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THE SCIENTIFIC STORYTELLERS: HOW EDUCATORS, SCIENTISTS, AND ACTORS TELEVISED SCIENCE

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THE SCIENTIFIC STORYTELLERS: HOW EDUCATORS, SCIENTISTS, AND ACTORS TELEVISED SCIENCE

Ingrid Ockert

A DISSERTATION

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TABLE OF CONTENTS

ABSTRACT ……..... i
ACKNOWLEDGEMENTS……..…iii

INTRODUCTION
The Unseen Storytellers 1

CHAPTER ONE
The Master of Ceremonies:
The Johns Hopkins Science Review, 1948-1955 31

CHAPTER TWO
The Scientific Wizard:
Watch Mr. Wizard, 1951-1965 80

CHAPTER THREE
The Young Rebels:
NOVA, 1971-1976. 130

CHAPTER FOUR
The Ideal Workshop:
3-2-1 Contact, 1977-1980. 191

CHAPTER FIVE
The Star Professor:
Cosmos, 1968-1980. 250

Conclusion
The Voices of Tomorrow. 255

BIBLIOGRAPHY…….. 269

ABSTRACT

This dissertation explores the history of science television in the United States. My project is centered on the flows of knowledge between scientific storytellers of television: the scientists, television creators, and audience members who contributed to the development of the television genre. I examine five national programs **(***The John Hopkins Science Review, Watch Mr. Wizard, NOVA, 3-2-1 Contact,* and *Cosmos),* which aired on American television sets between the late 1940s and late 1970s. This history charts science television from the early days of broadcasting to the end of the "network era." Over thirty years, scientific storytellers produced a new form of discourse. Their distinct professional backgrounds, as actors, journalists, and scientists, affected the ways that they depicted science and scientists on screen. Early programs emphasized a technological understanding of science based around everyday experiences. Later, scientific programming focused on understanding the connections between political and social movements and science. Current events, advances in cinematography, and new pedagogical styles greatly affected the types of narratives told on television. The creation of science television series created an important space of dialogue for scientists and non-scientists.

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Television…takes us to the people who do the work. We see them and hear them often disagreeing, often plainly-half wrong and half-right…Even a rerun brings us closer to a scientist in his or her lab than most books can ever hope to do.

Philip Morrison, Professor of Physics at MIT,

A Teacher's Guide to NOVA, 1977

INTRODUCTION

The Unseen Storytellers

Even those working behind the scenes get a moment in the spotlight. On April 24, 1952, a hundred renowned television broadcasters gathered to honor their peers at the annual Peabody award ceremony at the glitzy Hotel Roosevelt in New York City. Sitting in the Grand Ballroom, amid sprays of tropical palms and white linen tables cloths, the executives of the Radio and Television Executive Society lauded their members for creating innovative programs. They recognized *The Johns Hopkins Science Review*, America's first science show, as one of the most intelligent, mature, and interesting shows on the air. Lynn Poole, the creator of the program, accepted the Peabody on behalf of the show's production team. Standing at the podium, Poole withdrew a small mirror from his suit pocket and showed it to the crowd. "Many people have said that television is today's mirror," Poole mused:

> On the face of this mirror, since 1948, we have had the opportunity of presenting scientists, scientists who have paraded across this screen to show the work that they have been doing … But there's another side to this screen. Behind the screen, there is a side that is not seen…there are administrators and networks and universities and stations…These are all sorts of people who are behind that

> screen. People you never see. Today, we pay equal tribute to the men who are behind this television screen, which is today's mirror.[1]

In his address, Poole acknowledged television programs as physical representations of unseen communities of collaboration. As he talked, viewers from around the United States watched the televised awards ceremony in their homes. No doubt, his colleagues at the Peabody Awards understood that a team of writers, scientists, actors, educators, and journalists created *The Johns Hopkins Science Review*. Poole's statement was not aimed at them, but at his viewers outside of the hotel's ballroom.

Poole wanted to raise his audience's awareness about the magic of broadcasting. Like a theatrical performance, a perfectly executed television program in the 1950s presented the illusion of an immaculate conception. A show appeared instantly on a television set, with just a flick of a switch. The characters on the screen always knew what to say; their make-up was perfect. They glided effortlessly between different sets. Good television programs masked the very nature of their own development. Only in moments of television's failure (a random goof-up on set, a stray wire) did the illusion falter. An invisible technician became visible.[2] Normally, viewers had no idea that every program depended on relationships between writers, directors, and actors. Poole recruited an even more unpredictable ally: the scientist. His daring words asked his viewers to peek

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[1] "Lynn Poole – The Johns Hopkins Science Review – 1952 Peabody Award Acceptance Speech," YouTube video, 2:33, Posted by the Peabody Awards, February 2, 2015, https://www.youtube.com/watch?v=8gLdgSD34JQ.

[2] Similarly, Shapin has argued that the work of laboratory technicians is often masked unless disaster strikes. Steve Shapin, "The Invisible Technician," *American Scientist*, 77, No. 6, (Nov. – Dec. 1989), pp. 554-653).

through television's looking glass; he prompted them to consider how television itself was created.

The intricate, unseen world of science broadcasting is just beginning to be understood. In this dissertation, I explore the history of science television and the people who created it. As the opening anecdote makes clear, a television program represents a community of people, both visible and invisible to the camera, who create and circulate an image to manage their roles and authority. Science programs are the dynamic products of these collaborations. Seemingly minor decisions made among the production staff determine which images of science are projected to millions of Americans. Television critics praise scientists for their expertise on camera. But, behind the scenes, professionals actively debated the very authority of scientists in the process of creation. My project is centered on these flows of knowledge between scientists, television creators, and audience members in five programs **(***The John Hopkins Science Review, Watch Mr. Wizard, NOVA, 3-2-1 Contact,* and *Cosmos),* which aired on American television sets between the late 1940s and late 1970s. This history charts science television from the early days of broadcasting origins to the end of the so-called "network era."[3] These shows became nationally successful for their scientific storytelling.

[3] Communications scholar Kyle Conway characterizes the "network era" as the period from the late 1940s until the early 1980s. During this period, national networks (ABC, CBS, and NBC) dictated the distribution and creation of programs. In the 1980s, cable networks like HBO disrupted this monopoly; additional technologies like VCRs also gave viewers greater control over when they watched programs. Kyle Conway, *Technology/Form: An Introduction to Media and Cultural Studies* (Grand Forks, University of North Dakota Communication Program: 2012), 73.

I have focused my analysis on several questions. Who controls the production of scientific rhetoric on television programs? How did these people affect the image of science and scientists, on television, over thirty years? How did these programs influence audience engagement with science? Although my research spans across thirty years, these questions remain constant. Rather than providing film analysis, I offer readers a historical perspective on the creation of a science television production and reveal a rich story of collaboration between a diverse set of scientific storytellers: scientists, producers, writers, actors, and educators.

In the 2010s, many scientists write, direct, and star in their own television series: like Neil DeGrasse Tyson's *Cosmos*, Brian Greene's *The Elegant Universe*, and Brian Cox's *Wonders of the Solar System*. But, in the early days of television, such direct control by a scientist was highly unusual. In the 1950s and 1960s, professionals in the humanities controlled the creation of television programs. Individuals with expertise in dramatic forms of storytelling started the very first science television programs. Actors and television directors drew upon elements of design from their experiences in other successful venues, like theater. Scientists were primarily seen as consultants to these television series. While their advice about scientific demonstrations was welcomed, other storytellers just did not believe that scientists had the skills necessarily to create an engaging series. Some scientists were willing to let others tell their stories, but scientists in academia realized television's potential as an exciting pedagogical medium. By the mid 1970s, university professors eagerly sought out opportunities to work with teams of

directors and writers on television programs. Additionally, a new generation of scientists, one that had grown up with television, emerged. They were much more interested in collaboration than their predecessors. Gradually, scientists transformed from contributors to creators of television series. They became recognized as scientific storytellers.

