, 1956, Smithsonian Institution Archives, Record Unit 7091, Box 330, Folder 5.
[615] "Program for the Eleventh Annual Science Talent Search."

I'm eagerly looking forward to the Xmas reunion."[616] One finalist wrote to the Science Service staff: "I believe I learned more about how to make friends than ever before; at least I felt perfectly at home."[617]

If the networking activities of the Science Talent Institute were meant to impart a message to the contestants about their value and exceptionality, the words of the acclaimed scientists and members of the funding establishment who spoke at their Awards Dinner reinforced the message. Several emphasized the value the scientific profession placed on youth. Dr. Karl T. Compton, then-president of MIT, gave the address at the Awards Dinner in 1944, and emphasized the importance of scientists to national defense, while also making sure to tell students that in science, their youth was an asset. "A very large proportion of the greatest scientific discoveries have been made by men in their twenties or early thirties…This may be because youth is more imaginative and less conservative than old age," he said. "Don't let yourselves be discouraged by observing that textbooks usually show pictures of great scientists as elderly men; this only means that their portraits were not painted until sometime after their great work was done."[618] At least one voice tried to temper the overwhelming

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[616] Eugene F. Haugh, "Dear STSers," *Science Talent Searchlight*, February 1948, 34.
[617] Science Clubs of America, "Science Talent Searchlight," February 1948, 53, Smithsonian Institution Archives, Record Unit 7091, Box 446, Folder 20.
[618] Compton, "Young Scientists and War," 180. In another example, near the end of his speech to the STS finalists at the 1949 gala dinner, chairman of the Red Cross Basil O'Connor listed the names of scientists who had made important discoveries at a young age. "This is how humanity progresses, in every field of endeavor," he said. "The young mind re-explores the established principles and picks up on the flaws previously overlooked. Or starting off on a tangent, in pursuit of some original idea that may have no obvious practical application or intrinsic value, suddenly ends up with an amazing basic contribution to the art or the science of better living." Basil

approbation, as Harlow Shapley told the first class of winners at their banquet, not to get "vain or bumptious" because of this honor: "Most of these vain young scientists perish as scientists through becoming smothered in their own petty vanities and introspections." David Kaiser observes that older physicists during the 1950s and 1960s condemned the younger generation as spoiled by the external rewards that the profession now offered; according to the elders, "social conformity…seemed to lead directly to intellectual complacency."[619] Shapley's remark seemed to make a similar generational criticism even before the postwar shifts in the scientific profession; however, he somewhat tempered the harshness of his critique when he added, "This distinction of being a winner in the Science Talent Search should be a source for sympathy, rather than for congratulations because upon you heavy responsibility has been placed. You have no escape now from the necessity of hard work, persistent thinking, and sincerity in scientific activity. We expect great things of you."[620]

The Science Service made sure that the finalists received exposure in the press, leveraging their youth as an unusual way to frame the discussion of scientific issues. In the 1951 issue of the Science Service publication *Chemistry*, the STS finalists were referred to as "The Famous Forty"; although this may have been wishful thinking on the Science Service's part, the finalists did receive a fair amount of media coverage through

O'Connor, "Science and Humanity" (presented at the Eighth Annual Science Talent Search, Washington, D.C, March 7, 1949), 9–10.

[619] Kaiser, "The Postwar Suburbanization of American Physics," 868.

[620] Harlow Shapley, "Scholarship Winners Told Beware of Bumptious Vanity," *The Science News Letter* 42, no. 4 (July 25, 1942): 52, doi:10.2307/3918955.

the Science Service.[621] The STS finalists were interviewed on the Science Service's "Adventures in Science" radio program each year from 1942-1958, discussing their projects and major scientific issues of the day.[622] The publication of the essays of the first "class" of STS winners in booklet form, by Penguin and the Science Service, was another form of public recognition, framed as public service; as Watson Davis's introduction proposed: "If even one idea presented by these talented young people proves of direct or indirect value to America's military forces, this effort will have been well worth while."[623] The Science Service often tried to achieve coverage by tying student projects to issues of contemporary concern. For example, at the 1956 STS, the Science Service took a poll of the finalists asking how the United States could achieve "technological survival" in the face of the manpower shortage, then released the results of the poll to the press, hoping for coverage pegged to the ongoing worries about scientific manpower. The press release noted that students called for "high schools…to take as much pride in outfitting chemistry and physics labs as they do in outfitting their football teams." John H. Venable, Jr., of Atlanta, GA, thought that "the winner of a science contest should be held in as high esteem as the school's star football player."[624]

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[621] "Young Scientists at Work," *Chemistry*, March 1951, 2.
[622] Terzian, "'Adventures in Science'."
[623] Watson Davis, "Foreword," in *Youth Looks at Science and War* (Washington, D.C. and New York: Science Service and Penguin, 1942), iii.
[624] Science Talent Institute, "Teen-Age Scientists Offer Cures for Threat to U.S. Technological Survival," March 5, 1956, Smithsonian Institution Archives, Record Unit 7091, Box 330, Folder 5. As Venable won the third-place prize that year, his plea may not have been completely disinterested.

STS Finalists as Super-Normal: Hobbies, Personalities, and Homes in the Spotlight

While the Science Service used contestants' opinions on scientific matters or national policy as hooks to promote science coverage, the contestants' life histories were opportunities for reshaping public opinion about scientific professions. The "Supplementary Information" that the Science Service provided to newspapers—short life histories of the contestants, their projects, hobbies, and commitments—were a chance for the Service to depict the contestants as healthy, well-adjusted people whose childhoods had been full of achievements both wondrous and ordinary. A 1955 STS press release described the scientist as a paradoxically omniscient and easy-going everyday citizen: "Today's scientist no longer fits the popular misconception as to his kind—a retiring, cloistered, head-in-the-clouds individual who shuns the company of all except the few who possess advanced know-how in his particular field of endeavor. Today's scientist knows about—and can talk about—biochemistry and Beethoven, paleontology and politics, biology and baseball, dermatology and Democrats, radioactivity and Republicans."[625] Nor were younger scientists exempt from the requirement for well roundedness; another press release from that year described the STS winners as "a teen-age boy physicist-mathematician-chemist…who stars on his high school's varsity tennis

[625] Science Talent Institute, "Teen-Age Scientists of Tomorrow Learn to Chart Scientific Course."

team…a Colorado boy entomologist who excels in his chosen field, has a consuming interest in Shakespeare, and plays a hot guitar."[626]

The privileging of the "well-rounded" young scientist is striking, when contrasted with the level of commitment to scientific activity that the Science Service recommended to young people inquiring about scientific careers. In their pamphlet "How to Get Into Science and Engineering," the Service recommended a rigorous slate of activities: get good grades, experiment in science on your own, enter science projects in science fairs, read science literature ("if you demonstrate a serious, intelligent interest, you can probably arrange to have access to the library of some research or industrial laboratory in your vicinity"), go to professional scientific meetings ("serious young scientists normally are welcome at such meetings"), meet professionals in your area of interest, join and participate in a science club (but "minimize time spent in meetings that are just talk"), and, finally, "enter scholarship and other competitions."[627] Membership in such intellectual clubs as math team, chess club, and science club was common among STS finalists, and the Supplemental Information sheets and other press materials written by the Science Service did use this profile as a way of provoking wonder in the reader. For example, in 1958, the Science Service's "Young Scientists" copy—provided to newspapers participating in the Service—began with this lede: "When Daddy was a boy, he built a scooter out of a board and some old wheels, or maybe he put a crystal radio set

[626] Science Service, "Pennsylvania Boy, Wisconsin Girl, Colorado Boy Take Top Talent Search Honors," February 28, 1955, Smithsonian Institution Archives, Record Unit 7091, Box 330, Folder 5.
[627] Science Service, "How to Get Into Science and Engineering," n.d., Smithsonian Institution Archives, Record Unit 7091, Box 401, Folder 35.

together in a cigar box and ran the aerial out on the clothesline…No wonder he feels a thousand-bewildered-years-old when he looks over the hobbies that this generation plays with for relaxation: cyclotrons and radiation analyzers, for instance."[628] To some degree the STS did reward those whose "hobbies" were science-related, despite the image that these hobbies might present of a one-dimensional "genius" type. The Supplementary Information sheet for the 1953 contest said of Howard Resnikoff, of Brooklyn: "His extra-class activities lean heavily toward those which will further his career or otherwise require planning and thought—mathematics and physics team, chess team and scientific games club."[629]

Mention of non-scientific hobbies served to anchor the "new generation" to reality, while still maintaining a wholesome image. Finalists were often described as "finding time" for their hobbies alongside their scientific work. In "Supplementary Information," students mentioned many non-scientific hobbies, such as tennis and dancing, fishing, camping, debating, and acting in class plays. In just a few examples of this kind of presentation, the Information for Paul Erhard Teschan, of Milwaukee, the 1942 winner, mentioned that he had had his arrangement of "The Erl-King" performed by his school glee club.[630] In 1956 the Supplemental Information for finalist Robert A. Gorn, of Newton, MA, wrote, "although science is his first love—he hopes to become a research physicist—he is an accomplished piano player and ice skater, and is an Eagle

[628] Science Service, "Young Scientists Series."
[629] Science Service, "Supplementary Information for the Twelfth Annual Science Talent Search."
[630] "Twenty Scholarship Winners Chosen for Science Talent," *The Science News-Letter* 42, no. 4 (July 25, 1942): 51, doi:10.2307/3918955.

Scout."[631] "Most of these aspiring scientists have been recognized as leaders by their fellow students by being elected to office in numerous clubs and organizations," the 1946 Supplemental Information mentioned.[632]

As the ultimate token of normalcy, many Science Service press releases mentioned the athletic prowess of the finalists. This was particularly significant, because, as alluded to above, the older scientists who debated manpower issues in the postwar era often mentioned the degree of approbation afforded athletes in high schools with an envious eye. In one example, NSF founding head Alan T. Waterman remarked in his 1960 introduction to the reprint edition of *Science: The Endless Frontier*: "As a nation we still seem a long way from a universal understanding and appreciation for intellectual activity generally and probably will remain so until we attach roughly the same importance to academic achievement as we do, for example, to prowess in sports."[633] The Science Service was not unaware of this oft-repeated argument. In a memorandum written to convince newspapers to support local science fairs, Davis quoted a cooperating editor: "'It's a grand feeling to have one of my readers come up to me and say "I'm so glad you are doing something for someone who isn't a half-back.'"" Davis then went on to quickly qualify: "(Don't misunderstand the reader, the editor, or us—for we are all in

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[631] Science Talent Institute, "Robot, Electronic Turtle, Space Satellite Among Teen-Agers' Science Exhibits," March 3, 1956, Smithsonian Institution Archives, Record Unit 7091, Box 330, Folder 5.
[632] Westinghouse Company, "Finalists Announced In Fifth Annual Science Talent Search," January 24, 1946, Smithsonian Institution Archives, Record Unit 7091, Box 392, Folder 5.
[633] Alan T. Waterman, "Introduction," in *Science, The Endless Frontier*, by Vannevar Bush (Washington, D.C: National Science Foundation, 1960), xvii.

favor of football and many top science clubbers are good players.)"[634] The Science Service press releases about STS finalists didn't miss a chance to mention a finalist's status as football letterman.[635] The Science Service often mentioned the height or body style of the male winners in their press releases, especially when it was impressive. In 1956, the release announcing the winners mentioned a "six-foot plus boy physicist" and a "six-foot, three-inch…boy physicist-engineer."[636] In 1960, the *Science News Letter* described the "top young scientist of the year," Jerome G. Spitzner of St. James, MN, as a "husky young farm-boy physicist" who is "hailed for his scholastic, scientific, and wrestling squad prowess."[637] By focusing on athletic feats and masculine physical appearance, the Science Service claimed some of the approbation normally directed at athletes for its scientist winners, underlining its point that young scientists could be as "normal" as their peers; it also reinscribed a model of scientific achievement that was fundamentally masculine.

While the Service's official representation of its STS finalists adhered to the party line of the scientists being "leaders" among their peers—abnormal only in their extreme normalcy—the Talent Search archives include a few documents that offer a messier look at the contestants' relationships to science, work, and leisure. Only one set of

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[634] Davis, "Memorandum on National Science Fair," 1.
[635] Science Service, "Supplementary Information for the Seventh Annual Science Talent Search," 16; Science Service, "Mathematical Talent Wins $2,800 Science Scholarship," March 5, 1956, Smithsonian Institution Archives, Record Unit 7091, Box 330, Folder 5.
[636] Science Talent Institute, "Maryland, Illinois, and Georgia Boys Take Top Talent Search Honors."
[637] "Top Young U.S. Scientists Chosen," *The Science News Letter* 77, no. 12 (March 19, 1960): 182, doi:10.2307/3941955.

"biographical notes" on Science Talent Search finalists survived in the Science Service archives, from the Search of 1953. It's unclear who compiled these notes, or what they were used for, though it seems fair to presume that they may have been used to create the Supplemental Information sheets that were distributed to newspapers. The raw content, however, contains much more insight into teachers' honest evaluations of their students than was included in the Supplemental Information sheets. In what seem to be excerpts from their responses to the "Personal Data Blank," many of the teachers wrote that the students were *too* invested in science. On John Mack Winter, Jr., of Vermillion, SD, teachers reported that he "spends too much time at serious work—not enough on social activities," though they hastened to add that he was "not socially maladjusted in any respect." David Bryant Mumford, of Summerland Key, FL, had improved in his social relationships recently: "A year ago Dave was a very cocky lad, impressed by his own superior intelligence and disliked by many boys because of his 'chip-on-the-shoulder' attitude. He has mellowed and matured a great deal in the past year." Kenneth Jeremy Harte, of Scarsdale, NY, was "lacking" socially. "Has too small a group of close friends, difficult to get to know—retiring and hesitant in conversation are his principal negative characteristics."

According to the teachers, the finalists' work habits also left something to be desired. Merle A. Mitchel, of Norfolk, VA, was "slow in starting her work, but once she has begun her work it is not difficult to keep her interested in it." Barbara Erika Gertrude Hopf, of Bloomington, IN, "does not organize her time to best advantage. Sometimes is rushed at last minute." Richard Nelson Claytor, of Tulsa, was "an overly self-critical person; this probably keeps him from doing more than he does." David Elliott Sosin, of Highland Park, NJ, "likes to be first to solve problems and therefore sometimes jumps to conclusions." Joanna Russ of New York (later an acclaimed author of feminist science fiction) was "such an enthusiast that she will undertake countless numbers of jobs before realizing she has started too many projects." None of the students whose teachers made these negative comments were top-ten finalists, with the exception of Russ; however, the fact that they made it over as many "hurdles" as they did—reaching the status of "trip winners"—means that the Science Service allowed for at least some introverted behavior in their selection process.

A final piece of evidence is available to show that the STS finalists worked more than would perhaps be considered "well-rounded"—and that the discussion of this level of work was a core part of their culture. The alumni writing to each other in the Science Talent Searchlight spoke of work with a breezy commiseration; their descriptions of their personal levels of "busy" were elaborate and humorous. James B. Gibson '46 reported to his fellow STSers on his work at Cal: "I start studying…beating my cranium….against a stone wall…and my friends start yelling at me to 'Relax and be human!' HA! HA!! HA!!! GRRR!!!!"[638] Gibson dated his letter "?-?-'4?(?)"—signifying his befuddled disconnection from the everyday world. Russell Johnson, Jr. (also '46) wrote: "As soon as I came back to school a reaction against pleasure set in and I have been working uncomfortably hard since. My schedule shouldn't be hard, but it makes me fair dizzy—as

[638] James B. Gibson, "Greetings," *Science Talent Searchlight*, February 1948, 26.

witness the original date on this letter—November 12—still visible thru the scratchings. There was no reason I shouldn't have finished the letter then—I just whirled away from it."[639]

Merit vs. Inclusion: Could The Ideal Young Scientist Be Any American?

In their discussions of the methodology of the STS, Steuart Britt and Harold Edgerton were careful to emphasize what they saw as the meritocratic nature of their selection process. "*The names and geographical localities represented were completely unknown*," they emphasized, "for this information had been blanked out so that identification was by serial number only. Also, no questions concerning either race or religion appeared in any of the forms used."[640] In several instances, winners of humble origins were singled out for press coverage; when the male 1945 winner, Edward M. Kosower, appeared on "Adventures in Science," the press release was careful to mention that his father, who appeared on the program alongside his son, was a taxi driver in New York City.[641] A Supplemental Information sheet for 1957 finalist Warren Carleton Rauscher, of San Francisco, mentioned that he "credits his father, a meat processor, for triggering his

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[639] Russell Johnson, "Dear STSers," *Science Talent Searchlight*, February 1948, 27.

[640] Edgerton and Britt, "The Third Annual Science Talent Search," 320. Perhaps Britt and Edgerton felt the need to emphasize the anonymity of the process because some states (and some schools) were over-represented among trip winners; in 1944, for example, Britt, Edgerton, and the Service's Helen Davis wrote that one-third of trip winners in the first three years of the contest had come from New York State. Harold A. Edgerton, Steuart Henderson Britt, and Helen M. Davis, "Is Your State Discovering Its Science Talent?," *Science Education* 28, no. 4 (October 1944).

[641] Science Service, "Science Experiments Most Interesting Hobby," June 23, 1945, Smithsonian Institution Archives, Record Unit 7091, Box 391, Folder 18.

interest in science."[642] The representation of STS finalists as emergent from all quarters suited the Science Service's professed ideology, which held that science could be found everywhere and for all people. The idea of a young scientist being rewarded for an independent, joyful commitment to science, carried forward without access to expensive equipment or fancy school laboratories, meant that the lives of STS finalists could be reproducible, given a strong enough personal will; that they loved what they did; and that their rewards were entirely fair.

However, a more nuanced analysis of the body of STS finalists reveals that, in many ways, their successes were attributable to the social context into which they were born. In his study of the STS finalists, Robert MacCurdy commented that their families tended to be "stable, cultured, educated; enjoy[s] economic advantages, [have] leisure time, democratic, permissive."[643] In 1959, the *Science News Letter* admitted that 57.5% of the finalists had had scientists somewhere in their family background, but added cheerfully, "conversely, no scientists are recorded on 42.5% of the family trees."[644]

The strong relationship between "democratic" or "permissive" families and STS finalists was one that the Science Service publicized in the *Science News Letter* at the end of the 1950s. In 1959 and 1960, Science Service writer Shirley Moore contributed an STS wrap-up item to the *Science News Letter,* reporting on a survey of the parents of the STS

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[642] Science Service, "Young Scientists Series," February 18, 1957, Smithsonian Institution Archives, Record Unit 7091, Box 402, Folder 6.
[643] "Biographical Notes on Science Talent Search Contestants," 1953, Smithsonian Institution Archives, Record Unit 7091, Box 401, Folder 5.
[644] Shirley Moore, "Raising a Future Scientist," *The Science News Letter* 76, no. 9 (August 29, 1959): 135, doi:10.2307/3941333.

finalists. With the cooperation of the Science Service, and inspired by a Moore article, journalist Marianne Besser wrote a 1960 book which surveyed both scientist parents and parents of STS finalists, asking many of the same questions: how do you raise a kid who likes science? The answers were a primer in new-style family permissiveness: Parents should "share" and "guide" their children, rather than "pushing," "in the direction of the child's own interest." Mothers, especially, should try to join in their children's hobbies whenever possible. When choosing school courses, parents should encourage children to follow their interests, rather than trying to fit in by picking "snap" courses in order to get good grades; relatedly, "two-thirds of the mothers and fathers advised emphasis on research for the pure joy of the search, not mainly for honors and prizes."[645] Many of the mothers told the reporters that they needed to give up their own need to be a "good housekeeper," for the sake of the child's collections, and they advised other mothers to do the same; giving the child permission to be messy was a key part of the process of encouraging inquiry.

Both Moore and Besser found that STS parents were willing to provide their children with what Besser called "a lab of his own," in order to pursue scientific hobbies. Besser interviewed the mother of Eric Martz, of Indiana, who told her about Eric's room decorated with a snake cage, aquarium full of snapping turtles, a "disemboweled radio," and reference books; Besser argued, "Eric's room reflected his personality, interests, hobbies, and tastes—as it should." Besser acknowledged that space might be a

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645 Shirley Moore, "Bringing up a Scientist," *The Science News Letter* 77, no. 23 (June 4, 1960): 362, doi:10.2307/3941907.

consideration for some families, but thought that this limitation could be circumvented by giving a child a corner or a kitchen cabinet as a laboratory; however, the family of the contestant who grew up under these conditions, Philip Wagreich, eventually moved to a "house in the suburbs which had a basement where he could experiment"—and Philip's "science interests were a deciding factor in their move."[646]

While the STS was nominally open to all races, African-American faces were uncommon in the photographs documenting the STSers' Washington trips during the 1940s and 1950s. Moreover, in a 1949 report on the past year's statewide Science Talent Searches, which were conducted alongside the national STS[647], Margaret Patterson reported (without comment) that Alabama segregated the contests by race; while white winners received the generous prize of tuition and fees paid for four years at one of four Alabama universities, the "Negro" winner received no choice: a free ride at Tuskegee. The celebrations were also separate; the white winners received an expenses-paid visit to the Alabama Junior Academy of Science Meeting, while the black winners convened at Tuskegee.[648]

The treatment of female contestants at the STS also complicated the picture of a disinterested meritocracy. Nominally, the STS was committed to shifting the culture so that women could join men in expanding the American scientific workforce. Edgerton

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646 Marianne Besser, *Growing up with Science*, 1st ed. (New York: McGraw-Hill, 1960), 175–177.
647 "Aiding Young Scientists," 245. The state and national searches concurrently, rather than the state-level searches serving as a first barrier to entry for the national contest.
648 Margaret Patterson, "State Science Talent Searches 1948-1949," 1949, 4, Smithsonian Institution Archives, Record Unit 7091, Box 446, Folder 37.

and Britt wrote in 1944 that the contest's first three years revealed a significant difference in the scores of boys and girls on the aptitude examination.[649] The two used this evidence to defend the STS' decision to eliminate gender parity in the larger group of trip winners. (From the mid-1940s onward, the STS selected trip winners according to the ratio of boys to girls who submitted entries.) Edgerton and Britt argued that this difference between the sexes in scores indicated the need for better scientific training for American girls: "They [the girls' scores] are probably due…to environmental and cultural factors rather than to inherent biological differences."[650]

If that's the case, the STS was part of this culture. In an advertisement for the 1943 Science Talent Search, the Science Service's booklet was headed by an illustration of a young man and woman looking from a rise across a vista criss-crossed with telephone lines and neatly tended fields. The man and the woman might represent the "boy" and "girl" winners of the talent search, but for the fact that they are holding hands; a possible vision of equitable labor on scientific problems is submerged by the image of a couple facing the future.[651] In including girls in the search, the STS thought of itself as forward-thinking; however, as will be seen, the actual experience of girl STS finalists may have been more constrictive than liberating.

In the ambivalent relationship of the STS to its female contestants, the Science Service joined a postwar picture of discomfort with female scientists. John Rudolph

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[649] Critical ratios: 1942: 14.4; 1943: 16.6; 1944: 18.2
[650] Edgerton and Britt, "Sex Differences in the Science Talent Test," 193.
[651] "The Second Annual Science Talent Search" (Science Service, 1943), G. Edward Pendray Papers, Princeton University Archives, Box 40, Folder 3.

writes that an interesting consequence of the manpower crisis of the 1950s was the increasing attention paid to the role of women in scientific and technical occupations. Although girls and women were identified as an untapped resource particularly valuable because they couldn't be drafted, Rudolph argues that many of those arguing for the expanded inclusion of women in the sciences were looking for girls to fill non-research jobs: lab technician, high school teacher.[652] David Kaiser argues that the increased "suburbanization" of physics—the transformation of the profession from a calling into a career, and the increasing number of married male graduate students—meant that the environment became increasingly unwelcoming to female graduate students.[653]

The Science Service's representations of young female scientists show the effort the Service was making in order to represent girl scientists as "normal," in the sense of postwar gender roles. Just as the Service tried to represent boy scientists as brawny and athletic, girls needed to be feminine and unprepossessing. The 1955 "girl winner," Kathleen A. Hable, of Loyal, WI, was described as "soft spoken, brown-eyed," and an "accomplished pianist." Hable was "poised, quiet, quick, witty," and was described by her teachers as "do[ing] a lot of work without a lot of noise."[654] In 1960, the "girl winner" was Betty Lou Snarr, of Oklahoma City, OK, described by the *Science News Letter* as "a sparklingly feminine petite chemist"; the *News Letter* added, "The field of physical

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[652] Rudolph, *Scientists in the Classroom*, 60.
[653] Kaiser, "The Postwar Suburbanization of American Physics," 877.
[654] Science Service, "Pennsylvania Boy, Wisconsin Girl, Colorado Boy Take Top Talent Search Honors."

chemistry will be brightened a few years hence by the addition to its ranks of pretty, five-foot-two Betty Lou Snarr."[655]

Girl STSers were portrayed as nurturing and family-oriented. Girls' work with fellow students was portrayed as "helping," while boys were called "authorities" or "leaders."[656] The 1953 Supplementary Information presented Karen M. Spangehl, of Phoenix; she "loves children to the extent of planning a career in pediatrics."[657] Merry Margolish, of New Rochelle, NY, a 1957 finalist, "has two aspirations for her future: raising a family and doing medical research because 'for a woman, a family should be as important as a career.'" In both press releases the year of her contest, the Service led with this quote.[658]

In early years of follow-up surveys assessing the careers of contestants, Edgerton and Britt omitted the girls, as they were "comparatively fewer in number, and many…probably will not pursue active scientific careers."[659] Surveying the 1942 and 1943 contest participants and winners in 1966, Edgerton found that out of a sample of participants numbering 1550, 80% of the female respondents responded to a questionnaire saying that they had left science (compared to 38% of males). Five out of

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[655] "Top Young U.S. Scientists Chosen," 182.
[656] Science Service, "Supplementary Information for the Seventeenth Annual Science Talent Search."
[657] Science Service, "Supplementary Information for the Twelfth Annual Science Talent Search."
[658] Science Service, "Supplementary Information for the Sixteenth Annual Nationwide Science Talent Search," February 6, 1957, Smithsonian Institution Archives, Record Unit 7091, Box 402, Folder 6; Science Service, "Young Scientists Series."
[659] Edgerton, Britt, and Norman, "Later Achievements of Male Contestants in the First Annual Science Talent Search," 404.

eight of these female respondents had ("not unexpectedly," Edgerton said) become homemakers. On this subject, Edgerton found that the smaller sample of female winners interviewed gave him even more conclusive results. Out of 31 interviewees, twenty were married, and eleven were single. A third of the married women had continued to "build a professional satisfaction on top of home responsibilities," although these women "recognized that their husbands' job is of first importance…child bearing limited their professional work." Although those who were single reported occupational satisfaction, they "still found life incomplete and felt that marriage would be a desirable addition to or substitute for their job." Edgerton found no evidence that the single women in the sample had "remained single out of dedication to science; many expressed their desire for marriage, a possibility which becomes more remote as they advance in their professional competence and status." To Edgerton, these findings meant that there was "a need for realism in considering women as a manpower resource in scientific and technical areas, re-examining the social, economic, and education conditions under which they are a tappable resource."[660]

In the *Science Talent Searchlight*, many women wrote in about jobs or school; others, such as Elizabeth Foster (STS '43), reported having put schooling on hold in favor of family. Foster wrote in 1948 about her upcoming marriage to a fellow graduate student: "If I find that sweeping floors (or floor, depending on the extent of our abode) and working at least part time (we're sharing expenses) does not completely occupy my

[660] Harold A. Edgerton, "Science Talent: Its Early Identification and Later Development," *The Journal of Experimental Education* 34, no. 3 (April 1, 1966): 95–96.

time, I may take courses toward a Ph.D."[661] Virginia March Kline (STS '43) reported on her life as a full-time housewife, which left her feeling "isolated": "I'm tutoring organic chem. one afternoon a week to help keep me from forgetting all I've learned in the long four years—hope to go back to work one day."[662] In one issue of the *Searchlight*, women's ambivalence about their post-STS paths was submerged in a cartoon, depicting one woman holding multiple babies, presumably in a postpartum state; she says to her visitor, "Thank goodness I finally have something to report to the STSL" (fig. 7). Among all of the stories from young women recounting productivity in college that appeared in that issue, and other reports evincing misgivings at being out of the lab, the editorial voice evident in this cartoon emphasized reproductivity above all.[663]

Conclusion: Postwar Shifts in Science Promotion

The most salient feature of the postwar shift in discourse about children's science play is its increased instrumentalism. In his 1960 novel *The Child Buyer*, journalist John Hersey depicted the sale of a bright ten-year-old science aficionado to a corporation; the book, written after Hersey had spent the postwar years advocating for better education of gifted children, was a scathing look at the adults surrounding the young Barry Rudd, all of whom find different reasons (greed, blind admiration of authority, even scientific curiosity) to allow the sale. The treatment that Barry will undergo at the hands of the corporation will shut him off from the social world and the natural world, abstracting his

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[661] Elizabeth J. Foster, "Dear Fellow STS'ers," *Science Talent Searchlight*, February 1948.
[662] Virginia March Kline, "Hi Gang!," *Science Talent Searchlight*, February 1948.
[663] "Thanks Goodness I Finally Have Something...," *Science Talent Searchlight*, February 1948.

brainpower until he is only a cogitating machine. *The Child Buyer* asked readers to follow the implications of the incessant calls for increases in manpower to their logical—and horrifying—conclusion. What would a society be, if it refused to recognize a child's right to a period of aimless and undirected play?[664]

Artifacts of children's popular science created in the prewar era, when children's scientific interest seemed common and easy, shifted focus in the postwar era to a career-oriented preparatory mindset. For example, the Brooklyn Children's Museum became "more didactic and task-oriented," hosted workshops and programs sponsored by the National Science Foundation, and acquired more and more books in chemistry, astronomy, and physics, while slowing down purchases of nature study books.[665] The Porter Chemical Company changed their motto in the mid-1950s from "Experimenter Today…Scientist Tomorrow" to "Porter Science Prepares Young America For World Leadership." Perhaps in imitation of the STS, Porter also created a national scholarship contest, which ran from the mid-1950s through the early 1960s.[666] Both examples show the influence on children's culture of public worries over America's continuing scientific and technological supremacy.