As scientific storytellers themselves changed, so did the television ideal of 'the scientist.' In the early 1950s, the typical scientist on screen was a reserved man in a white lab coat. He was the straight man to the bubbly, charismatic television host. Two roles emerged. The ever-knowledgeable conveyed authority, while the television host (and co-star) played along as the student (a stand-in for the unseen audience). But, by the 1970s, scientists were no longer portrayed as the all-knowing stars of the program. Instead, programs like *NOVA* depicted scientists as approachable professionals. By taking the camera out of the television studio and into the greater world, filmmakers emphasized that scientists were an integral part of American society. Children's programs like 3-*2-1 Contact!* deemphasized barriers to entering scientific professions. These new programs humanized scientific professions by spotlighting scientists' emotional reactions to their own work: moments of joy, frustration, and wonder. Gradually, by the late 1970s, the staid professor of early, postwar programs had been reimagined as a more approachable, engaging scientist. In fact, by the 1970s, almost all the scientists invited to be guests on television programs were warm, funny, and likeable. The idealized, on-screen image of the 'scientist' persuaded audiences that scientists could be talented television educators –

a necessary shift for scientists like Carl Sagan who wanted to direct their own television programs. Behind the scenes and onscreen, scientists became trusted storytellers.

As more scientists were invited into television studios as guests and contributors, televisions broadcasted new narratives of science. Following earlier styles of science pedagogy from the early 20th century, science television programs in the 1950s emphasized a style of 'everyday science' on the television screen. 'Everyday science' stressed the importance of new technological consumer products. Educators encouraged their students consider the applicability of basic science principles in daily life. 'Everyday science' could be easily taught through flashy demonstrations, which were ideal spectacles for television. Additionally, industrial scientific partners, like corporations, believed that such television programs served as ideal advertisements for their products. They became eager collaborators and sponsors. But by the late 1950s, science professors at universities reconsidered their curriculums. They decided that students needed to be taught to think 'like scientists.' Optimistically, these professors believed that young students, schooled in scientific principles, would be inspired to become the scientists of tomorrow. On the heels of Sputnik, they pushed through a national educational reform for high schools in 1958. The actual impact of this style of scientific pedagogy was fully realized a decade later. The shift away from the more generalized 'everyday science' created new opportunities for different ways of connecting with audiences.

Scientific storytellers created two forms of narratives for television, which stepped away from the applicability of scientific technologies in daily life. By the 1970s, these two science stories overtook 'everyday science' on screen. One approach, parallel to the new science educational curriculum, taught viewers to 'think like a scientist.' This method was showcased in *3-2-1 Contact!* The other approach, epitomized by *NOVA*, focused on the connections between science and society. This narrative of science was popular with audiences but some scientists disliked it, believing that it 'politicized' science. Industrial scientific partners did not particularly care for either of these new styles. 'Thinking like a scientist' emphasized individuals, not products. 'Science and society' potentially raised consumer awareness of the darker sides of consumerism, like pollution and the military-industrial complex. Additionally, some scientific storytellers no longer wished to openly collaborate with commercial agencies; they feared that their programs would be seen as 'tainted' by their audience. After the 1960s, industrial scientific partners no longer served as main collaborators in scientific storytelling. Instead, from the mid 1970s onward, the creators of science television increasingly sought funding from federal agencies, like the National Science Foundation, and private donors.

As these scientific storytellers crafted their stories, they carefully considered their audience. In the 1950s, science educators had believed that both men and women could be taught 'everyday science.' Women, they thought, would be eager to learn the science

behind their commercial appliances (like washing machines). The kitchen became a site of domestic science. Television studios also idealized white, moderately wealthy women as their target audience, believing they held the primary purchasing power in postwar families. Many young women stayed at home and watched television with their young children. They might be persuaded to buy products of educational value for their children. Accordingly, the very first science television programs were aimed at these women. The first science television hosts presented themselves as attractive, heterosexual men. They paid special attention to their female audience and addressed them directly through the screen. They invited women, including scientists, to appear on programs. Hosts praised the scientific skills of young girls and encouraged them to consider careers in science.

New storytellers focused on new audiences. By the 1970s, television producers, educators, and scientists wanted to widen their viewership. For the first time, they reflected upon the race of their audience. Some scientific storytellers carefully considered how the inclusion of more diverse scientists on screen could impact their audiences. They also consciously targeted their programs to different ages. Scientific storytellers who were educators wanted specifically to reach children; they believed that engaging television programs could create a new generation of scientists. Other scientific storytellers, like journalists, specifically focused on older Americans, both the men, urging them to become more aware citizens.

Actual audiences also reacted to these television programs with different emotions. In the early 1950s, programs like *The Johns Hopkins Science Review* and *Watch Mr. Wizard* encouraged viewers to be simply wowed by a chemical explosion. But, over time, scientific storytellers urged their audience to not merely be entertained by their programs; a good science television series should provoke them to reconsider their personal relationships to science. An episode about the dangers of nuclear reactors, for instance, might move a viewer write a letter to their congressman. Over time, science television creators encouraged their viewers to form closer, more personally tangible connections with the television hosts and their science programs. Viewers in the 1950s wrote eager letters to television studios simply thanking a host; viewers in the 1970s penned ardent poetry rhapsodizing the appearance of a host. Between the 1950s and the 1980s, audiences expected scientific storytellers to create emotionally potent, yet educational science television series.

Over thirty years, scientific storytellers produced a new form of discourse: science television. Their distinct professional backgrounds, as actors, journalists, and scientists, affected the ways that they depicted science and scientists on screen. In the early days, actors portrayed scientists and wrote programs that reinscribed established stereotypes. As scientists became central contributors and, eventually, creators of programs, they presented more humanizing images of scientists. Other elements, like shifting styles in scientific pedagogy, affected the types of narratives told on television. The intended goals of these programs also changed. In the 1950s, scientific storytellers used their programs

to sell commercial items. These earlier programs were not greatly influenced by current events. But, by the 1970s, a new generation of scientific storytellers told provocative, emotional stories that emphasized science and society. The scientific storytellers reached through television's mirror to connect with their audiences.

Historiography

Mike Fortun, a sociologist of science, invokes the ancient symbol of the chiasmus, X, in order to think through interconnected topics. He notes that, "the chiasmus marks a folding of two things into each other that, like any number of M.C. Escher prints, never settles down into a first-this, then-that image, statement, or concept."[4] Topics of study such as science communication, popularization, public science, citizen science and science education are similarly linked to me. It's hard to tease apart distinct definitions: when *is* science communication different from science education, for instance? Many of the same people who worked in science education also worked in science communication. As I'll explain later, these historic actors themselves resist being lumped into categories that obscure their professional identities.

Each of these overlapping categories have a growing historiography. Until the 1990s, most historians accepted 'popularization' as a two-part model of scientific dissemination.[5] Historians and sociologists of science writing in the 1990s, such as

[4] Mike Fortun, *Promising Genomics: Iceland and deCode Genetics in a World of Speculation*, (University of California Press, 2018), 15.
[5] In this older model, the first part assumed that scientists developed an 'elite' knowledge in a closed setting, such as a laboratory. In the second part, the knowledge is transmitted from this 'insular' community

Stephen Hilgartner, Roger Cooter, and Stephen Pumfrey, promoted a new interlocking model of popularization. They suggested that 'popular science' was a common understanding of science collaboratively created by scientists and non-scientists.[6] During the past two decades, historians of science have begun to write lively histories of public science, popular science, and science communication.[7] Many of these histories have been linked to a specific site, like a science museum. A more textured history of engagement contributes to a more comprehensive understanding of visual and conceptual symbols associated with science (i.e. "lab coats", "microscopes"). By including a wealth of understudied sources, historians have uncovered a great deal about the motivations of their scientific actors and the creation of scientific rhetoric.[8]

My initial challenge, as I conceptualized the project, was to piece together records that were not site-dependent, but, rather, created in multiple locations and over many years. Some of the records were held publicly, others were siting in offices and garages. When beginning this project, I needed to find other studies of science communicators and their audiences. Particularly, I sought other examples of such disparate actors working

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to the 'general public' (i.e. people outside of that community), by a cultural mediator (i.e. journalist, science writer), who simplified any scientific language for mass consumption.

[6] See Stephen Hilgartner, "The Dominant View of Popularization: Conceptual Problems, Political Uses," *Social Studies of Science*, 10. No 3 (1990), 519-539. 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 (1994), 237-267.

[7] Historians of Victorian England led the way for this type of research in the early 2000s. See Bernard Lightman, *Victorian Popularizers of Science: Designing Nature for New Audiences (*Chicago: The University of Chicago Press, 2007); Peter Bowler, *Science for All: The Popularization of Science in Early Twentieth-Century Britain* (Chicago: The University of Chicago Press, 2009). James Secord, *Victorian Sensation: The Extraordinary Publication, Reception, and Secret Authorship of* Vestiges of the Natural History of Creation. (Chicago: Univ. of Chicago, 2001). Ralph O'Connor, *The Earth on Show: Fossils and the Poetics of Popular Science, 1802-1856* (Chicago, University of Chicago, 2013).

[8] Katherine Pandora and Karen Rader, " Science in the Everyday World," 99, *ISIS,(*2008).

together to create science television and films. I wanted to understand how non-print mediums, like films, had been utilized as pedagogical tools in order to contextualize the nexus between science education and science television. Finally, I hoped to place my work into a large landscape of the cultural history of science. For seminal histories of science communication, I turned to the works of James Secord, Marcel LaFollete, and Bruce Lewenstein. Looking for specific case studies of scientific storytellers on film, I read the works of David Kirby, John Rudolph, and Timothy Boon. Finally, to understand how my project would fit into the cultural history of science, I consulted a variety of historians, notably Declan Fahy and David Hecht.

James Secord's *Victorian Sensation: The Extraordinary Publication, Reception, and Secret Authorship of Vestiges of the Natural History of Creation* has particularly influenced my research, especially his explanation of the circulation and the reception of educational materials.[9] In 2004, during his plenary address at the British Society for the History Science, Secord remarked that, " To do real historical work means thinking always about every text, image, action, and object as the trace of an act of communication, with receivers, producers, and modes and conventions of transmission. It means eradicating the distinction between the making and the communicating of knowledge."[10] His premiere study focused on a 19th century controversy around a book about transmutation, Robert Chamber's *Vestiges of the Natural History of Creation and Other Evolutionary Writings*. Secord's close study followed the history of Vestiges'

[9] James Secord, *Victorian Sensation: The Extraordinary Publication, Reception, and Secret Authorship of* Vestiges of the Natural History of Creation. (Univ. of Chicago: 2001).
[10] James Secord, "Knowledge in Transit," *ISIS* 95 (2004): 661.

origins, its publication, and subsequent reception among British readers. Although the book detailed a particular story of Victorian science communication, I found Secord's multi-pronged approach immensely helpful. Secord provides a literary analysis of *Vestiges* in order to demonstrate the book's emotional appeal upon audiences. His focus on Chamber's skills as a storyteller encouraged me to pay attention to the narratives broadcasted through television. Secord argues that books such as *Vestiges* upset the boundaries between scientists and "the laity." His discussion concerning the making of scientific expertise helped me understand why scientists wanted to control the production and circulation of scientific narratives, even on television. Finally, Secord acknowledges the role of readers as active contributors to scientific conversation. While reading *Victorian Sensation*, I learned how historians could read first-person accounts, like letters and diaries, to understand larger ripples of popular reception. Similarly, my study emphasizes the presence of viewers, using fan-mail and editorials, in the creation of a viewing community. *Victorian Sensation* gave me perspective on how I could write a comprehensive history of science communication, which combined a micro-historical approach (focusing on individual creators) and a macro-historical approach (describing national reception).

To specifically understand how scientific storytellers collaborated on television, I turned to the work of prolific historian Marcel LaFollete. Since the 1960s, LaFollete has written about the histories of science communication in print, radio, and television. Her first book, *Making Science Our Own* provided a close look at development of stereotypes

about scientists in newspapers from the early 20th century onward.[11] Then in *Science on Air,* she traces the origins of the influential Science Service, a news bureau that disseminated scientific current events and new insights in research.[12] In her most recent book, *Science on American Television*, LaFollette provides a broad overview of science on American television, an ideal springboard for further inquiry.[13] I approached *Science on American Television* curious about LaFollette's perspective on the ways that scientists and non-scientists worked together, behind the scenes. Drawing mainly on secondary sources, LaFollette presents scientists as reluctant contributors to a commercial medium. She argues that the early dreams of science educators, to turn television into an exciting educational tool, were dashed by the 1970s. By this moment, broadcasters were more interested in making showy specials than educationally rigorous ones. LaFollette's comprehensive study of the science series helped me in several ways. Firstly, her detailed overview helped me orient myself in time and space– readers of her work will notice that my study runs in parallel to hers. LaFollette's study talks about how national trends impacted the popularity of this particular genre of science television. Throughout the book, she discusses the increasing impacts of commercializing on the genre. Her thoughts on this subject were useful for me, as I thought about how scientific storytellers could also be corporate underwriters.

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[11] Marcel LaFollette, *Making Science Our Own*: *Public Images of Science, 1910-1955,* (Chicago: University of Chicago Press, 1990).
[12] Marcel LaFollette, *Science on the Air: Popularizers and Personalities on Radio and Early Television* (Chicago: University of Chicago Press, 2008).
[13] Marcel LaFollette, *Science on American Television: A History* (Chicago: University of Chicago Press, 2013).