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[664] John Hersey, *The Child Buyer; a Novel in the Form of Hearings Before the Standing Committee on Education, Welfare, & Public Morality of a Certain State Senate, Investigating the Conspiracy of Mr. Wissey Jones, with Others, to Purchase A Male Child*, 1st ed. (New York: Knopf, 1960).

[665] Cindy Schofield-Bodt, "A History of Children's Museums in the United States," *Children's Environments Quarterly* 4, no. 1 (Spring 1987): 5.

[666] John Tyler, *The Chemcraft Story: The Legacy of Harold Porter* (Haworth, NJ: St. Johann Press, 2003), 39, 31.

The Science Talent Search might seem, at first glance, to be a real-world version of Hersey's United Lymphomblloid Corporation's hunt for the gifted, or to be invested solely in improving the output of young scientists with a view to "world leadership." But in examining its careful representation of its successful finalists as "well-rounded," independent human beings, it becomes clear that the Science Service was attempting not only to find "talent," but also to represent the "talent" that it found in such a way as to create a new vision of the experience of being a young person in the United States. Whether or not the young scientists who arrived at the STS were actually as "well-rounded" as the Service wanted them to be, they were not juvenile delinquents, obsessed with pop culture, or hopeless conformists.

In looking for the science-obsessed, those working for the Science Service sought young people who, they believed, had—despite the culture that surrounded them—lived an archetypal childhood of an earlier time. In the postwar era, the adults looking to promote science play in young people's lives began to view their project as one of restoring prestige and interest to hobbies that (they believed) had formerly been common. In the space of a few decades, the science hobbyist had gone from appearing "modern" and advanced, as in the images of the "wireless boys" of the Brooklyn Children's Museum or the visions of experimentation on the tops of chemistry set boxes, to seeming vaguely forlorn and alone. From this time on, the young scientist was seen as a figure in need of protection—his curiosity fragile, his ego at risk.

Chapter 5: Science, Liberty, and Fiction: Heinlein's Juveniles and Children's Literature

Robert Heinlein's novel *Orphans of the Sky*, originally published as two short stories in *Astounding Science Fiction* in 1940 and 1941 and then as a book in 1964, takes place on a "generation ship"—a spaceship designed for such a long journey that the human passengers will cycle through several generations before they reach their destination. In this particular generation ship, a mutiny has left the society inside fragmented, with the superstitious remnants of the original crew, having forgotten about the journey, convinced that the ship is the entire universe. The narrative concerns the adventures of young Hugh Hoyland, who was born on the ship; he accidentally finds out the truth about their situation, and spends the rest of the narrative first trying to convince the sanctioned authorities of this truth, and then battling their obstructions as they try to make him fall in with the official line. This story encapsulates Heinlein's vision of the relationship between generational change and scientific advancement: young people are more prepared to learn new things; older people tend to fear any change in their established world order.

Hoyland's eye-opening journey to understanding reality exemplifies the experiences Heinlein hoped his young readers would have when encountering his novels. In 1948, one such reader, a seven-year-old future science fiction writer and critic, Alexei Panshin, discovered a strange book on the shelves of the East Lansing Public Library: *Rocket Ship Galileo*, by Robert A. Heinlein. "There was nothing else in the children's collection like that," he later wrote. "In the late Forties, very little serious science fiction had been published in book form for either adults or children. It was still thought of as pulp literature, more than a bit dubious in the eyes of old-fashioned small town librarians." Once Panshin began to read Heinlein's juveniles, he read all twelve of them, coming to see the books as guides to the real world: "It seemed there was nothing that Heinlein didn't have the true scoop on. He certainly knew more than my schoolteachers did. They were only able to teach me what was ordinary and obvious."[667]

The plots of Heinlein's juveniles[668], which envisioned true education as a process of individualization, were profoundly influenced by his noted Libertarian leanings.[669] The narrative of an education in science, for his protagonists, was inherently masculine; learning mental discipline was a process of individualization, which meant independence from civilization. Harking back to his own childhood as a reference point, Heinlein believed that all American boys were scientifically minded, and that if they weren't turning into scientists, it was because their schools were failing them; for him, the professionalization of education, its bureaucracy, and its rules were unproductive. He

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[667] Alexei Panshin, "Heinlein's Child", n.d., http://www.enter.net/~torve/critics/child.html. I should note that Panshin later wrote a work of literary criticism about Heinlein's oeuvre, *Heinlein in Dimension* (1968), that created such tension between him and Heinlein that Heinlein sued to stop its publication; the controversy over this book, which eventually won a Hugo Award, is still ongoing in fan communities (see, e.g., "What is it with Heinlein fans and Panshin?" – Straight Dope Message Board, n.d., http://boards.straightdope.com/sdmb/showthread.php?t=168279).
[668] The label "juvenile" was used for books intended for young adults before the 1970s, when "young adult" or "YA" became common. See Farah Mendlesohn, *The inter-galactic playground : a critical study of children's and teens' science fiction* (Jefferson N.C.: McFarland & Co., 2009), 5.
[669] On Heinlein's public image as libertarian, see Lehr, Stan and Louis Rossetto, "The New Right Credo -Libertarianism," *New York Times (1923-Current file)*, January 10, 1971. This article, written by two seniors at Columbia, links Heinlein to Ayn Rand, Goldwater speechwriter Karl Hess, and Murray Rothbard, editor of the newsletter Libertarian Forum; the piece points to the 1966 Heinlein novel about a community on the moon that revolts against a dictatorship, *The Moon is a Harsh Mistress*, as a key text.

thought that the teaching of a true scientific mindset should include the encouragement of experimental thinking about the social order; this speculative bent often caused him to run afoul of cultural gatekeepers. For Heinlein, the "true scoop," informed by science, math, and logic, could be transformative for young people, but he believed that this transformation was obscured by the hidebound traditionalism of those who taught and wrote for children. The dichotomies, to his thinking, were clear—science and rationality vs. emotion, young vs. old, progress vs. blind adherence to custom.

Heinlein's books represented the advance guard of the gentrification of young adult science fiction. As Jnis Sviplis has written, young people often read the pulp magazines in which science fiction got its start in the United States in the 1920s and 1930s; writers Isaac Asimov and Frederick Pohl have said that they discovered the genre at age ten, and Heinlein himself read the pulps as a high school student.[670] The 1940s and 1950s represented a transitional phase; as Julia Mickenberg writes, the era's heightened interest in science education translated into bigger budgets for school library purchase of science books, and, in turn, more science books were published to take advantage of the demand.[671] The publication of book-length juvenile science fiction by mainstream publishing houses, and the purchase of it by libraries, was a part of this trend, though opinions differed about its literary and scientific worth. Writing about "Literature, Science, and the Manpower Crisis" in *Science* in 1957, Joseph Gallant argued that an

[670] J. Svilpis, "Authority, Autonomy, and Adventure in Juvenile Science Fiction," *Children's Literature Association Quarterly* 8, no. 3 (2009): 22–26.
[671] Julia L Mickenberg, *Learning from the Left: Children's Literature, the Cold War, and Radical Politics in the United States* (New York: Oxford University Press, 2006), 190.

integration of science and the humanities would create the spark of interest that would bring more students to scientific careers; about science fiction, he wrote "Much in this medium is worthless, but the best specimens are catalysts to the imagination, not to crude and easy fantasies, but to disciplined and orderly marshaling, imaginatively, of the *possible* by extension from the known."[672] In an attempt to offer "quality" reading material, librarians tried to distinguish between this "worthless" science fiction (usually epitomized by the pulps and comics) and the "best specimens." In 1958, for example, *Junior Libraries* ran an article by author Geoff Conklin, advising librarians to look for material written by authors with some scientific training, and to "keep an open mind," not to "confuse s/f with cheap comics"; in fact, he added, "with a little unassuming guidance, s/f can replace comics in the reading diet."[673]

The Heinlein books published by Scribner's, despite their roots in science fiction, received critical acclaim from within the children' literature community. In the *New York Times* in 1950, Ellen Lewis Buell, editor of the children's section of the *Times Book Review*, wrote "We need more writers of the caliber of Robert Heinlein, the only author in [the sf field] who writes consistently (and brilliantly) for young people."[674] Richard S. Alm, reviewing the recent development of literature written especially for adolescents in *The School Review* in 1956, singled out Heinlein as one of fifteen authors "making

[672] Joseph Gallant, "Literature, Science, and the Manpower Crisis," *Science*, April 26, 1957, 791.
[673] Geoff Conklin, "What Is Good Science Fiction?" *Junior Libraries*, April 15, 1958, 18.
[674] Ellen Lewis Buell, "There's Fact and Fancy—And the Horse is Still King," *New York Times (1923-Current file)*, November 12, 1950.

worthy contributions to the reading lives of young people."[675] The Heinlein juveniles also appeared on the New York Public Library's *Books for the Teen Age* list throughout the late 1940s and the 1950s.

After Heinlein entered the field of juvenile sf, and his books sold well, other established sf writers followed suit. Notable publications in this genre included Asimov's Lucky Starr series, 1952-1958, published under a pseudonym, Paul French; the Winston Science Fiction series[676], published by the John C. Winston Company (later Holt, Rinehart, and Winston) from 1952-1961, and comprising 35 novels by authors including Lester Del Rey, Arthur C. Clarke, and Ben Bova; and the Undersea Trilogy, by Pohl and Jack Williamson, published from 1954-1958.[677] Many of these books reprised themes from Heinlein's Scribner's juveniles, with teenage male protagonists and action taking place at academies or boot camps. Two of Heinlein's Scribner's novels were also adapted by Hollywood; *Rocket Ship Galileo* became the 1950 movie "Destination Moon," while *Space Cadet* was the basis for the television serial "Tom Corbett: Space Cadet."[678]

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[675] Richard S. Alm, "The Development of Literature for Adolescents," *The School Review* 64, no. 4 (April 1956): 177.

[676] At least one reviewer juxtaposed the Winston books with Heinlein's juvenile oeuvre, with the former emerging the worse for the comparison: "Characterization, motivation, and even description are meager, if at all present." Villiers Gerson, "Out in Space," *New York Times (1923-Current file)*, June 28, 1953.

[677] Svilpis, "Authority, Autonomy, and Adventure in Juvenile Science Fiction." Svilpis' article contains a more complete overview of the sf work produced for adolescents during this period. To these examples, I would add Carey Rockwell, *Space Pioneers*; the books of Andre (Alice) Norton, including *Star Man's Son*; Ellen MacGregor, *Miss Pickerell Goes to Mars*; Richard Elem, *Teen-Age Science Fiction Stories*; Nelson Bond, *The Remarkable Exploits of Lancelot Biggs, Spaceman*.

[678] Franklin, *Robert A. Heinlein*, 14. I am not examining either of these texts in this chapter, for the following reasons. Heinlein acted as a consultant on "Destination Moon," but its plot was

Heinlein's Scribner's books emphatically align science practice with masculinity, individualism, and personal expansion. His conflicts with his editor, Alice Dalgliesh, and with other professionals determining the content of children's reading, were informed by the gender politics of the postwar era; both the subject matter of his books and their publication history is embedded in the gendered nature of debates over the role of mothers, teachers, and experts in children's lives. World War II and the postwar years were a high point in the American discourse of "mother-blaming." In these years, Philip Wylie's *Generation of Vipers* (1942) was published; social scientists worried about the consequences of maternal overinvolvement for children being brought up in the "suburban matriarchy"; and Hollywood produced "Rebel Without a Cause" (1955) and "Psycho" (1960), both of which showed the terrible consequences of over-mothering.[679] As described in the last chapter, postwar worries about the fate of the young scientist in the school system often took the shape of fear that since intellectual activity was culturally perceived as feminizing, no young man would want to take up science as a vocation. The Science Service's depiction of successful STS finalists as athletic and physically fit was meant to counteract this perception. Heinlein's project—the work of a

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substantially altered from *Rocket Ship Galileo*'s initial outline, and its protagonists were grown men; the film was intended for an adult audience. Heinlein was not officially associated with 'Tom Corbett: Space Cadet," and wrote to Dalgliesh and her assistant that although the show was popular, he didn't think Scribner's should try to promote *Space Cadet* by associating it with the serial, which he found "moronic." Robert A. Heinlein to Alice Dalgliesh and Virginia Fowler, January 5, 1951, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.

[679] Wini Breines, *Young, white, and miserable : growing up female in the fifties* (Boston: Beacon Press, 1992); Stephanie Coontz, "When We Hated Mom," *The New York Times*, May 7, 2011, sec. Opinion, http://www.nytimes.com/2011/05/08/opinion/08coontz.html?_r=4&pagewanted=all; *"Bad" Mothers: The Politics of Blame in Twentieth-Century America* (New York: New York University Press, 1998).

man who identified himself as firmly on the side of science and scientists—was another reclamation of science as a vital activity of American boyhood.

Heinlein saw science fiction as a medium for presenting boys with a vision of a life spent committed to extrapolative thinking. He hoped readers would get hooked on the kind of "scientific" analysis that could not only provide them with power over their physical environments, but also help them re-think the parameters of their social order. In twelve years of writing for Scribner's, he solidified his opinion about officially sanctioned children's literature: he resolved that those who shaped children's reading material were underestimating children's ability to handle technical detail and sociological speculation. In this, Heinlein believed, children's literature (which he viewed as the province of women, much like teaching and mothering) was not only failing children, but also weakening national resolve in a time of war.

This chapter will first recount the history of Heinlein's involvement with Scribner's, and provide context for the place of these "juveniles" in the publishing landscape of the time. Then, turning to the texts themselves, I will show how Heinlein's vision of the connection between science and individualism advocated a circumvention of formal schooling. Heinlein's sociological speculations within these juveniles, which included the elimination of schools, challenged boundaries between the "adult" and the "child." At the same time, the freedom that his young protagonists found through their independent pursuit of science was consistently gendered male. In Heinlein's vision, loving science could help a child escape the external social constraints of being young;

gender, on the other hand, made inexorable biological demands, and no amount of affection for math or laboratories could save a girl from her fate.