Finally, I consulted Bruce Lewenstein's dissertation to cultivate a greater understanding of larger postwar trends in science communication. Lewenstein's study focuses on the creation of several communities following World War II: science journalists, science magazine publishers, and science policy makers. Examining the 1950s and 1960s, primarily, Lewenstein reveals the internal squabbles between scientists about their roles as educators and collaborators.[14] Lewenstein argues that postwar journalists, civil servants, scientists, and publishers shared a commitment to strengthen science's cultural power. Although science journalists and policy makers in these decades often framed their work to their public as objective, Lewenstein reveals that they were consciously aware of their specific goals for science communication. I found a similar disconnect among my actors; while some scientific storytellers might have a particular purpose for their material (to raise the respectability of scientists, for instance), they wouldn't admit it to their audiences. Lewenstein also draws attention to a shift from published materials that promoted applicability of science ("everyday science") and towards materials that praised the skills of scientists ("thinking like a scientist"). While governmental agencies and commercial publishers appear only a few times in my chapters – the National Science Foundation, for instance, makes a few cameo appearances – they are still important actors. Reading Lewenstein's dissertation helped me understand how these unseen actors were working alongside my scientific

[14] Bruce Lewenstein, "Public Understanding of Science in America, 1945-1965," PhD diss., University of Penn., 1987.

storytellers. Additionally, Lewenstein's other articles about the science 'bubble' in the 1980s have helped me visualize the end of the dissertation.[15]

Together Secord, LaFollette, and Lewenstein helped me frame this project as a study of the dynamics between storytellers and their audiences. To understand more specific, concrete examples, specifically related to television and film production, I looked to three other works. I picked up my copy of David Kirby's *Lab Coats in Hollywood* during a trip to Boston during the fall of 2013, long before I realized that I would be writing about television. *Lab Coats in Hollywood* examines the relationship between scientists and non-scientists in the American film industry.[16] Kirby contends that scientists, when working as consultants, can bolster the credibility and popularity of film. Filmmakers, however, also shape scientific iconography and audiences' reception of future scientific announcements. Kirby's careful analysis provided a model for me to understand the fluid alliances between scientists and media makers. Borrowing upon this work, I gathered information from my historical actors (through correspondence, internal production material, etc.) to help me explain how scientists and media makers delineated their own tasks on television productions. Additionally, Kirby conceptualizes television performance as a form of expertise. He noted that scientists frequently consulted actors on how to appear "scientific" on films. Building upon this observation, I suggest that the ability to successfully present oneself before a camera became a valued form of expert

[15] Bruce Lewenstein and Declan Fahy, "Scientists in popular culture." In M. Bucchi and B. Trench (eds.), *Handbook of Public Communication of Science and Technology*, (London: Routledge), 83-96.; Bruce Lewenstein, "The Arrogance of 'Pop Science," *The Scientist*, July 12, 1987, 12.
[16] David Kirby, *Lab Coats in Hollywood*, (Boston: MIT Press, 2011).

knowledge among scientific storytellers.[17] Actors claimed exclusive ownership over this expertise in the 1950s. Scientists who wanted to learn to become trusted on-screen 'experts' had to learn to present themselves to unseen audiences. Kirby's study helped me understand how scientists learned to fashion themselves into valued members of the scientific storytelling team.

John Rudolph's *Scientists in the Classroom: The Cold War Reconstruction of American Science Education* helped me understand the nexus between science education and science television. Rudolph uses a variety of materials to explore the transformation of postwar science education in American public schools in the 1950s and 1960s.[18] In it, Rudolph offers a detailed history of two national scientific working groups, the *Physical Science Study Committee* and the *Biological Sciences Curriculum Study* (PSSC and BSSC), which collaborated with filmmakers in the late 1950s to make educational science films for high schools. Rudolph's work enabled me understand why educators, and subsequently broadcasters, moved away from the "everyday science" style of storytelling and embraced a model of 'thinking like a scientist'. Additionally, Rudolph's reconstruction, through letters, of the conversations happening between educators in Washington, D.C. and Boston, allowed me understand the motivations of postwar science educators. Rudolph's analysis provided the science educators' perspective on the very

[17] Thomas Doherty's work on postwar newscasters also makes this observation. Doherty notes that President Eisenhower was the first president to hire actors in order to learn how to perform in front of a camera. Thomas Doherty, *Cold War, Cool Medium: McCarthyism, and American Culture* (New York: Columbia University Press, 2005).
[18] John Rudolph, *Science in the Classroom: The Cold War Reconstruction of American Science Education* (New York: Palgrave Macmillan, 2002).

first science films created for the PSSC. As I observed in my own research, the conversations between these different storytellers (educators and directors) elucidated competing ideas in scientific pedagogy.

In 2014, as I was conducting archival research at WGBH, Timothy Boon published an article in the *British Journal for the History of Science* about the history of the British Broadcasting Corporation's *Horizon,* the forerunner of *NOVA*. He claims that television producers and writers completely controlled the creation of BBC's *Horizon*, without input from either audiences or scientists.[19] My third chapter draws upon Boon's careful analysis of in-house politics of *Horizon* to discuss how the British style of documentaries was exported across the Atlantic.[20] *Horizon* also marked the shift toward the "science and society" programming of the 1970s, suggesting that the shift was not just an American occurrence. As Boon asserts in his article, a comprehensive look into the beginnings of an ongoing television series helps historians and viewers understand pertinent elements of science communication.

Finally, I wanted situate my dissertation within a larger cultural study of science. How did products of science communication themselves (i.e. television programs, newspaper clippings) become part of popular cultures? Two books helped me parse this question. Declan Fahy's *The New Celebrity Scientists* is a close reading of popular

[19] Timothy Boon, " 'The televising of science is a process of television': establishing Horizon, 1962-1967," *The British Journal for the History of Science*, 48, (2014): 1-35.
[20] After Boon, others have written about the production history of Horizon. Brian Kantor, " Performing "the authoritative account": How the BBC's Horizon produces knowledge," (M.A thesis, University College London, 2017).

newspaper articles and magazines. Fahy suggests that popularly recognized celebrities have cultivated a persona both glamorous and approachable.[21] Fahy's account is written without any archival material, demonstrating that a history of persona can be told from popular publications alone. Additionally, Fahy concentrates his study on modern scientific celebrities (like Neil DeGrasse Tyson). This allowed me to see how journalists choose to magnify specific qualities of scientists to generate buzz. Another book, David Hecht's *Science and Storytelling,* demonstrates this quite well. Hecht uses the celebrity of J. Robert Oppenheimer to examine how different actors (journalists, playwrights, other scientists) crafted distinct visions of the scientist for their own, distinct purpose.[22] He also describes Oppenheimer's failed attempts to influence his own legacy. To me, both of these books emphasized journalists' enormous power as storytellers. Journalists can propel an unknown scientist into the limelight with just a few glowing articles. Through continued coverage, these scientists can become beloved (or vilified) icons of popular culture.

Jessica Wang further urges historians to consider emotional realities when reconstructing the past. "Emotion at the level of both individual perceptions and cultural sensibility matters," she explains, "as a critical means of addressing the lived experience."[23] Television proved especially adept at prompting volatile, emotional

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[21] Declan Fahy, *The New Celebrity Scientists: Out of the Lab and into the Limelight*, (Rowman & Littlefield Publishers, 2015).

[22] David Hecht, *Storytelling and Science: Rewriting Oppenheimer in the Nuclear Age,* (University of Massachutes Press, 2015).

[23] Jessica Wang, "Physics, Emotion, and the Scientific Self: Merle Tuve's Cold War," *Historical Studies in the Natural Sciences* 42 (2012): 388.

reactions from its audience. My work documents the range of emotions that non-scientists felt towards science between the 1950s and 1980s. These key books helped me conceptualize how historians could access emotions in non-print mediums. By examining audience's reactions to programs, as well as the intentions of television creators, I intend my work to contribute to a larger study of science and popular culture.

Methodology

Drawing upon my own research and the work of previous scholars, my dissertation explores how scientists and non-scientists (scientific storytellers) worked together to broadcast science on television. Each chapter centers on a particular television program and a different group of scientific storytellers. My actors' senses of identity were often deeply embedded into the actual television programs that they worked on. They thought of themselves as literal components of their television program. Surprisingly, there was little continuity between television programs. Every program attracted a different group of collaborators; few of these collaborators worked on more than one television series.