Heinlein, Children's Literature, and Science Fiction

Heinlein often claimed authority to know "what boys like" on the basis of his own childhood, education, and coming-of-age, leveraging his nostalgia for his own adventures as a young person in arguing for increased freedom for boys' explorations; in the process, he constructed an autobiography that highlighted his own initiative and curiosity. Heinlein was born in 1907 in Butler, Missouri, one of nine children. The family was lower middle-class, and Heinlein's father worked as a bookkeeper for International Harvester. According to his official biographer, "his father's income was never quite enough,"[680] because of his large number of children. Philip Wylie, who Heinlein admired[681], called himself a "motherless man," distancing his life story from the suffocating mother-son dyad he diagnosed as the cause of so many national problems[682]; Heinlein's tales of his own youth, often full of the independence that being one of nine siblings afforded him, seemed to prove that he too made his own life. Young Heinlein worked various jobs, beginning in third grade. He read Roy Rockwood's Great Marvel series, Tom Swift, Horatio Alger, Twain's *Huckleberry Finn*, Edgar Rice Burroughs, SF pulp magazines, and H.G. Wells. He bought a set of the encyclopedia *The Book of*

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[680] William H. Patterson, *Robert A. Heinlein: In Dialogue with His Century: Volume 1 (1907-1948): Learning Curve*, First Edition. (Tor Books, 2010), 27.
[681] Ibid., 315.
[682] Jennifer Terry, "'Momism' and the Making of Treasonous Homosexuals," in *"Bad" Mothers: The Politics of Blame in Twentieth-Century America*, ed. Molly Ladd-Taylor and Lauri Umansky (New York: New York University Press, 1998), 175.

Knowledge with money he earned delivering newspapers. He had a basement chemistry laboratory ("his youngest sister, Mary Jane, wryly remarked that her mother never knew when the house might explode"[683]) and belonged to science clubs both inside and outside of school. After high school, he attended the Naval Academy at Annapolis, where he trained in engineering; he graduated in 1929, and served as an officer in the early 1930s, before receiving a discharge in 1934 for medical reasons.

Heinlein's life after the end of his active duty in the Navy fluctuated between political involvement and literary effort. Living in California, he thought he might enter politics as a Democratic candidate, and worked for Upton Sinclair's End Poverty in California (EPIC) campaign. He began his writing career in 1939, selling a story to *Astounding Science-Fiction*; his writing was interrupted during World War II, when he worked again for the Navy at the Philadelphia Naval Shipyard doing aeronautical engineering. By the postwar era, he had become ardently anti-Communist; writing a sworn affadavit in 1945 on behalf of a scientist friend who needed to clear his name with an investigatory committee, Heinlein characterized himself as one who "hated" Communists and could "smell" them.[684] During the postwar years, his writing career was still nascent; thus, his time working with Scribner's came at a key career-building phase. Eventually, Heinlein garnered an audience of millions for his adult and juvenile novels, which included his most famous work, *Stranger in a Strange Land* (1961); he published

[683] Patterson, *Robert A. Heinlein*, 28.
[684] Robert Heinlein, "Sworn Statement of Robert A. Heinlein Concerning Robert Cornog", May 17, 1945, Box 306, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.

thirty-five books altogether, all of which are still in print today, and won the Hugo Award for best sf novel of the year four times.[685]

Because of the popularity of his juveniles, and the significant role they played in mainstreaming science fiction for children during the postwar era, Heinlein's professional conflicts with his editor are a site of culture creation that embodies many of the power struggles that shaped science promotion for children during the Cold War. Heinlein often characterized his editor at Scribner's, Alice Dalgliesh, as hopelessly conventional and timid, but Dalgliesh viewed herself as a publisher of "modern" books, and a forward-thinking person. Educated at Columbia's Teacher's College, Dalgliesh initially wanted to be a kindergarten teacher, before transitioning into publishing. Over her career, she wrote over forty children's books, two of which (*The Bears on Hemlock Mountain*, 1953, and *Courage of Sarah Noble*, 1955) received Newbery "honor book" designations.[686] During the 1920s and 1930s, when children's editors debated the relative merits of fairy tales and realistic stories (the "Grimm vs. milk bottles" debate described in chapter 2), Dalgliesh strongly advocated realism. She wrote in *Publishers' Weekly*: "It is an achievement to picture everyday things with understanding and imagination…Modern life…is full of interesting, real things, and there is no time for sugary little fairy tales of the type that

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[685] H. Bruce Franklin, *Robert A. Heinlein: America as Science Fiction* (New York: Oxford University Press, 1980), 4-5.
[686] "ALA | Newbery Medal & Honor Books, 1922-Present", n.d., http://www.ala.org/ala/mgrps/divs/alsc/awardsgrants/bookmedia/newberymedal/newberyhonors/newberymedal.cfm#30s.

used to be published by the dozen."[687] This commitment to the "new" and the "real" in this "interesting world" led her to profess great respect for science and scientists, but she criticized Heinlein's manuscripts nonetheless for being both too technical and too socially extrapolative. Jacalyn Eddy writes that female children's book editors of the 1920s and 1930s identified strongly with their profession and their community, and adds that the "bookwomen" of that era saw themselves as custodians of "taste" for the public.[688] In Dalgliesh's interactions with Heinlein, she was very aware of this gatekeeper role, often making comments and offering criticisms while protesting that she herself wouldn't mind the more daring aspects of his juveniles, but she knew that the greater community of reviewers, librarians, and teachers wouldn't approve.[689]

The publication history of the Heinlein juveniles reveals that Heinlein made a yearly commitment to Scribner's throughout the late 1940s and the 1950s, despite his misgivings about what he saw as the restrictive nature of writing for children. The twelve Scribner's juveniles were published between the years of 1947 and 1958.[690] Heinlein also wrote a thirteenth book for Dalgliesh, *Starship Troopers*, which she found unacceptably

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[687] Alice Dalgliesh, "Improvement in Juvenile Books During the Last Ten Years," *Publishers' Weekly*, October 25, 1930, 1471.
[688] Eddy, *Bookwomen*, 156-157.
[689] In some cases, Dalgliesh sent Heinlein's manuscripts to such figures as Helen Ferris, the editor of the Junior Literary Guild, or Margaret Scoggin, who hosted the WMCA radio show "Young Book Reviewers," and then wrote back to Heinlein quoting liberally from the comments of these respected outsiders as support for her own opinions. Alice Dalgliesh to Robert Heinlein, December 26, 1946, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz; Alice Dalgliesh to Lurton Blassingame, March 18, 1949, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[690] A complete list of Heinlein's Scribner's titles, with publication dates: *Rocket Ship Galileo*, 1947; *Space Cadet*, 1948; *Red Planet*, 1949; *Between Planets*, 1951; *The Rolling Stones*, 1952; *Farmer in the Sky*, 1953; *Starman Jones*, 1953; *The Star Beast*, 1954; *Tunnel in the Sky*, 1955; *Time for the Stars*, 1956; *Citizen of the Galaxy*, 1957; *Have Space Suit—Will Travel*, 1958.

violent and explicit, and which he published with Putnam's instead. Additionally, Heinlein published *Podkayne of Mars* with Putnam's in 1963, a book with a teenage heroine, which some considered a juvenile, though Heinlein himself did not. Many of the books were serialized before their publication—*Farmer in the Sky* was first printed in *Boys' Life*, the magazine of the Boy Scouts. When Heinlein first started writing these books, he thought that they would be aimed at readers in their early teenage years, with heroes three to four years older than the readers[691]; by the time he wrote *Starship Troopers*, he had revised his estimate of his readers' ages upwards, and thought that the typical reader was "fifteen years old, male, and somewhat superior mentality. I am not interested in writing for dullards; I have better things to do with my time."[692] The plots of these books were not directly related to each other, unlike previous series fiction for young people, such as that produced by the Stratemeyer Syndicate; Heinlein thought that this meant that the books could retain their integrity as separate novels, and he and Dalgliesh seemed to agree that "series" fiction carried an undesirable lowbrow flavor.[693]

Although not technically "series" fiction, the books' plots are thematically related; all concern boys who take interplanetary journeys, arriving at a new level of mastery and knowledge in the process. Telling the story of the writing of *Rocket Ship Galileo* for Scribner's publicity materials in 1947, Heinlein wrote that the question that

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[691] Robert Heinlein to Lurton Blassingame, January 29, 1945, Box 331, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[692] Robert Heinlein to George, February 12, 1959, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[693] Robert A. Heinlein to Lurton Blassingame, March 4, 1949, Box 331, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.

prompted the writing of the book was “In what way will the atomic age affect most strongly the lives and interests of boys?” “The answer,” he said, “discounting the awful possibility of World War III, lay in interplanetary flight…The romance of space flight will grip the imagination of the rising generation of boys in the same fashion as did air flight for the generation just passed.”[694] Heinlein often assumed that boys would be interested in the things that fascinated him, and his interest in rocketry and space travel might have driven this assessment of boys’ interests, but in this case the postwar fashion for space-themed television, films, radio shows, and toys stood witness to the accuracy of his diagnosis.

Science as Self-Discipline: Heinlein vs. the School

In the opening pages of Heinlein’s first juvenile, *Rocket Ship Galileo*, the scientist uncle of one of the protagonists inspects the group laboratory where his nephew and two friends conduct investigations. He is impressed with the level of systematization that he finds: “It is common enough in the United States for boys to build and take apart almost anything mechanical, from alarm clocks to hiked-up jalopies. It is not so common for them to understand the sort of controlled and recorded experimentation on which science is based.” Uncle Don Cargreaves also visits his nephew’s solitary basement laboratory, which, he tells his nephew, is a bit messy, but seems to contain the makings of real science: “It didn’t look like a drawing room but it did look like a working laboratory.” Especially important to the scientist’s positive assessment was the notebooks he saw that

[694] Robert Heinlein, “Tomorrow the Moon”, 1947, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.

his nephew kept, notebooks which, one of the friends volunteers, are "the influence of Ross' old man," a retired electrical engineer. "Dad told me," Ross says, "he did not care how much I messed around as long as I kept it above the tinker-toy level. He used to make me submit notes to him on everything I tried and he would grade them on clearness and completeness." Importantly, however, Ross' dad doesn't continue to contribute to his son's lab activities after that point: "He says they're our babies and we'll have to nurse them," Ross tells Art's Uncle Don.[695]

From *Rocket Ship Galileo* to his final Scribner's juvenile, *Have Space Suit—Will Travel*, Heinlein featured young protagonists who achieved manhood through hours of independent study and a devotion to exacting technical detail. His highly individualistic philosophy of education assumed that the American boy was interested in science, and that what he needed to succeed at shaping his interest into commitment was not a school or a pedagogically trained educator, but plenty of elbow grease and contact with older, established men who practiced science, math, or engineering. Like the criteria for winners of the Science Talent Search, Heinlein's books preached the virtues of independent inquiry, leavened with some carefully considered contacts with "real" scientists, and promised that this approach would be rewarded. Other objects of children's culture produced during this time also featured the informal science education that took place when a child encountered a "real" (usually male) scientist. The television show "Mr. Wizard" (1951-1965), for example, revolved around the encounters between the avuncular Wizard and the children living in his neighborhood, while the Danny Dunn

[695] Robert A Heinlein, *Rocket Ship Galileo* (New York: Scribner, 1947), 15-16.

series, by Raymond Abrashkin and Jay Williams, depicted a boy who forms a bond with a scatter-brained professor, Euclid Bullfinch, and learns his science through helping Bullfinch with his experiments. These learning situations abstracted science teaching from the school setting; as in Heinlein's books, the message is that one way to truly "get" science was through one-on-one contact with a male teacher with practical experience.

Heinlein held the libertarian belief that a school bureaucracy could not educate, and that children and, to a lesser degree, their parents needed to take their children's education into their own hands. This point of view was informed by his own experience with schooling; he argued that he had attended a school with overcrowded classrooms and insufficient facilities, and that he had, nonetheless, managed to learn, through his own desire to do so. Near the end of his time writing for Scribner's, Heinlein wrote to Dalgliesh defending his inclusion of corporal punishment in *Starship Troopers*; a lack of corporal punishment, for Heinlein, came to stand in for all of the things that he saw wrong with the school system. Heinlein wrote:

> I have formed a firm opinion that we have probably the worst secondary schools on this planet—and I have checked schools in our Deep South, the East Coast, the Middle West, and the West Coast and have compared them with schools in South America, in Singapore, in Australia, in Indonesia, in Denmark, and many other places. We have the worst schools, the most palatial school buildings, and the most over-privileged and self-pitying and under-qualified teachers I have found anywhere. And by <u>far</u> the worst discipline![696]

His objections to American schooling and American teachers were founded partially in the gender of the schoolteacher: "Our American public schools are today largely staffed

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[696] Robert Heinlein to Alice Dalgliesh, February 17, 1959, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.

by half-educated females and spiritually-castrate males (who are just as ignorant)."[697] These teachers, he believed, were incapable of guiding young people to acquire the kind of mental discipline that was necessary for learning science and mathematics. Indeed, as shown below, most effective teachers within the Heinlein juveniles are men—usually men with practical experience in the STEM fields or the military (bona fides which, by Heinlein's lights, could not help but exempt a person from being "spiritually-castrate").