I refer to all five programs as unit as 'science television series.' Some of these programs were intended to be educational, others were informational, and still others were meant only as entertainment. Surprisingly, the creators of these programs all held opinions on the classification of the programs. While Lynn Poole considered *The Johns Hopkins Science Review* as educational, later scientific storytellers considered it as more

informational because it was aimed at adults, not children. Don Herbert conceptualized *Watch Mr. Wizard* as a purely entertaining show for its first several years, and then reclassified it as educational. The original crew of *NOVA* adamantly stated that their program was informational, not educational, because they saw themselves as more closely allied with journalists than university educators. *3-2-1 Contact* and *Cosmos* were always conceived as educational programs. The lack of linguistic clarity among the creators of these programs suggests the malleability of the genre. Similarly, it points to the ways that each distinct program fulfilled a particular niche in the cultural landscape of science on television.

A few more qualifications: I'm honing in on science programing, not medical television programs or nature programming.[24] General educational programs, such as *Sunrise Semester*, *Continental Classroom,* and *Omnibus,* are also not included. I've also omitted one-time science television specials like Walt Disney's *Our Friend the Atom* and Frank Capra's *Bell Science Series*.[25] My concentration on American-made programs allows me to comment on concurrent cultural developments.[26] Finally, my dissertation is

[24] For illuminating works on the history of medicine on television, see Lisa Carwright, *Screening the Body, Tracing Medicine's Visual Culture*, (Minn.: University of Minnesota Press, 1995). David Serlin, ed., *Imagining Illness: Public Health and Visual Culture*, (Minn.: The University of Minnesota Press, 2010). For nature on television, see Greg Mitman, *Reel Nature, America's Romance with Wildlife on Film*, (University of Washington Press, 2009), Vincent Campbell, *Science, Entertainment and Television Documentary,* (Palgrave, 2016).
[25] For example see Mark Langer, "Why the Atom is our Friend: Disney, General Dynamics and the USS Nautilus," *Art History*, 18, (1995): 71.
[26] This excludes *Connections, Horizon, The Undersea World of Jacques Cousteau, National Geographic Specials,* and others.

focused on television series with circulating public collections. Unfortunately, this means a few series like *Walter Cronkite's Universe* are excluded.[27]

The title for this dissertation ("The Scientific Storytellers") arose from my own struggle to classify these historical actors into a single category. Despite the immense skill of professionals who create science television programs, no single phrase reliably encapsulates them. Sometimes, they were called 'science communicators,' they were also called 'science popularizers and 'science educators.' They worked to further 'the public understanding of science' or to conduct 'outreach.' Any one label masks the diverse expertise of this talented team of television creators. The verbal tensions surrounding these words matter greatly to the argument of this dissertation. Professional titles connote cultural prestige. Words create a sense of belonging and community. My research reveals that no commonly agreed term of identity for these professionals. Those involved in broadcasting science on television struggled to define themselves to others. They certainly would not have called themselves scientists (even if they had trained in chemistry, biology, or physics as undergraduates). In fact, those with previous scientific training hesitated to overstate their own scientific expertise.[28] Instead, they largely defined themselves by distinct established professional identities: writer, journalist, director, professor, or educator. Many of them did not want to be identified as

[27] Although I have been able to track down archival material related to the program at the University of Texas, there are no publicly circulating copies of that program.
[28] This is a question that I regularly asked the creators of science programs.

'popularizers,' a term that their colleagues have flung at them as a pejorative.[29] 'Science communicator' is a more neutral term applied retroactively by historians and sociologists. While it is most inclusive than 'science educator' (some science communicators do not consider themselves as teachers), it opaquely masks the expertise of the individual. The instability of this identity has simultaneously prevented these professionals from forming a sense of professional community. The lack of linguistic clarity highlights the ways that scientists, broadcasters, and writers have struggled to identify themselves as colleagues and valued each other's expertise.

I have chosen to use the term 'scientific storyteller' to talk about these professionals as a collective unit. No matter what their role, the actors in this dissertation frequently invoked storytelling to describe their unique professional expertise. Lynn Poole, the creator of *The Johns Hopkins Science* Review, told his colleagues that, if they wanted to learn how to write science television, they should start by writing plays. Similary, Don Herbert, the creator of *Watch Mr. Wizard,* explained to his colleagues that he plotted every episode of his program like a child's mystery story. Michael Ambrosino once noted that he started *NOVA* because he "wanted to examine how the world worked, to use the scientific process of discovery as a narrative device to tell good stories."[30] The writers of *3-2-1 Contact!* intentionally created comedic skits and dramatic serials embedded with scientific facts. One journalist dubbed Carl Sagan 'the Cosmic

[29] Ann Druyan, *"*Carl Sagan: A Sense of the Sacred," in Carl Sagan, *Carl Sagan's Cosmic Connection: An Extraterrestrial Perspective,* (Cambridge University Press, 2000), xx.
[30] David Stewart, "Ambrosino and NOVA: Making stories that go 'bang.'" Current, May 4, 1998, Accessed January 6, 2018 from https://current.org/1998/05/ambrosino-and-nova-making-stories-that-go-bang/.

Storyteller' for his ability to spin stories of the universe. Whether they writing a script, filming an interview, or prepping a demonstration, all my actors developed unique methods to translate scientific narratives for the television screen. From the 1950s onward, the scientific storytellers created a new form of expertise as they broadcasted science on television.

Chapter Overview

Five different scientific storytellers and their teams led the development of these science programs. Each chapter bears a description of the show's creators: the showman, the wizard, the documentary-makers, the workshop, and the scientist.

A master showman launched America's first science show. In Chapter One, I examine this science series, *The Johns Hopkins Science Review*. Starting in 1948, *The Johns Hopkins Science Review* was the first nationally broadcast series about science shown in the United States. Beaming out from WAAM Studios in Baltimore, Maryland, the television series was produced by well-respected Johns Hopkins University. The creator of the program was Lynn Poole, the charismatic director of public relations for the University. Poole was one of the first to create a network of scientists, television producers, and educators. Poole's descriptions of his own role as a communicator, often against characterizations of his guest scientists, reveal the tensions that existed between the two groups of professionals. Poole created a new type of science programming, focused on the science of everyday living. *The Johns Hopkins Science Review* promoted

an inclusive vision of science that proved popular with female viewers. It also emphasized the importance of understanding the applications of science outside of the laboratory and in the postwar home. Serving its purpose as a vehicle for public relations, the *Science Review* also confirmed the importance of science as a tool of democracy and its audience as active participants of science.

While their parents worried about the Cold War, a young magician from the Midwest entranced young baby boomers. In 1951, actor Don Herbert created *Watch Mr. Wizard,* a science television program for young children. Chapter Two explores the popularity of *Watch Mr. Wizard* in the 1950s and 1960s. Like Lynn Poole, Herbert embraced a message of 'everyday' science, but he wisely tailored his program for television's fastest growing audience: children. *Watch Mr. Wizard* became a popular television series for young children and their parents. Herbert's dual appeal to children and their parents established him as a trustworthy teacher. Although he employed flashy demonstrations, Herbert's teaching methods gently oriented the child into the world of scientific fact. A thorough examination of fan mail from the series underscores the positive reception of Herbert's approach to science education. Echoing the *Johns Hopkins Science Review*, Herbert built alliances with commercial partners. Viewers saw science on television translated into an understanding of science in their supermarket. Finally, Herbert's characterization of scientists as friendly, normal individuals won the approval of postwar academic scientists. *Watch Mr. Wizard* transformed scientists into competent, friendly characters. Herbert emerged as a scientific celebrity for the first generation of

television viewers. But, as the whims of commercial television shifted, even Mr. Wizard was whisked aside.