Part of the process of achieving mastery for the protagonists in Heinlein's books—and, thus, for his imagined readers—was the young person's realization that education was a highly individualistic project, one best carried out outside of the confining parameters set by the establishment. A young protagonist often underwent an epiphany in which, convinced that schooling had prepared him for a task, he would come into contact with an adult male who would convince him of the opposite. At the beginning of *Have Space Suit—Will Travel*, Kip explains that he won't be getting a scholarship to MIT based on his high school education: "The emphasis [at Centerville High] is on what our principal, Mr. Hanley, calls 'preparation for life' rather on trigonometry. Maybe it does prepare you for life; it certainly doesn't prepare you for CalTech." Kip finds out this hard truth when his father takes a look at his textbooks and tells him that if he continues relying on this school for his education, he's sure to flunk out if he "tackles any serious subject—engineering, or science, or pre-med" in college. Kip's dad makes an extensive chart of the various classes Kip could take in his upcoming

[697] Ibid.

three years in high school, and despairs of his chances of emerging with a decent education. "'Son, Centerville High is a delightful place, well equipped, smoothly administered, beautifully kept. Not a 'blackboard jungle,' oh, no!—I think you kids love the place. You should. But this—' Dad slapped the curriculum chart angrily. 'Twaddle! Beetle tracking! Occupational therapy for morons!'" Kip takes new classes, and also starts reading books on his own ("those books were hard, not the predigested pap I got in school"). In 1957, Heinlein assessed the "themes" he had tried to "preach" in his Scribner's series; the first was "That knowledge is worthwhile in itself—and that a thorough acquaintance with mathematics is indispensable to the acquiring of much of the most worthwhile sorts of knowledge."[698] Kip, like many other Heinlein heroes, experienced the most trouble and success with mathematics. For Kip, knowledge leads to knowledge, and eventually to enlightenment, as he reads more and more math: "Analytical geometry seems pure Greek until you see what they're driving at—then, if you know algebra, it bursts on you and you race through the rest of the book. Glorious!" He begins to read about chemistry and physics, and outfits his family's barn with "a chem. lab and a darkroom and an electronics bench and, for a while, a ham station." The end result of his self-study: he passes the College Boards his senior year.[699]

Other Heinlein juveniles also expressed critiques of mainstream educational systems. Part of the rite of passage in *Space Cadet,* which was based on Heinlein's own

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[698] Robert Heinlein to Alice Dalgliesh, April 30, 1957, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[699] Robert A Heinlein, *Have Space Suit--Will Travel* (New York: Scribner, 1958), 8-13.

experience in the Naval Academy[700], lies in overcoming the insufficient prior education the boys have received in Earth schools. Matt, who's joined an elite group of scientist-soldiers who keep the peace by promising to bomb any planet that threatens war, arrives at the Patrol school with an insufficient working knowledge of mathematics and needs to be brought up to speed by his tutor, Lieutenant Wong. Wong doesn't blame Matt, but instead the system, shaking his head: "I sometimes think that modern education is deliberately designed to handicap a boy. If cadets arrived here having already been taught the sort of things the young human animal can learn, and should learn, there would be fewer casualties in the Patrol."[701] The Patrol's school achieves its educational goals through solo study, achieving, in effect, a situation much like Kip's, even within an educational institution. Most students spend time with each other only when they meet in laboratories or for group drill time. This enhances individual responsibility and accountability; as Lt. Wong says, "It's pleasant to sit in a class daydreaming while the teacher questions somebody else, but we haven't got time for that."[702]

Many of the Scribner's juveniles contained similar sequences, in which boy protagonists embark on independent study, and these instances Heinlein is careful to juxtapose the higher value of learning done outside an official structure with the education the boys might otherwise have gotten by joining their peers. In *Starman Jones*, for example, Max Jones studies astrogation (astral navigation) by reading his deceased

[700] Robert Heinlein to Alice Dalgliesh, May 30, 1947, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[701] Robert A Heinlein, *Space Cadet* (London: V. Gollancz, 1979), 75.
[702] Ibid., 76.

uncle's books; denied entry to the astrogator's guild because his uncle failed to give him a recommendation before dying, he nonetheless succeeds at lying his way onto a ship, and after a series of unfortunate events robs the ship of its formally trained astrogators, he manages to pilot the ship and its cargo of settlers back to safety.[703] Several protagonists, including the trio of boys of *Rocket Ship Galileo* and Castor and Pollux Stone, of *The Rolling Stones*, turn down opportunities to study inside formal institutional structures, in favor of adventure in space; though the parents, in each case, initially object, they finally agree to their children's plans when the boys agree to pursue independent study in mathematics during space flights between planets. The ensuing adventure, and the boys' admirable performances under pressure, conclusively answer the question of whether this choice was the right one.

Heinlein's stand against what he saw as the watering-down of American education was one that he made both in the narratives of his books and in the process of writing and editing. In his engagement with the field of children's literature, he often argued that the professionals in the field misunderstood how much technical content boys wanted, and how proficient in these fields boys already were; Heinlein believed in the scientific authority of American boys. Writing for *Library Journal* in 1953, in an article giving tips about acquiring science fiction for young people, he implored librarians to check with "an Air Force or Artillery officer, a physics teacher, or almost any fourteen-

[703] Heinlein loved Horatio Alger stories as a child, and wrote that his juveniles were plotted in the same fashion as Alger's rags-to-riches stories, except that the trajectory of his protagonists is not from poor to rich but from boy to man. Robert Heinlein to Alice Dalgliesh, February 3, 1959, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.

year-old boy, especially boys who are active in high school science clubs" before choosing to buy new interplanetary science fiction for young people.[704] He argued in several different ways his point that boys could take science fiction in which discussions about mathematics, logic, or astrogation lasted for pages at a time. It's significant that the boys' club in *Rocket Ship Galileo* was modeled on Heinlein's own high school group, The Newton Club; Heinlein often drew from his own childhood experience in arguing that boys wanted a high level of technical detail in a novel. During a conflict over the level of detail in his depiction of alien life forms in *Red Planet*, Heinlein told his longtime agent, Lurton Blassingame, who was acting as a mediator, that Dalgliesh was not qualified to assess fiction written for boys: "I've read a couple of the books she wrote for girls…they're dull as ditch water. Maybe girls will hold still for that sort of thing; boys <u>won't</u>."[705] He justified his position by listing his childhood activities as credentials: "Having been a boy who raised white mice, snakes, silk worms, belonged to the Scouts, science clubs, cadet corps, climbed mountains, built telescopes, radio sets, etc., I think I know a damn sight more about boy tastes than she does."[706] Failing to convince Dalgliesh that the happenings in *Red Planet* were scientifically accurate, Heinlein appealed to an outside authority, scientist R.S. Richardson, to back him up. Heinlein wrote to Blassingame, enclosing a monograph by Richardson: "It should be sufficient to stop the clock on the notion that this book *Red Planet* is an uncontrolled exercise in fantasy.

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[704] Robert Heinlein, "Ray Guns and Rocket Ships," *Library Journal*, July 1953, 1190.
[705] Robert A. Heinlein to Lurton Blassingame, March 4, 1949, Box 331, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz. Emphasis in original.
[706] Heinlein to Blassingame, March 4, 1949.

Richardson's trained mind sees the implications in my details; Dalgliesh doesn't have the knowledge to see what I was doing—a direct result of the fact that she objected to overt technical explanation."[707] Heinlein implored Blassingame to try to find another publishing house for *Red Planet*, one that might be staffed by an editor "with some knowledge of science and some knowledge of the science-fiction field." "One of them," he added, "might even be a man, with recollection of what he liked as a boy."[708]

Heinlein's own prior experience, however, belied the idea that a male editor might be inherently more suited to his science fiction books. What Heinlein wanted was an editor who shared what he considered to be a forward-thinking allegiance to the idea of "the future"; he associated this quality with masculinity. In 1946, a (male) editor from Westminster, William Heyliger, refused a first draft of *Rocket Ship Galileo* (then titled *Young Atomic Engineers*) because it wasn't set in a small town, but rather explored interplanetary travel. Heinlein sent a letter to Blassingame, refusing to make the revisions requested, and outlining his rationale. "Boys of 1965 [when the book is set] won't be limited to a small town, unless they are either poverty-stricken or dull," Heinlein wrote. He then told Blassingame about three nephews: Buddy, "not yet out of high school, has just completed two transcontinental trips, made by motorcycle bought as junk and rebuilt by him. He wants to be a rocket pilot. He expects to go to the Moon." Another nephew, Colin, age 13, read some of the chapters of the book, and "his comment on the story was technical rather than literary—he said that I had not given the details of the captive test

[707] Robert A. Heinlein to Lurton Blassingame, March 15, 1949, Box 331, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[708] Heinlein to Blassingame, March 4, 1949.

run explicitly enough. He has Boy Scout merit badges in such things as radio, electricity, astronomy, metal work, etc. Rocketry is simple from his stand point." [709]

This letter set a precedent for Heinlein's ongoing crusade to convince Dalgliesh that kids wanted more science; he gathered anecdotal examples from all over. Heinlein asked a friend in New York to monitor a radio show called "Young Book Reviewers" for a review of "Space Cadet," and the friend replied:

> I called WMCA and they tell me the program reviewing your book was one of the best they had…The Bronx Science High School loosed a gang of science fiction fiends on the program and they had a hell of a time. Even the woman who runs the program was impressed—she allowed that she might have to look into science-fiction sometime. I might add that the station does not select the book. It is picked by the youngsters and yours was the first of its kind to be reviewed. Prior to that there had been derogatory comment about 'Buck Rogers stuff' but the s-f boys persisted and they tossed them a bone which turned out to have a lot of meat on it. I rather gather that more s-f will be used in the future.[710]

Simultaneously, Heinlein argued that part of the reason why older people did not understand science fiction was that they were out of touch with the advances of science, and incurious about their workings. Children, on the other hand, such as his characters in the Scribner series, are "commonplace 'heroes,' surrounded by the technology of their period—but they aren't impressed by it, at least no more than a kid today would be impressed by a trip to the Boulder Dam. They take the gadgetry for granted, as I took the telephone for granted, and as the current crop of youngsters take TV for granted."[711] In a 1951 letter to his aunt Anna Lyle, a retired schoolteacher, Heinlein promised to send

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[709] Robert Heinlein to Lurton Blassingame, March 16, 1946, Box 331, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[710] John to Robert Heinlein, February 10, 1949, Box 306, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[711] Heinlein, February 12, 1959.

along a copy of *Space Cadet*, saying, “I think it is one you would like even though it is on my boys’ list—or perhaps because it is. I feed the boys stronger meat than I do adults. Most adults just don’t have as much intellectual curiosity as the kids do and I have to bear that in mind when I write for adults. With the kids, when I get an interesting idea, I can play with it.”[712]

Boys, Heinlein believed, were better equipped to understand one of his key beliefs and lessons: science is continually expanding, and thus a person who seeks to keep up with science, and to learn more and more about the world, will often need to think beyond his comfort zone. In *Farmer in the Sky*, Ortega, a ship's engineer, conducts an informal school with the children aboard the spaceship emigrating to Ganymede; during a lecture about the impossibility of traveling at the speed of light, protagonist Bill challenges him, asking what would happen if a ship got close to the speed of light and then stepped up its drive. The engineer finds it impossible to answer, and says, "Don't ask me questions like that. I'm an engineer with hairy ears, not a mathematical physicist.”[713] Bill’s hypothetical question stands for his willingness to expand his thought beyond the given parameters. In both *Space Cadet* and *Red Planet*, boys who interact with Martian and Venerian natives find that they have to think beyond their own scientific horizons in order to understand the natives’ way of manipulating matter. In *Space Cadet*, the stranded heroes realize that the natives have the ability to synthesize chemicals. Discussing their need to get off the planet, the boys are in despair, because their rocket ship powered by

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[712] Robert Heinlein to Anna Lyle, April 10, 1951, Box 306, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[713] Robert A Heinlein, *Farmer in the Sky* (London: Gollancz, 1975), 61.

alcohol and oxygen, neither of which they possess. They realize that the Venerians have been able to synthesize maple syrup to feed their injured lieutenant, and decide to see if they have the ability to make fuel components. Discussing whether or not to ask the natives to help, the boys go back and forth regarding the natives' ability to create chemicals. Oz voices doubts, saying that the natives don't have the technological or electrical capacity to synthesize chemicals. Protagonist Matt argues back: "There may be more ways of doing engineering than the big, muscley, noisy ways we've worked out..."[714] And indeed, taking a chance on the natives' abilities turns out to bear fruit, as the natives take their fuel sample and turn it into more fuel. This flexibility of mind, Heinlein argues, is possible only because the boys know enough to understand how little they know—a lesson that can be learned only outside of school.

Imagining Future Social Orders: Sociology as Disruption of Authority

If Dalgliesh objected to the technical detail present in some of Heinlein's writing for boys, she had even more trouble accepting the sociological speculation that later became his trademark. This caused more trouble between the writer and his editor, as Heinlein believed that the social sciences were even more interesting—and worthy—as a topic of inquiry than the natural and physical ones. Explaining the Academy's processes of education, *Space Cadet*'s Lieutenant Wong tells the hero, Matt, about "hypno," a procedure that will help him study certain subjects under the influence of hypnosis. "Everything that can possibly be studied under hypno you will have to learn that way in

[714] Heinlein, *Space Cadet*, 232.

order to leave time for the really important subjects," he says, to which Matt replies, "I see. Like astrogation." Wong then says that astrogation is "kindergarten stuff," and tells Matt that he knows "from your tests that you can soak up the math and physical sciences and technologies...” What's more important to learn with a conscious mind is

> The world around you, the planets and their inhabitants—extraterrestrial biology, history, cultures, psychology, law and institutions, treaties and conventions, planetary ecologies, system ecology, interplanetary economics, applications of extraterritorialism, comparative religious customs, law of space, to mention a few.[715]

Many of the tests of mental agility that Heinlein’s protagonists undergo are not strictly “scientific,” but rather involve larger questions about culture and social arrangements. Heinlein believed that “speculative fiction,” a term he preferred to “science fiction,” “is also concerned with sociology, psychology, esoteric aspects of biology, impact of terrestrial culture on the others [sic] cultures we may encounter when we conquer space, etc., without end.”[716] The boys of *Space Cadet* were supposed to use the habits of mind they had acquired from studying “hard” science in order to face the more difficult questions of the “soft” sciences.

Many of the extrapolative situations that Heinlein’s juveniles favored played with the arrangement of social relations, in order to provoke his young readers into asking the questions about the fungibility of human nature and the ramifications of cultural change; it was these that caused the greatest impasse between himself and Dalgliesh. During the conflict over *Red Planet*, Heinlein wrote to Blassingame that he thought Dalgliesh

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[715] Ibid., 76.
[716] Heinlein to Blassingame, March 4, 1949.

objected to the book because she was fundamentally confused about the nature of science fiction. Because Dalgliesh was proud of having published Kenneth Grahame's *Wind in the Willows*, Heinlein said, she didn't object to fantasy or fairy tales; rather, "she has fixed firmly in her mind a conception of what a 'science-fiction' book should be, though she can't define it and the notion is nebulous." Heinlein thought Dalgliesh's ideas about science fiction could be summarized thus: "'Science has to do with machines and machinery and laboratories. Science-fiction consists of stories about the wonderful machines of the future which will go striding around the universe, as in Jules Verne.'"[717] Although his fiction did contain some laboratories and wonderful machines, he thought this approach was uninteresting; fiction that described machinery without including speculation about the changes in human relations in the society surrounding that machinery was less fully realized than his own efforts.

Unfortunately, he found, imagining future possible social orders often put him in conflict with Dalgliesh and others within the field of children's literature. The fundamental cause of the conflict, he believed, was between the mission of speculative fiction, which he articulated as the exploration of the assumption, "The customs of our tribe are <u>not</u> the laws of nature," with editing suggestions that, he argued, "add up to the notion that I must never assume that the present-day customs, opinions, and attitudes dear to our tribal shamans are anything less than divinely inspired and immutable."[718] Although Dalgliesh wrote in *Publishers' Weekly* in 1943, in a wartime essay about

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[717] Heinlein to Blassingame, March 4, 1949.
[718] Robert Heinlein to Alice Dalgliesh, May 1, 1957, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.

children's books and the teaching of "tolerance," that children's literature needed to incorporate "fully thought out factual material, history, biography, and—much needed—anthropology" in an effort to teach children about "differences and prejudices," she believed in the presentation of present-day "truths" about people across the globe.[719] In contrast to this latitudinal approach, which assumed that tolerance could be taught by showing children in one stable, unified culture the truth of how others living in faraway stable, unified cultures existed in the present day, Heinlein's extrapolative approach, which merged science fiction with anthropological and sociological speculation, was meant to make children think about the long view, and changes in social customs over time. Because of the particular themes that Heinlein chose for his extrapolations, which included age, family, race, and gender, this aspect of his Scribner's juveniles often caused friction with his editor.

Some of the conflicts that Heinlein anticipated, but which barely arose, were over his message regarding tolerance of other races and cultures. He officially espoused a policy of color-blindness. In this, he was part of a trend in children's books of the 1940s (as Dalgliesh pointed out in her 1943 essay, this was a major theme of wartime book production; as Mary K. Eakin wrote in 1955, in the years after 1945 "scarcely a [children's] fiction book was published that did not either treat an aspect of intercultural relations as its main theme or else bring in some problem of this sort as a subplot").[720] In a letter to Blassingame written while he was working on *Young Atomic Engineers*,

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[719] Alice Dalgliesh, "To Light a Candle," *Publishers' Weekly*, April 28, 1943.
[720] Mary K. Eakin, "Trends in Children's Literature," *The Library Quarterly* 25, no. 1 (January 1, 1955): 51.

Heinlein wrote that his heroes were of Scotch-English, German, and 'American Jewish" extraction, and warned, "You may run into an editor who does not want one of the young heroes to be Jewish. I will not do business with such a firm. The ancestry of these three boys is a 'must' and the book is offered under those conditions. My interest was aroused in this book by the opportunity to show to kids what I conceive to be Americanism."[721] The conflict did not arise, though, as Suzanne Rahn argues, Morrie, of *Rocket Ship Galileo*, was an "invisible" Jewish character, because he's never explicitly identified as such, despite the presence of certain cultural markers.[722] During the editorial process for *Tunnel in the Sky*, which included a prominent black female character, Caroline, Heinlein told Dalgliesh that he "wanted Caroline identified as Negro from the start…This girl's characterization all through the book is believable only if she is colored, I want her tagged from the start." Replying to Dalgliesh's concern that "this Negro secondary character would lose us sales in the South," he wrote back, "This is not a point on which I am willing to budge."[723] He did, however, change the identifier used to describe Caroline from "black" to "Zulu," thereby giving her an exotic provenance that would also explain her "characterization" as a brash, uncouth female warrior while also abstracting her from present-day conflicts in the United States. *Starship Troopers*' protagonist, Juan "Johnny" Rico, was Filipino; Heinlein asked Putnam's to leave his name off of the blurb on the back of the book:

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[721] Heinlein to Blassingame, March 16, 1946.
[722] Suzanne Rahn, "'Like a Star Through Flying Snow': Jewish Characters, Visible and Invisible," *The Lion and the Unicorn* 27, no. 3 (2003): 316.
[723] Robert Heinlein to Alice Dalgliesh, May 2, 1955, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.

> I intentionally withheld his name and country until the latter part of the book because he is a prototype for all boys from anywhere on this planet, regardless of race or nationality…I went to considerable trouble to disguise his name and nationality until the reader had had time to become acquainted with him; therefore I think we might well leave his name off the blurb, if a second dust jacket printing is made.[724]

At the same time, Rico is a rich kid, the son of a businessman; his position of privilege vis-a-vis his friends and his culture is such that he is effectively white. In the shaping of his young Jewish, black, and Filipino characters, as in his treatment of gender, Heinlein was less radical than he thought.

Heinlein's extrapolations regarding the relative power of parents over children, and of children in society, were especially troublesome for Dalgliesh. One of her major issues with *Red Planet* was a scene in which the boy protagonists use guns to fight alongside their fathers in a colonial uprising; in a meeting in which the adult members of the colony resists the idea of arming what he considers to be "children," another colonist argues: "This is a frontier society and any man old enough to fight is a man and must be treated as such—and any girl old enough to cook and tend babies is adult, too." Referring to their coming conflict with the corporation that owns their land, he adds, voicing Heinlein's true beliefs:

> Whether you folks know it or not, you are headed into a period when you'll have to fight for your rights. The youngsters will do the fighting; it behooves you to treat them accordingly. Twenty-five may be the right age for citizenship in a

[724] Robert Heinlein to William McMorris, November 7, 1959, Box 332, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.

> moribund, age-ridden society back on Earth, but we aren't bound to follow customs that aren't appropriate to our needs here.[725]

Heinlein, himself a firearms buff, wrote to Dalgliesh that he believed in "training kids early in the use of 'dangerous' weapons."[726] The issue of armed heroes arose again and again; in 1953, she asked him to remove from *Farmer in the Sky* a reference to the protagonist defending himself against his stepfather's beatings with a knife—a request which provoked a three-page disquisition from Heinlein on the virtues of the armed citizenry—and in 1958 she objected to a scene in *Have Space Suit—Will Travel* in which the hero Kip throws a malted milk in a bully's face.[727] Heinlein asked Dalgliesh to let him know whether she actually received objections to this scene from librarians, and wrote

> If the control over what teen-agers read…actually is in the hands of persons so tender-minded, so pacifist, so conformist, so emotionally and spiritually castrate as this would imply, then I must seriously reconsider what use I want to make of the remainder of my life—whether to retreat no farther but fight them on their own ground, or whether to seek other battle ground of my choosing.[728]

He blamed "weak-stomached ladies of both sexes, tender-minded creatures who fear fighting more than they fear slavery" for this censorship: "They have done their damndest to raise up a generation of sissies, afraid to fight, not trained to fight."[729] These conflicts may have been part of Dalgliesh's ongoing effort to keep the books above the "comic

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[725] Robert A Heinlein, *Red Planet* (London: Gollancz, 1949), 170.
[726] Robert A. Heinlein to Lurton Blassingame, March 24, 1949, Box 331, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[727] Robert Heinlein to Alice Dalgliesh, May 13, 1954, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[728] Robert Heinlein to Alice Dalgliesh, April 11, 1958, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[729] Robert Heinlein to Alice Dalgliesh, December 24, 1958, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.

book level" by eliminating moments of violence; before the controversy over *Starship Troopers*, however, it doesn't seem that anybody besides Dalgliesh officially objected to the level of weaponry present in the books.

Heinlein's protagonists armed themselves not just with guns or malted milks, but also with the law, and this particular brand of speculation also caused him trouble. In *The Star Beast*, published in 1954, right at the time the Kefauver Committee debated comics regulation, the protagonist John Stuart Thomas divorces his mother, who wants him to become a lawyer rather than journey to a faraway planet and become an expert in xenobiology. The character of Thomas's mother violates all of the moral goods which Heinlein has designated: she clings to tradition, and so demands that her son get an accredited law degree instead of learning in an informal environment; she refuses even to become interested in xenobiology; she tries to leverage guilt about leaving her side to keep him from growing up. In her self-centered superficiality, Mrs. Thomas embodies many of the qualities of Wylie's Momism. Learned Bulman, a children's librarian for the Free Public Library of East Orange, NJ, wrote to Dalgliesh letting her know that he planned to give the book a negative review in the *Library Journal*, on basis of this plot point ("It is certainly one of his best but WHY did he destroy it with his reference to the Court of Divorce for Children?")[730] In the ensuing flurry of letters, Heinlein told Bulman that he believed that society's inevitable progress toward a "better civilization" would certainly make it a common for children to have the right to initiate a split with parents:

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[730] Learned T. Bulman to Alice Dalgliesh, August 30, 1954, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.

"I expect the idea of minor children as persons in the eyes of the law to grow in the same fashion in which we have seen women become legal persons."[731] This episode added to Heinlein's dissatisfaction with the process of writing juveniles—he felt that Dalgliesh had not defended him sufficiently, and wondered if he should stop writing for young people altogether if he was going to be "stuck in a dead-end street with a barricade marked 'Librarians' across it"[732]; two years later he was still considering whether a plot change would bring "librarians such as that pompous and provincial Mr. Bulman baying at my heels."[733] The conflict also exemplifies Heinlein's belief that young people's choices should be privileged. "Do you really think that children are morally obligated to be humble to adults even when the adults are utter fools?" he asked Dalgliesh.[734] [735]

If Heinlein succeeded in imagining multicultural friendships, armed young people, and child-parent divorce courts, the results of his depiction of gender relations are more complicated, and point to a belief in biologically determined gender roles. Much has been written about Heinlein's female characters, and critics seem to concur that representations of girls and women in his juvenile fiction are a mixed bag. Science fiction author and critic (and 1953 STS finalist) Joanna Russ, writing in 1972, argued that

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[731] Robert Heinlein to Learned T. Bulman, September 7, 1954, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[732] Robert Heinlein to Alice Dalgliesh, September 7, 1954, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[733] Robert Heinlein to Alice Dalgliesh, April 2, 1956, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[734] Heinlein to Dalgliesh, May 13, 1954.
[735] In 1958, after *Have Space Suit—Will Travel* was published, Bulman wrote Heinlein a congratulatory letter, calling the book "excellent" and adding that he agreed with the book's assessment of contemporary schooling. Bulman, letter to Heinlein, October 24, 1958, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.

Heinlein's work fails at imagining alternative futures when it came to gender roles, while Marietta Frank argues that the strength of female characters in *Have Space Suit—Will Travel* and *The Star Beast*, along with the alien matrilineal societies of *Space Cadet* and *Citizen of the Galaxy*, render Heinlein's work quasi-feminist.[736] Heinlein argued that girls could, and did, read and enjoy his books; he dedicated *Red Planet* to his niece, Tish, who, he wrote to Dalgliesh's assistant Virginia Fowler, "is one of my most loyal fans…like many little girls, she reads boys' books as much or more than girls' books. (This seems to be a fact and should be significant to publishers; Ginny [his wife] tells me that she borrowed and read all the Tom Swift books et cetera because she found girls' books unbearably dull.)"[737] In a 1951 letter to Dalgliesh, he mentions reading fan letters and says "I think it might interest you to know that I get more letters from girls about my 'boys' books than from boys."[738]

Certainly, his attitude toward female training in STEM subjects was, on the surface, a positive one. During World War II, Heinlein scouted universities for female engineers, looking for draft-exempt workers for his research division at the Philadelphia Naval Yard; he wrote that he found at the University of Delaware that the School of Engineering didn't permit females to register, and was furious: "I took nasty pleasure in

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[736] Marietta Frank, "Women in Heinlein's Juveniles," in *Young Adult Science Fiction*, ed. C. W. Sullivan III (Westport, CT: Greenwood Press, 1999), 86; Joanna Russ, "Images of Women in Science Fiction," in *Images of Women in Fiction; Feminist Perspectives*, ed. Susan Koppelman Cornillon, Rev. ed. (Bowling Green, Ohio: Bowling Green University Popular Press, 1973), 86.
[737] Robert Heinlein to Virginia Fowler, August 1, 1949, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[738] Robert Heinlein to Alice Dalgliesh, April 11, 1951, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.

chewing out the President of the University…by telling him that his University's medieval policies had deprived the country of trained engineers at a time when the very life of his country depended on such people."[739] Virginia Heinlein, whom Heinlein met during the war when they were both employed at the Naval Yard, was a chemical engineer, and when they married Heinlein wrote to a friend that she "knows more science than I do," following up by praising her for also possessing more traditional female traits: "she is an excellent cook, a good housekeeper, and a good money manager."[740] After they were married, Virginia stopped working as a chemist.

The raw competence that many of his female secondary characters exhibit may have been a function of his need to de-sexualize the plots of these juveniles. He complained that he needed to omit romance from all of the books, to quell the fears of librarians who were "utterly faithful to the stork theory, while simultaneously being devout adherents of the more foolish aspects of Dr. Freud's Dream Book"; however, he thought that the "young goats" who were his audience were "subconsciously aware that I have to fake in this respect," and that they forgave him because they had access to "playboy [sic], Scribner's adult list in pocketbook," and "the real McCoy, just across the aisle…in school." [741] In this context, the flat characterization of these "Boy Scouts with breasts" (as Joanna Russ refers to the women of Heinlein's books) may have been intended as a way to sneak in beneath the radar of censorship.

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[739] Patterson, *Robert A. Heinlein*, 308.
[740] Robert Heinlein to Cal Laning, December 2, 1948, Box 306, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[741] Heinlein, February 12, 1959.

These young women, so interested in science or soldiering or engineering, illustrate the contradictions within Heinlein's libertarian philosophy of thought: if science investigation is endless, and the boy protagonists only discover more frontiers to pursue, the story of a girl growing up often hinges on her decision to forsake further study—to accept limitation, rather than expansion. Virginia Heinlein seems to be the ideal real-life counterpart to (or model for?) Heinlein's fictional girls, who often exhibit real competence at various "manly" jobs, only to forsake these occupations once they "grow up" or get married. Thus Betty Sorensen, John Thomas Stuart's girlfriend in *The Star Beast*, acts as a lawyer throughout the book, managing her boyfriend's efforts to keep his xenopet Lummox from being destroyed by fearful townspeople; at the end of the book, however, to the amazement of some adult onlookers, she sublimates her pushiness and savvy to John Thomas's future career, bargaining with authorities until he is promised a post as an ambassador. In *Tunnel in the Sky*, Rod, the protagonist, has a sister who is a brash, efficient soldier, but who gives up her career at the end of the narrative in order to get married.

Perhaps the best example of Heinlein's inability to rethink gender roles in a transformative way is the book published by Putnam's in 1963, *Podkayne of Mars*. In the only one of Heinlein's juvenile books to feature a youthful female protagonist, the young spitfire Podkayne (Poddy) Fries, Martian colonist and daughter of a professor father and engineer mother, has her heart set on being the captain of a spaceship. Her adventures accompanying her brother and great-uncle on a tour of Venus and Terra, however, end in trouble, as she's kidnapped and injured by a fellow passenger. "Poddy" meets a young man who also wants to be the captain of a ship, and slowly starts to think that she should "let a man boss the job, and then boss the man," instead of striving for the job herself. Looking at herself in the mirror, and checking out her newly broadening figure, she muses, "One might say we were designed for having babies. And that doesn't seem too bad an idea, now does it?" Remembering an emergency on board the ship when she helped out in the nursery, she thinks, "A baby is lots more fun than differential equations." She reflects that, instead of training to be a pilot, she might train to engineer the pediatric departments (crèches) of starships, and thinks, pragmatically, "Which is better? To study crèche engineering and pediatrics--and be a department head on a starship? Or buck for pilot training and make it...and wind up as a female pilot nobody wants to hire?"[742]

Just as the male protagonists of Heinlein's juveniles subvert tradition in order to follow a more rational path, Poddy's realization constitutes a rebellion against her own parents, as her mother is an engineer and (as a result) an absent mother. Great-Uncle Tom excoriates Poddy's father at the end of the book, arguing that her parents wouldn't have allowed Poddy to go on the voyage alone in the first place if they had had their priorities straight ("You should tell your wife, sir, that building bridges and space stations and such gadgets is all very well...but that a woman has more important work to do").[743]

Originally, the story ended with a scene in which Poddy dies trying to protect a juvenile native; the protest from the editor of *Worlds of If,* where the story was first

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[742] Robert A Heinlein, *Podkayne of Mars* (London: New English Library, 1977), 126-127.
[743] Ibid., 175.

serialized, led Heinlein to rewrite the ending so that it was somewhat more ambiguous before publishing the tale in novel form.[744] Poddy's tragic end, one that no male Heinlein protagonist ever had to suffer, epitomizes the closing-off of her trajectory toward self-realization—a closure that no degree of intellectual interest in science could prevent.