Nearly a decade after *Watch Mr. Wizard*, a group of rebels rebooted the entire genre of science television. By the early 1970s, American commercial broadcasters shied away from investing scientific content on television. This gap was noticed by producers of the new, federally created Public Broadcasting System (PBS). In 1974, WGBH, one of PBS's stations, launched *NOVA*, a weekly science documentary series. In Chapter Three, I focus on the first three years of NOVA's creation, under the watchful eye of Michael Ambrosino, its first executive producer. Unlike previous series, *NOVA* did not present itself as an educational program. Instead, following the tradition of programs at the BBC, *NOVA* was an informational series focused on telling controversial stories of science and society. In the early 1970s, Ambrosino, a veteran producer, recruited a ragtag crew to immigrate across the Atlantic and train a group of American filmmakers. This diverse team of filmmakers and writers formed the foundation of a production company that is still creating science documentaries. PBS' commercial-free platform gave *NOVA*'s producers the freedom to film provocative, political documentaries. *NOVA'*s depiction of science normalized science as an average vocation, supporting a new characterization of scientists as 'average.' *NOVA* episodes encouraged viewers to become engaged users of scientific information.

As *NOVA* was launched, a group of educators, television writers, and scientists attempted to redefine children's science programming. Creative professionals at the Children's Television Workshop, a NYC-based production company, energized children's television with new formats and animations. By the mid-1970s, they had created two beloved series: *Sesame Street* and *The Electric Company.* Joan Ganz Cooney, the leader of the Workshop, decided to try her hand at a science series. *3-2-1 Contact,* the resulting program, debuted in 1980 and is the subject of Chapter Four. *3-2-1 Contact!* represented a complex set of negotiations between professionals in childhood education, television production, and scientific academia. At each phase of the show's production, these stakeholders would negotiate boundaries about the extent of their own expertise. Eventually, the professionals at the Children's Television Workshop were respected as creators of science education. *3-2-1 Contact!* was notable not just for its unique history of creation, but also for its unusual approach. Unlike earlier science series, *3-2-1 Contact* focused on audience inclusivity. The creators of *3-2-1 Contact* were among the first to appeal to a racially diverse audience and promote a message of gender equality. Additionally, *3-2-1 Contact* expressly encouraged children to pursue scientific careers. Writers and science educators prompted their viewers to become young researchers as they watched the program. Instead of watching scientists perform endless science demonstrations, viewers learned how to solve scientific riddles themselves. This method of science education stressed the importance of viewer's personal identification with science.

Finally, in 1980, a scientist created a television program of his very own. Together with a team of scientist, writers, and historians, renowned planetary scientist Carl Sagan wrote and produced his magnum opus, *Cosmos: A Personal Journey*. Yet, *Cosmos* did not make Sagan famous; it was Sagan's previously established fame that made *Cosmos* an national sensation. To understand how *Cosmos* was created, it is necessary to take stock of how Carl Sagan created a public persona and developed his educational philosophy. Unlike previous chapters, Chapter Five begins long before the production of television program. Instead, I describe how a scientist honed his abilities to become a master scientific storyteller. Through many appearances at colleges and high schools in the late 1960s and early 1970s, Sagan fashioned his image as a personable science professor. He embodied the 70's vision of a 'groovy scientist': open-minded and fashionable, yet also a serious scholar. Sagan's visits to Johnny Carson's *Tonight Show* sharpened his skills as a television presenter. All these forms of outreach prepared Sagan for his debut to a much larger and international audience. On *Cosmos*, Sagan took his audience on a voyage through space and time. He encouraged his viewers to reaffirm their trust in science by understanding how principles of science permeated history, art, and music. By the 1970s, a science program like *Cosmos* set a new standard for science television series as emotionally touching television productions.

From 1948 to 1980, scientists, actors, and journalists shaped an innovative medium of communication: the science television series. With just a flick of a switch, scientists entered the living rooms of thousands of Americans. Yet, like a shimmering

electric mirror, these television programs also reflected the creation of a new, growing professional community. As these individuals spent years writing scripts and filming episodes about science, they created their own form of expertise. Within thirty years, the unseen scientific storyteller emerged as a powerful creator of narrative and an influencer of popular culture in the 20th century.

CHAPTER ONE

The Master of Ceremonies: The Johns Hopkins Science Review, 1948-1955

In 1950, Mr. Television ruled American airwaves. Milton Berle, the real name of this popular comedian, held court every Tuesday night at 8:00 on CBS's *Texaco Star Theater.* His zany antics and silly skits enchanted many Americans. But, at half past seven, around 500,000 viewers rebelled.[31] They switched the dials on their television sets to the DuMont channel and tuned into watch a different type of program: a science series. Many television critics were shocked that any show could win viewers away from CBS's prized performer. Writing for *The Chicago Daily Tribune*, Larry Wolter remarked, "the program is totally unlike Berle's."[32]

Started in 1948, *The Johns Hopkins Science Review* was the first nationally broadcast series about science shown in the United States. Beaming out from WAAM Studios in Baltimore, Maryland, the television series was produced by the well-respected Johns Hopkins University. By 1950, the staff of *The Johns Hopkins Science Review*

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[31] "[It is] carried over 22 stations of the DuMont network at 8:30 on Mondays, is that this program enters 280,000 viewing homes, with an average of 2 ¼ viewers per home." Carroll V. Newsom. *Television policy for education* (Pennsylvania State College, 1953), 139.

[32] Larry Wolter, "Lynn Poole vies with Berle for Video Audience," *Chicago Daily Tribune,* Jan. 9, 1951, 6.

received around 875 letters a week; "enough," commented *TIME Magazine*, "to suggest that there is a TV audience for something besides comics."[33] One viewer wrote:

> Our family enjoys your program very much and only wishes that it were an hour long. However, we derive, from even the short half hour, more real pleasure than the hour of Mr. Television and his monstrous routine that doesn't have the excitement, sparkle, and mystery of your program.[34]

The host of *The Johns Hopkins Science Review* was no Milton Berle, but the suave Lynn Poole, an employee of Johns Hopkins University. As the very first scientific storyteller, Poole had no background in science or any sort of training in television; nonetheless he helmed *The Johns Hopkins Science Review* for its entire seven year run. As a science coordinator, the first director of Public Relations at Johns Hopkins, and tireless advocate for public education, Poole created his own network of scientists, television producers, and educators. Most importantly, he launched a new type of science programming, focused on the science of everyday living.

To explore *The Johns Hopkins Science Review*, the chapter is divided into three parts. In the first section, I argue that *The Johns Hopkins Science Review* promoted an inclusive vision of science that proved popular with female viewers. The television program appeared on national airwaves when broadcasters were courting a new audience,

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[33] "If you don't like Milton," *TIME.* Nov. 20, 1950, 85. Because there are no tabulations of how many letters the JSHR received each week, it is hard to determine whether this was a typical number. Indeed, according to an article published two years later, one episode elicited 175 letters a day. "The Hopkins on TV," *Newsweek*, March 17, 1952, 33.

[34] "Excerpt from Letters and Postcards," October 24, 1950. Television and Scripts 1948-1950, 1959, Record Group Number 10.020, Office of Public Information, Ferdinand Hamburger Archives, Sheridan Libraries, Johns Hopkins University.

young women and their children. Affluent housewives, television's targeted commercial audience, were looking for new sources of education and entertainment. At the same time, universities sought to burnish the reputations of their research laboratories, which had become obscured from the public eye during the Second World War. *The Johns Hopkins Science Review* won viewers among scientists and non-scientists alike. With topics as diverse as breast cancer and volcanoes, *The Johns Hopkins Science Review* emphasized "everyday science" rather than high-profile science. Serving its purpose as a vehicle for public relations, the *Science Review* also confirmed the importance of science as a tool of democracy and its audience as active participants of science.

Poole was especially skilled at producing shows for a general audience. In the second part of this chapter, we dive into the dynamics of the *Science Review's* production. A television was just a box of wires and tubes, but with the flick of a switch, it became a window into another world. Crucial to that transformation, I suggest, was Lynn Poole's careful production of hyper-reality, a reflection of the real world on the television screen.[35] The show's materials explain not just the production of a television program, but also the production of a new type of scientific communicator, a telegenic non-scientific specialist. By exploring *Science via Television*, Poole's 1950 guide to television production, written for broadcasters and educators, we can understand how Poole imagined his own quasi-scientific identity. Poole's descriptions of his own role as a communicator, often against characterizations of his guest scientists, reveal the tensions

[35] Lynn Spiegel, *Make room for TV: television and the family ideal in postwar America*, (Univ. of Chicago: 1992), 137.

that existed between the two groups of professionals. As will be seen in future chapters, scientists and non-scientists have long struggled to demarcate professional authority in scientific storytelling.

The success of *The Johns Hopkins Science Review* depended upon Poole's ability to get along with other parties, his fellow scientific storytellers. The third and final section of this chapter details these relationships: between commercial partners, broadcasters, and his wife, Poole's main creative collaborator. Corporate sponsorship, although discreet, sustained the program's existence for seven years. Poole tried to build a televisual network that not only promoted *The Johns Hopkins Science Review*, but also himself as a leading scientific storyteller. As will be seen in later chapters, science television personalities like Poole often used the fame of their television program to create future opportunities for themselves.

Everyday Science and You

In 1948, only 0.4% of American households owned a television set. By 1952, this number had jumped to 33%.[36] Who gazed at the electric mirror of the modern age? "Television," quips Lynn Spiegel, "has always had its eye on women."[37] Network executives at ABC, NBC, CBS, and DuMont[38] competed for the attentions of this

[36] James Baughman, *Same Time, Same Station: Creating American Television, 1948-1961*, (Baltimore: Johns Hopkins University Press, 2007) 53.
[37] Lynn Spiegel, "Introduction," in *Private Screenings: Television and the Female Consumer*, ed. Lynn Spiegel and Denise Mann (Minneapolis: Univ. of Minnesota, 1992), vii.
[38] DuMont was national channel run by New Jersey based DuMont Laboratories, which produced television series. Baughman, 70.

consumer.[39] NBC marketing researchers summarized their ideal viewer in 1954 as "an upscale, if only moderately affluent housewife whose daily life consisted not only of chores, but also, shopping for her own family."[40] Television producers hoped that specially tailored programs would bridge the connections between the private home and the public market.

The rhetoric surrounding television consumption was invariably gendered.[41] Journalists and advertisers promoted television as a relaxing and passive activity for men. But 'stay at home' mothers became realized as an important, untapped audience. In the early 20th century, a well-off woman employed other women to care for her children and to clean her house. Fifty years later, the invention of household appliances, such as private washing machines, meant many women who might have no longer employed domestic help.[42] As historian of technology Ruth Schwartz Cohen argues, a professor's wife and a factory worker's wife could both afford machines to help them around the house.[43] But the invention of such devices, paired with a popular 'do-it-yourself' ethos,

[39] Ibid.
[40] Lynn Spigel, *Make room for TV: television and the family ideal in postwar America*, (Univ. of Chicago: 1992), 82-83.
[41] Historians of communication have written textured histories to understand the intersections between gender, audience, and television. See Spigel, *Make room for TV: television and the family ideal in postwar America*. Andrea Press, *Women Watching Television: Gender Class, and Generation in the American Television Experience* (Philadelphia: Univ. of Penn. Press, 1991), Marsha Cassidy, *What Women Watched: Daytime Television in the 1950s*, (Austin: University of Texas, 2015). Cecilia Tichi, *Electronic hearth: Creation an American television culture* (New York: Oxford University Press, 1991). Karal Ann Marling, *As Seen on TV: The Visual Culture of Everyday Life in the 1950s (*Cambridge: Harvard University Press, 1996).
[42] Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave*, (New York: Basic Books, Inc., 1983), 199.
[43] Ibid.

meant that some women spent a longer time than their mothers and grandmothers had cleaning, cooking, and caring for their families.

Male television executives assumed that these women watched television as they worked around their homes.[44] They particularly aimed their programs at affluent white women. As a producer in 1954 wrote to NBC, " We do not want to alienate lower education levels; we want to keep them but attract higher type dames in addition."[45] Their counterparts in the consumer product design industry sold television sets that fit tastefully onto the kitchen counters.[46] These conceptions of women's viewing habits prompted DuMont to be the first network to offer full daytime programming in 1948. Afternoon and morning television shows, primarily soap operas, were meant to entertain women as they worked.[47] It was a move that antagonized the larger networks, galvanizing ABC and CBS to offer their own afternoon content. DuMont also formulated a new type of show for housewives: the televisual magazine. Modeled on women's magazines, the 'magazine' program featured short narrative snippets of programing which, ideally, allowed women to tune in and out of the program while concentrating on their other tasks.[48] A DuMont television program, according to *Variety*, could "be appreciated just as much from listening to them as from watching them."[49]

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[44] Spiegel, *Make Room for TV*, 94.
[45] Baughman, *Same Time, Same Station,* 97.
[46] Mary Beth Haralovich, "Sit-coms and Suburbs: Positioning the 1950s Homemaker," in in *Private Screenings: Television and the Female Consumer*, ed. Lynn Spiegel and Denise Mann (Minneapolis: Univ. of Minnesota, 1992), 124.
[47] Spiegel, *Make Room for TV*, 78.
[48] Spiegel, *Make Room for TV*, 79.
[49] Spiegel, *Make Room for TV*, 78.

Yet television offered these women more than just a source of entertainment. Some college-educated wives became frustrated housewives. "Their desire for intellectual and creative work," Elaine Tyler May suggests, "which had been sparked while in college, was unfulfilled."[50] Particularly challenging, university faculty actively discouraged women from continuing their education in the late '40s in order to make room for incoming GIs. In one instance, Cornell University cut their women's enrollments to only twenty percent.[51] Additionally, women within science departments were demoted to allow for the promotion of male faculty.[52] Once married, these women settled into home-life. They organized PTAs and Girl Scout Troops, but looked for other sources of information in their libraries, magazines, and television sets. Sales of popular science books surged in the 1950s, due to, among other factors increasing numbers of interested women readers.[53] "Better educated than ever before, but with few prospects of using their education in the workplace," historian Beth Luey argues, "[women] sought out reading that would keep their minds active and engaged."[54]

While the networks were trying to figure out what women wanted to watch, universities were also vying for the attentions of the American public. During the Second World War, public sources of information about science had dwindled. Even the *Science Service,* a well-respected science education organization, struggled to find scientists

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[50] Elaine Tyler May, *Homeward Bound: American Families in the Cold War Era*, (Basic Books: 1988), 79.
[51] Rossiter, *Women Scientists in America: Before Affirmative Action: 1940-1972,* (Baltimore: The Johns Hopkins University Press, 1995), 31.
[52]Rossiter, *Women Scientists in America,* 35.
[53] Beth Luey, "Leading the Public Gently": Popular Science Books in the 1950s," *Book History*, 2 (1999): 246.
[54] Ibid., 245.