Conclusion: Delinquency and Authority

Heinlein's final book for Scribner's, *Starship Troopers*, is the locus of his most public and notorious conflict with Dalgliesh. In this juvenile, Johnny Rico, a wealthy young man, joins the military after graduating from high school. Earth is unified under one government and has one military, and the franchise and political office are restricted to veterans, who are presumed to have a superior understanding of what being a citizen really means. The narrative follows Rico through boot camp, in which he learns lessons about the value of submitting to properly constituted authorities, and into war against a communistic interstellar enemy, the Bugs.[745]

At first glance, *Starship Troopers* seems to be a digression from the rest of the Heinlein juveniles in its focus on war rather than science. Rico does attend officer candidate school, where he struggles to acquire enough mathematical skills to pass his

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[744] Franklin, *Robert A. Heinlein*, 144.

[745] This book drew extensive criticism from within the SF community. In 1978, for example, SF writer Michael Moorcock wrote, in an article titled "Starship Stormtroopers," that the book was "pure debased Ford out of Kipling, setting the pattern for Heinlein's more ambitious paternalistic, xenophobic (but equally sentimental) stories" such as *Farnham's Freehold* (1964), a futuristic fantasy in which cruel black people rule the world and a white hero fights them. Michael Moorcock, "Starship Stormtroopers", December 24, 2002.

tests, given his earlier poor preparation in high school. However, the substance of the book is not about Rico's scientific education, but about his transformation from callow youth to military man. The authority figures in this story don't encourage Rico to keep more extensive lab records; they teach him instead that a failure to follow orders to the letter will earn him corporal punishment. Heinlein, like many adults of his era, was worried that juvenile delinquency threatened the nation's future; however, unlike those adults that historian James Gilbert describes[746], he didn't believe that the mass media had caused the problem, rather asserting that the lack of corporal punishment in schools and at home was the cause. Dalgliesh wrote to him: "Do you really believe that flogging is the remedy for juvenile delinquency?" She reminded him: "Some of the boys have been beaten all their lives. What about the social conditions under which these boys have to grow up in cities—living often as a family of eight or ten in a room?"[747] Heinlein wrote back: "I meant what I said in that book, namely that the almost total abolition of corporal punishment in schools and the great fall-off in same in the home, all the direct result of the pernicious influence of a school of self-styled 'experts,' is a major factor in the present decay of our Republic."[748] Making an explicit distinction between random beatings and corporal punishment, "applied judiciously according to an explicit code of conduct," he compared the two to "rape and marital love."[749] Peter Stearns points out that the prevailing drift toward permissive parenting in the second half of the twentieth

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[746] James Gilbert, *A cycle of outrage : America's reaction to the juvenile delinquent in the 1950s* (New York: Oxford University Press, 1986).
[747] Alice Dalgliesh to Robert Heinlein, February 11, 1959, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[748] Heinlein to Dalgliesh, February 17, 1959.
[749] Ibid.

century has encountered significant resistance in the form of conservative backlash.[750] While the scientist-parents and parents of STS winners that Marianne Besser interviewed advanced this ideology of companionate home life as a cornerstone of scientific inquiry, Heinlein believed that intellectual and physical discipline went hand-in-hand.

Heinlein's views on militarism had shifted over the two decades in which he wrote Scribner's books. When he first published *Rocket Ship Galileo*, he wrote in a biographical summary for the Young Literary Guild's magazine *Young Wings* that space travel might bring "a new feeling of global unity. When men begin to think of Earth as their home, as they now think of America, or India…there might be a curious and very wonderful psychological result—it is possible that this opening of the Age of Interplanetary Exploration might be the end of the Age of War."[751] But by the time *Starship Troopers* came out, Heinlein had become a more militant Cold Warrior; one newspaper interviewing him on the occasion of Sputnik reported that Heinlein "commented acidly" on the lack of American foresight: "'It was the same thing with the atom bomb and the H-bomb,' Heinlein said bitterly. 'We have been living in a fool's paradise. When will we believe them when they say they are going to do something? The announced aim of the Communist party and the Soviet Union has been to take over the world.' He made a sour face. 'Look at the map today.'"[752] To another reporter asking about Sputnik, Heinlein said, "This isn't a matter of prestige—it's a matter of saving our

[750] Peter N Stearns, *Anxious Parents: A History of Modern Childrearing in America* (New York: New York University Press, 2003), 218.
[751] Robert Heinlein to Ruth Clement Boyer, May 22, 1947, Box 333, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[752] John Reubens, "The Gun Is Pointed At Our Heads", n.d.

necks. It's not even a question of can they clobber us, but how much intercontinental hardware is ready over there? Will they hit us this afternoon? Next spring?"[753]

Starship Troopers was intended to prepare young men to fight. The militarism of the book can be seen in the titles Heinlein suggested to William McMorris, who edited the book for Putnam's: "Shoulder the Sky" (from AE Housman: "The troubles of our proud and angry dust/Are from eternity, and shall not fail./Bear them we can, and if we can we must./Shoulder the sky, my lad, and drink your ale"), "Better to Die" (Horace Gregory: "Better to die/Than to sit watching the world die") and "Dulce et Decorum" (the classic from Horace: "Dulce et decorum est pro patria mori", or "How sweet and fitting it is to die for one's country"[754]).[755] In a much-revised letter to Dalgliesh, just before he left Scribner's, he wrote:

> What I am saying to my young reader is: 'Look, son, this is not an easy world; this is a grim and dangerous world—and it is quite likely to kill you. But you have a free choice: you can go to your death fat, dumb, and happy and never understanding what is happening to you right up to the time the bombs fall…or you can grow up, face up to your harsh responsibilities, look death in the face and defy it, and thereby enjoy the austere but very real and deeply satisfying rewards of being a man. But the choice is yours, and neither your mother, nor your teacher, nor the state can in anywise relieve you of it.[756]

This is the connection between *Starship Troopers* and the earlier juveniles: in all of these books, Heinlein visualized himself as reaching out to boys, circumventing the authority

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[753] William J. Barker, "Hello, Dog?", n.d.
[754] Wilfred Owen, British poet of World War One, appropriated this line to title one of his most famous poems, which condemned the idea of glorious patriotic death altogether; Heinlein did not note the irony.
[755] Robert Heinlein to William McMorris, August 20, 1959, Box 332, Robert A. Heinlein Archives, Heinlein Prize Trust/UC Santa Cruz.
[756] Heinlein to Dalgliesh, February 3, 1959.

of the mothers, teachers, and the state, in order to provide them with what was "true"—whether that "truth" lay in a commitment to military service, or a commitment to science.

In a 1940 story called "Requiem," published in *Astounding Stories*, Heinlein's character Delos D. Harriman, an ancient capitalist, buys a trip to the moon, where he intends to die. C.W. Franklin writes that this story contains "an eloquent picture of the boys and young men who made pre-World War II science fiction," and that Harriman is "a wonderful self-portrait of Robert Heinlein." Harriman muses:

> There were lots of boys like me—radio hams, they were, and telescope builders, and airplane amateurs. We had science clubs, and basement laboratories, and science-fiction leagues—the kind of boys that thought there was more romance in one issue of the *Electrical Experimenter* than in all the books Dumas ever wrote. We didn't want to be one of Horatio Alger's get-rich heroes either; we wanted to build space ships.

Franklin notes that the dreaming hero imagines his nagging wife calling him in from space, as he floats toward the moon in his rocket: "Delos! Come in from there! You'll catch your death of cold in that night air."[757]

Just as the organizers of the Science Talent Search visualized young "creative scientists" languishing in an inhospitable peer culture, Heinlein thought that curiosity was curtailed by the weight of convention. This female intervention into Delos's reverie symbolizes all of the forces of conventionality that conspire to keep boys—and men—away from true learning and advancement. In the Cold War era, the nostalgic older scientists and engineers who thought of their own childhoods as utopian spaces of learning and inquiry sought to re-create those spaces for the rising generation. Heinlein

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[757] Franklin, *Robert A. Heinlein*, 20-21.

thought of himself as a true advocate of the scientifically-minded American boy, believing that shared qualities of gender and scientific interest transcended his editor's professed expertise in children's culture.

Epilogue: The Exploratorium and the Persistence of Innocent Science

> *"'Cool!' panted the youngster with the flaxen hair. All around him lights were flashing, beeps were beeping and machines revolved furiously in the vast, echoing hall. The youngster had become enthralled with a TV set—but not an ordinary set. This one enabled him to manipulate the dials and create weird, electronic patterns on a screen that twisted and convoluted [sic] like some futuristic amoeba."*[758]*—Lead paragraph of a 1970 magazine article about the Exploratorium*

The Exploratorium, founded in 1969 in San Francisco's Palace of Fine Arts, is a fine place in which to end the story of the twentieth century's infatuation with scientific childhood. The space of this museum was anarchic, utopian, and carnivalesque in its design. Intended for both adults and children, the Exploratorium was a restoration project, meant to heal public incuriosity about and fear of science through the creation of what the founders termed a "forest" of scientific amusements. The Exploratorium encouraged visitors to touch, to make noise, and to follow their own paths through this "forest" of exhibits. In 1973, one magazine writer described some of these: "A rope strung 120 feet across the building with an attached cord hanging down. Pulling it causes giant waves to race along the rope…A suspended, rotating chair and a large gyroscope for the seated person to hold…A treelike sculpture of thousands of lights whose brilliance is dependent on how much loud noise it hears (from you)."[759] Although the museum's major contribution is often summarized as the idea of the "hands-on" exhibit in science museums, the Exploratorium sought more than simple interactivity. The Exploratorium's founder, Frank Oppenheimer, wrote that he wanted an exhibit to be capable of

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[758] Walter Blum, "The Exploratorium: Museum with an Electric Touch," *California Living*, March 1, 1970, 17.
[759] "Doing What Classrooms Can't," *Mosaic*, Spring 1973, 1.

demonstrating multiple principles, and to be cheap enough that it could be assembled quickly and handled roughly without fear of loss.[760]

As in the description of the "youngster with the flaxen hair," both the museum's personnel and its public depicted the Exploratorium's child visitors as re-activated by their encounters with this museum, which would take them away from the spectatorship of TV-watching and into a world where their own actions had reactions. At the same time, as public unease over Cold War nuclear standoff and the ecological crisis grew, the Exploratorium was a place where science could be represented as personal, restorative, and communal. This restoration was due in no small measure to the space's strong association with childhood.

If Robert Heinlein, whose 1961 *Stranger in a Strange Land* was later to become a beloved tome of the counterculture, believed in science as liberation for boys stuck inside a restrictive social order, the Exploratorium took this limited vision of intellectual liberation and extended it to all comers. It did so as the youth movement of the 1960s began to mount critiques of science as practiced on a large scale. In the Students for a Democratic Society's 1962 Port Huron Statement, the use of advanced physical science for war, rather than social good, was termed a disappointing "paradox": "With nuclear energy whole cities can be easily powered, yet the dominant nation-states seem more

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[760] Oppenheimer, Frank, "Everyone Is You -- Or Me", 1976, 2, Carton 5, Folder 24, Exploratorium records, BANC MSS 87/148 c, The Bancroft Library, University of California, Berkeley.

likely to unleash destruction greater than that incurred in all wars of human history."[761] Paul Goodman wrote in his 1960 polemic *Growing Up Absurd: Problems of Youth in the Organized System,* which was to be a much-referenced book within the youth movement, that the secrecy and competition of the Cold War had "corrupted" the adventure of space exploration. He thought that the younger generation was particularly harmed by this loss, and asked incredulously: "Our government cannot see that noble things must not be made base, romance must not be turned into disillusion, or what will become of the young people?" Goodman was disturbed by science's makeover into a proper career for those aspiring to an accepted model of success, as were the scientists who had questioned the Science Talent Search's criteria for finding "well-rounded" young winners. Pointing to the demographic profile of recently selected astronauts ("all prove to be white Protestant, in their early or middle thirties, married, with small children, and coming from small towns—in brief, models of salesmen or junior executives for International Business Machines"), Goodman decried the diminishment of scientific excitement into standard-issue tools to achieve conformity.[762]

Frank Oppenheimer, the charismatic founder of the Exploratorium, had a life story that echoed the counterculture's dynamic of enchantment and disillusion with the "system." Oppenheimer, who was born in 1912 and was the younger brother of the more famous J. Robert, held a Ph.D in physics from Cal Tech. He spent the war years at the

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[761] Viet Nam Generation, Inc., "Port Huron Statement," *The Sixties Project*, 1962, http://www2.iath.virginia.edu/sixties/HTML_docs/Resources/Primary/Manifestos/SDS_Port_Huron.html.
[762] Paul Goodman, *Growing up Absurd: Problems of Youth in the Organized Society* (New York: Vintage Books, 1960), 105–106.

Radiation Lab in Berkeley, working for the Manhattan Project on the problem of uranium isotope separation. In this capacity, he spent time at both Oak Ridge National Laboratory and Los Alamos. Along with other scientists in the immediate postwar era, Oppenheimer advocated nuclear energy be controlled by national regulatory bodies; he was later quoted as saying, "Those of us who worked on nuclear energy were filled with the humanitarian ideal that it would be used for the good of mankind, not war." Oppenheimer saw a promising research career cut short after he was investigated by the House Un-American Activities Committee, admitted to having belonged to the Communist Party from 1937-1940 (after initially denying his association), and refused to "name names." After being forced to give up his academic position at the University of Minnesota, he and his family spent a decade living on a cattle ranch in Colorado, where he taught science at a local high school. After returning to college teaching in 1959, Oppenheimer spent a year in London on a Guggenheim Fellowship, studying three European science museums.[763] Drawing from this research, he launched the Exploratorium in 1969 with initial funding from the San Francisco Foundation.[764]

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[763] The Science Museum in South Kensington, London; the Deutsches Museum in Munich; the Palais de la Decouverte in Paris.

[764] Oppenheimer, Frank, "Frank Oppenheimer - Biography"; "Biography: Dr. Frank Oppenheimer" (Association of Science-Technology Centers, May 1981), Carton 7, Folder 23, Exploratorium records, BANC MSS 87/148 c, The Bancroft Library, University of California, Berkeley; "Frank Oppenheimer - Chronology", n.d., Carton 7, Folder 22, Exploratorium records, BANC MSS 87/148 c, The Bancroft Library, University of California, Berkeley; Frank Oppenheimer, "The Exploratorium: A Playful Museum Combines Perception and Art in Science Education," *American Journal of Physics* 40 (July 1972): 978–984; Gwendolyn Evans, "An Explorer's Reward," *San Francisco Chronicle*, August 28, 1974.

Oppenheimer's persona—that of the kindly, eccentric, brilliant professor—was intimately associated with the museum itself. As with other (always male) promoters of kids' science culture in the twentieth century—for example, the *Book of Knowledge*'s Arthur Mee or A.C. Gilbert of the Gilbert Toy Company—Oppenheimer's public image became integral to his project. In a 1981 nomination of Oppenheimer for the National Science Foundation's Vannevar Bush Award, the Association of Science-Technology Centers argued that "what has made the Exploratorium so special are the same qualities that make Dr. Oppenheimer himself so special: an insistence on excellence, a knack for new ways of looking at things, and a high respect for invention and play."[765] The press picked up on this association and ran with it, for example, titling the 1973 magazine article titled "Dr. Oppenheimer's Marvelous Playground."[766] Oppenheimer's famous name and history made the story even better, as journalists could set up an opposition between the serious work of the Manhattan Project and the rainbow wonderland of the Exploratorium.

Oppenheimer represented himself as a perpetual experimenter: irreverent, joyful, and liberated. He was a prolific author of musings on science, social justice, and education. In many of his writings, he remembered childhood episodes of exploration, including a story in which the young Frank traversed the house with a bottle and inserted a tiny bit of every spice, chemical, and drug he could find, and another in which he ran

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[765] "Biography: Dr. Frank Oppenheimer."
[766] Skip Stewart, "Dr. Oppenheimer's Marvelous Playground," *Pacific World*, November 22, 1973.

his finger along the edge of a circular knife in a butcher shop ("I bled profusely").[767] In his writings, Oppenheimer represented himself as a large child; in "Adult Play," a 1980 article for the Exploratorium's magazine, Oppenheimer admitted, "There are times when driving that I keep time to radio music with the accelerator and the brake to produce a quite remarkable motion of the car."[768] K.C. Cole, a journalist and friend who wrote a biography of Oppenheimer and the Exploratorium, described him as "Tom Sawyer in a business suit": "He fidgeted endlessly, fiddling with small objects he kept in his desk or his pockets: a slide rule, a top, a magnifying glass, a pocket spectroscope. He smoked nonstop, and on more than one occasion set himself on fire by putting out butts in his pockets."[769] Oppenheimer's eccentricity and subversion of normative adult behavior tied him firmly to the kind of childhood curiosity and creativity that he was trying to cultivate in the museum's visitors.

Although some of the press reporting on the opening of the Exploratorium treated the project as a simple attempt to "make more scientists"—another project of postwar recruitment—Oppenheimer's motivations were more idealistic. If the STS sought to support a new cohort of young scientists by creating a youth culture that accepted and rewarded their "talent," Oppenheimer wanted to heal a larger culture separated from what he saw as the basic human instinct toward curiosity. Writing in 1983, Oppenheimer said that he had the idea for the Exploratorium after feeling that "too many people, including

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[767] Oppenheimer, Frank, "Adult Play"; Oppenheimer, Frank, "Curiosity."
[768] Oppenheimer, Frank, "Adult Play," *Exploratorium Magazine*, 1980, 2.
[769] K. C. Cole, *Something Incredibly Wonderful Happens: Frank Oppenheimer and the World He Made Up* (New York: Houghton Mifflin Harcourt, 2009), 10.

young people, had given up the hope of comprehending anything about nature, or even about the everyday gadgets they used or about the history and the workings of the society in which they lived. They had lost the conviction that the world about them is understandable."[770] Exploring the factors that could contribute to a loss of curiosity, Oppenheimer thought that fear—of physical dangers, or of appearing or feeling "stupid"—was a major culprit: "As a child you are taught many fears: not to play with wall plugs, not to talk to strangers, not to stick your head out of a car and feel the wind. You are told, 'curiosity killed the cat.'"[771] Fear of academic failure was one of the demons that Oppenheimer hoped to banish. In 1970, Oppenheimer wrote (in a phrase he often repeated): "No one ever flunks a museum, one museum is not a pre-requisite for the next. People do not list the museums they have attended on a job application form. Museums are thus free of many of the tensions which can make education unbearable and ineffective in the schools."[772]

Oppenheimer believed that explorations in science were particularly important in the 1970s, because they could help people become more open to recognizing the symmetries of human experience. Like John Dewey, who argued for the "scientific method" as a tool for everyday life in the modern world, Oppenheimer thought that

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[770] Oppenheimer, Frank, "Frank Oppenheimer Interview", October 10, 1981, 4, Carton 21, Folder 51, Exploratorium records, BANC MSS 87/148 c, The Bancroft Library, Multiversity of California, Berkeley.
[771] Frank Oppenheimer, "Exploring", 1983, 4, Carton 5, Folder 45, Exploratorium records, BANC MSS 87/148 c, The Bancroft Library, University of California, Berkeley.
[772] Oppenheimer, Frank, "Schools Are Not For Sightseeing", 1970, Carton 5, Folder 17, Exploratorium records, BANC MSS 87/148 c, The Bancroft Library, University of California, Berkeley.

explorations in science had mental effects that stretched beyond the simple comprehension of natural facts. For those who founded the Exploratorium, science's effects on the human psyche tended to create citizens who were more open to connection with each other. In a 1984 speech upon accepting a medal from the American Association of Physics Teachers, Oppenheimer pointed to what he called "the sentimental fruits of science": "What we discover about nature plays a deep and basic role in the way we think about ourselves, about other individuals, and about society as a whole."[773] Disconnection from curiosity would result in abnegation of citizenship: "If they give up [understanding] the physical world around them, they give it up with the social and political world as well, and then…they don't know how to act on any of the problems that come up."[774] The title of Oppenheimer's speech is particularly evocative when considered alongside Edward Thorndike's critique of the emotional underpinnings of the nature study movement in the early twentieth century. Unlike the nature study movement's advocacy of moral kinship with animals and plants, which Thorndike found so restrictive to children's practices of inquiry, the "sentiments" that Oppenheimer refers are emotions inspired by the rational practice of investigation.

In keeping with Oppenheimer's focus on "understanding," perception was (and remains) a central theme of the museum. Exploratorium exhibits play with visual illusions, perspective, optics, physics of sound, music, relative motion, and tactile

[773] Oppenheimer, Frank, "'The Sentimental Fruits of Science,' Dr. Frank Oppenheimer's Acceptance Speech for the Oersted Medal Awarded by the American Association of Physics Teachers, San Antonio, Texas, 31 January 1984," *American Journal of Physics* 52, no. 8 (August 1984): 686.
[774] Oppenheimer, Frank, "Frank Oppenheimer Interview," 6.

perception.[775] Artists were often invited to contribute exhibits. Photographs of child visitors during the 1970s highlighted the colorful nature of the Exploratorium's interior spaces, often featuring a silhouetted figure of a child against a rainbow backdrop.[776] Here, the Exploratorium had a connection to the psychedelic movement, which believed in the libratory potential of new understanding of perception.[777]

The choice of the senses and perception as a topic was deliberate, and meant to encourage the growth of a sense of agency in the museum's visitors. Oppenheimer wrote that the museum focused on perception because "it has the virtue of encouraging even lay people to argue and ask meaningful questions about a subject." This was particularly important for young visitors: "Elementary school students never feel free to argue about physics with an instructor or among themselves. They might ask questions, but they don't say 'You're wrong.' But with perception, this sense of back and forth argument can happen because there are so many variations in the way people can see and hear."[778] Rather than impart a given body of knowledge, the Exploratorium wanted to teach that knowledge could sometimes be contingent; "reality" wasn't the same for every person—a body of facts ready for access, as in encyclopedias like the *Book of Knowledge*—but this fact didn't negate the importance of trying to understand.

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[775] "Biography: Dr. Frank Oppenheimer."
[776] Blum, "The Exploratorium: Museum with an Electric Touch," 16; Shirley Boes Neill, "Exploring the Exploratorium," *American Education*, December 1978.
[777] Andrew Derek Syder, "'Shaken Out of the Ruts of Ordinary Perception': Vision, Culture and Technology in the Psychedelic Sixties" (Ph.D., Cinema-Television(Critical Studies), University of Southern California, 2009).
[778] Oppenheimer, Frank, "'The Sentimental Fruits of Science,' Dr. Frank Oppenheimer's Acceptance Speech for the Oersted Medal Awarded by the American Association of Physics Teachers, San Antonio, Texas, 31 January 1984," 686.

Rather than emphasize the glories of past scientific achievements, or tie these achievements to the life stories of successful individuals, the Exploratorium wanted to present science as a wide-open field, equally available to all comers. Oppenheimer wrote, “The Exploratorium is not designed to glorify anything. We have not built exhibits whose primary message is, ‘Wasn’t somebody else clever,’ or ‘hasn’t someone done a great service to mankind and the American way of life.’”[779] By diminishing these past accomplishments, the museum would put the visitor in primary relationship with the natural phenomena being explored. “We must not glorify the achievements of scientists, artists, engineers, or businessmen,” Oppenheimer wrote. “We must make it possible for visitors to feel that they are the clever and perceptive ones, not the scientists and engineers.”[780]

In order to decentralize authority still further, Oppenheimer hired high school students to act as “Explainers,” mingling with the visitors and talking about the exhibits and their effects. Oppenheimer wrote, “Young students can teach in a museum by demonstrating or fabricating particular exhibits, although they might feel incompetent or embarrassed to do so in a classroom.”[781] The Exploratorium made a special effort to hire Explainers, who were generally juniors and seniors in high school, from diverse backgrounds; one newspaper article reported that “the Explainers form an important bond

[779] Oppenheimer, “The Exploratorium: A Playful Museum Combines Perception and Art in Science Education,” 982.
[780] Oppenheimer, “Exploring,” 7. Emphasis in original.
[781] Oppenheimer, Frank, “Museums: A Versatile Resource for Learning and Pleasure,” 2.

between the institution and the community…their presence has attracted neighbors and friends who might not have visited the museum."[782]

The museum, which charged no admission until 1981,[783] was democratic, "a favorite playground of both schoolchildren and nuclear physicists, of artists and little old ladies."[784] In a reversal of the concept behind the Brooklyn Children's Museum, the Exploratorium was a space in which age was equalized, rather than celebrated. This idea was often visually represented in photographs appearing in museum publicity. A popular exhibit for years was "a room of skewed proportions that, to a viewer outside, has giantlike children towering over their shrunken parents."[785] Oppenheimer believed that the pursuit of understanding was ageless: "Our exhibits encourage people to ask, and then answer for themselves, the question: 'I wonder what would happen if I did this or that?' Some people say that the asking of this question makes children out of adults."[786]

If adults became children, children's childishness was emphatically allowed. Oppenheimer called the museum "manifestly noncoercive."[787] Students weren't required to line up and experience the museum's exhibits in order; the Exploratorium self-

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[782] "Young Explainers Learn and Earn," *The Cultural Post*, September 1975.
[783] Even in 1981, people under eighteen could enter the museum free. Present-day admission fees are somewhat steeper, with adults paying $25.00 and children under 18 $19.00. "Hours & Tickets | Exploratorium." *Exploratorium.edu*, n.d. https://transact.exploratorium.edu/e-commerce/ItemShow_tix.aspx?Grp=VbG6CNQ05/M=&Name=Dr2PY14C1erYaLq0yom4imiKaWR753FO.
[784] "Biography: Dr. Frank Oppenheimer."
[785] "Doing What Classrooms Can't," 2.
[786] Oppenheimer, "Exploring," 8.
[787] Oppenheimer, "The Exploratorium: A Playful Museum Combines Perception and Art in Science Education," 983.

consciously rejected regimentation. "It is impossible to lead a group through [the Exploratorium] on a guided tour," Oppenheimer wrote in 1972. "If one starts off with a group, one soon finds oneself alone, other people having stayed behind to play with or investigate one or another of the displays of the intended tour."[788] Writers often noted the physicality of young people's interactions with the museum space; a writer for *Mosaic* magazine, in 1973, noted that Oppenheimer's one rule was the prohibition on riding a bicycle between exhibits, and that this was "less to protect the exhibits than to avoid collisions between the kids darting from one to another."[789] Images used in magazine and newspaper publicity often included pictures of children spinning, running, or playing.[790]

One particular pop-cultural appearance of the Exploratorium shows how its ethos fit into a larger culture of child liberation. In a 1974 issue of the *Dennis the Menace* comic book, Dennis, the ultimate icon of permissive parenting,[791] and his long-suffering parents Hank and Alice go on a road trip and visit the Exploratorium. Here, Hank, Alice, and Dennis join together in being mystified and intrigued by the museum exhibits. Dennis, living up to his nickname, breaks rules and jumps on museum equipment that creates a drawing with a life-size platform before he's supposed to; his father chastises him, but the docent is gently accepting, musing, "This isn't the way it's supposed to

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788 Oppenheimer, "The Exploratorium: A Playful Museum Combines Perception and Art in Science Education," 980.
789 "Doing What Classrooms Can't," 2.
790 Ibid.; Stewart, "Dr. Oppenheimer's Marvelous Playground."
791 Henry Jenkins, "Dennis the Menace: 'All-American Handful'," in *The Revolution Wasn't Televised: Sixties Television and Social Conflict*, ed. Lynn Spigel and Michael Curtin (New York: Routledge, 1997), 119–138.

work…but you *have* made a different design."[792] In another sequence, Dennis watches as his parents enter a room that makes his mother look larger than his father. Dennis's amazement carries him from room to room, propelled by question marks inked above his head, his legs shaking with excitement. Dennis the "Menace" has found a science museum that matches his inquisitiveness and tendency toward chaos.

I have argued throughout this dissertation that the history of the creation of children's scientific culture has significance not only for those who wish to know the ways that knowledge has circulated between generations, but also for those seeking to understand how people perceived science as a part of their own lives. The Exploratorium's appeal was visual, conceptual, and ideological, as it represented a countercultural and utopian take on science education. In returning to a childish relationship with physical phenomena, and witnessing children do the same, the visitors to the Exploratorium thought that they could reclaim the original impulses to understand, stripping science of its recent relationship with politics, destruction, and fear.

In common discourse, both "children" and "science" have been emptied of politics and context, as adults view each as innocent, pure, and deeply connected to the meaning of life; at the same time, if we look at the history of such efforts, promotions of childhood science play have been deeply political and contextual. In the twentieth century, adults promoting science as a fun pastime for children have thought of science as a way to regain "childish wonder," a tool for financial advancement, a patriotic duty, and

[792] Hank Ketcham, "Dennis the Menace" (Fawcett, 1974), Carton 21, Folder 47, Exploratorium records, BANC MSS 87/148 c, The Bancroft Library, University of California, Berkeley.

a source of liberation. These beliefs have emerged from larger beliefs about gender, class, race, and childhood. This is why, when we ask why girls drop out of STEM pursuits, or wonder how to encourage under-represented minorities to becomes scientists, it can be helpful to look at the way scientific pursuits have been represented to children.

If the various permutations of children's popular science in the twentieth century teach us anything, it may be the fact that the statement "Children are natural scientists" is anything but uncomplicated. And what do we mean when we use the supposedly kid-friendly argument, as Obama did in the speech with which I began this dissertation, that science is "cool"? Should we encourage children to commit to "science" because it gives them the power to feel the thrill of firing a marshmallow cannon or to charm their friends with a chemical magic show? Because it's a "healthy" alternative to the "thrills" of radio, television, movies, comics, or video games? Because it gives practitioners a sense of agency, or because it disciplines? Because kids like science, or because we want them to like it?

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