willing to discuss their work on radio in the late 1940s.[55] As Leo Geier, Poole's assistant, explained:

> Immediately following World War II such basic research, with no immediate application to practical results or products was a new idea to the general public. Most Americans were either not aware of, or cared little about the fact that scientists in laboratories all over the world merely had curious minds regardless of their application to daily living.[56]

The (imaginary) chasm between the laboratory and the home appeared larger than ever. Research institutions wanted to promote their research facilities to Americans. Most Americans, they reasoned, were unaware of new postwar advances in technology. In 1945, the Johns Hopkins University recruited Lynn Poole as their first director of Public Relations.[57] (See Fig. 1). His first task was publicizing the University's non-medical departments to a national audience. "And try to do that," complained Provost P. Stewart Macaulay to Poole, "without in any way minimizing the prestige of the medical school. We have been trying to do this job for years and we have scarcely made a dent."[58]

Almost immediately, Poole thought about the possibilities of creating a television program.[59] When Baltimore's first television studio WAAM was opened in 1947, Poole became a frequent visitor and learned the tools of production from directors, cameramen,

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[55] Marcel LaFollette, *Science on the Air: Popularlizers and Personalities on Radio and Early Television*, (Chicago: University of Chicago Press, 2008), 194.
[56] Leo Geier, *Ten Years with Johns Hopkins*, (Baltimore: Johns Hopkins Press, 1958), 47.
[57] "Lynn Poole Named to High Post at Johns Hopkins," Lynn Poole's Scrapbook: 1945-1960, 10.020, Office of Public Information, Ferdinand Hamburger Archives, Sheridan Libraries, Johns Hopkins University. (hereafter the Lynn Poole Papers).
[58] P. Stewart Macauly to Lynn Poole, Dec. 5, 1945, the Lynn Poole Papers.
[59] Robert M. Yoder, "TV's Shoestring Surprise," *The Saturday Evening Post*, August 21, 1954, 92.

and technicians.[60] One year later, in 1948, the University and WAAM agreed to fund a public education program, *The Johns Hopkins Science Review*.

Lynn Poole wanted his science show to appeal to a wide audience, an audience that he conceptualized as being curious, but not necessarily scientists themselves. Indeed, Poole and his collaborators faced a challenge. They had to appeal to the diverse needs of a nuclear family; something to interest Mom, Dad, a few children, and invited guests.[61] The show was broadcast at 8:30 in the evening on the DuMont network. As NBC programmer Sylvester Weaver described, 8:00 to 10:00 PM was considered "primetime," perfect for variety shows; more serious dramas were aired on network television at 9:00, after children had been put to bed.[62] At 8:30, women were likely still finishing up their chores, but they moved their tasks to the living room to watch television with their family.[63]

On the behalf of DuMont network executives and commercial collaborators, *The Johns Hopkins Science Review* particularly reached out to women. Instead of focusing on high-profile science subjects, like physics, Poole wrote scripts emphasizing the scientific qualities of carving and nutrition. Although these specialties are rarely discussed in

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[60] Ibid, 92.

[61] In the early 1950s, it was still quite unusual for every family in a neighborhood to own a television set. To accommodate, families frequently invited their friends over to watch a television program. Spiegel, *Make Room for TV,* 27.

[62] Baughman, *Same Time, Same Station,* 91. Children were an important part of the postwar audience; DuMont rose due to the popularity of its space serial, *Captain Video*.[62] But, as I will discuss in the next chapter, it wasn't until premiere of *Watch Mr.Wizard* that science shows became associated with children's programing.

[63] This is based on sociologist Mirra Komarovsky's descriptions of women's daily lives in 1953. Cowan, *More Work For Mother,* 198, 199.

today's science courses, common household practices and technologies were incorporated into science education materials until the mid-1960s, such as textbooks for science curriculums.[64] "Everyday science" is my shorthand for a type of knowledge that connects the activities of daily life with scientific principles. Poole himself never used this term, although he talked about "science of the daily life" and "science for everyone."[65] A journalist wrote after the show ended, "The aim of the program [..] remained constant: to report accurately the latest developments in science and the humanities and explain what they mean in the everyday life of the viewer."[66]

Poole often wrote episodes on topics that were stereotypically aimed at women; nutrition, household maintenance, and, yes, even diamonds. On one such program, about chemical composition of synthetic detergent, Poole began, " This question might interest a great deal many of you, including housewives."[67] He continued with demonstrations of the best soaps for cleaning floors, scrubbing clothes, and washing hair. Poole also collaborated on other materials, like pamphlet mentioned earlier, that were likely written for women. In fact, television critic John Crosby complained that the *Science Review* had

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[64] During the 1930s through the early 1950s, many American educators believed in life adjustment education, which encouraged students to prepare themselves for the technology that they would encounter in factories, on farms, and in the home. In the mid 1950s, educators at MIT and other universities pushed for a re-written high school science education that stressed the importance of physics and mathematics. See Kimberley Tolley, *The Science Education of American Girls – A historical perspective* (New York: Routledge Falmer, 2003). John Rudolph, S*cientists in the Classroom: The Cold War Reconstruction of American Science Education*, (New York, NY: Palgrave Macmillan, 2002).

[65] As will be discussed in the following chapter, *Watch Mr. Wizard's* Don Herbert also talked about the "science of everyday living."

[66] John C Schmidt,. "Hopkins' Ten Years in TV." *The Sun,* Mar 09, 1958.

[67] "How clean is clean." Johns Hopkins Science Review. DuMont. November 3, 1952. VHS. Johns Hopkins Television Programs: 1948-1960, Special Collections, Milton S. Eisenhower Library, The Johns Hopkins University.

too many "women's programs."[68] He wanted fewer episodes on everyday science like woodwork, and more about space and rockets.

Still, during the show's seven-year run, a national fan base coalesced around the series (See Fig. 2). Poole received hundreds of letters from high school teachers, bus drivers, engineers, and parents from around the United States. "Now we are beginning to receive the kind of programs television is capable of...informing and entertaining too," crowed fans from Ohio.[69] "Your Science Review at last gives the family something to watch and talk about for days," cheered viewers in New Jersey.[70] Another fan remarked, "You don't think we're morons. Keep it up."[71] The *Science Review* did not keep records of its viewer mail, but Poole often mentioned on air how the show was popular among women, including female high school teachers and mothers.[72]

Poole saw women as active, not passive, participants in science. On a personal level, Lynn Poole also viewed women as collaborators (such as his wife, Gray Johnson) and as teachers (like his former mentor, modern dancer Ruth St. Denis).[73] (His collaborations with Johnson are discussed at the end of this chapter.) He encouraged his viewers to connect with scientific topics in their lives. Two episodes on women's health

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[68] John Crosby, "Radio and Television," *New York Herald Tribune*, Mar 20, 1953, 17.
[69] "Excerpt from Letters and Postcards," October 24, 1950. The Lynn Poole Papers.
[70] Ibid.
[71] Robert M. Yoder, "TV's Shoestring Surprise," 92.
[72] "Seven years old," Johns Hopkins Science Review. DuMont. March 6, 1955. VHS. Johns Hopkins Television Programs: 1948-1960, Ferdinand Hamburger Archives, Sheridan Libraries, Johns Hopkins University. (hereafter the Johns Hopkins Television Programs).
[73] Before Poole joined JHU, he was a modern dancer and performed in Europe. Donald Kirkley, "Debut One Series He Created,"*The Sun*, Oct. 4, 1964, TV3.

won *The Johns Hopkins Science Review* many fans, men and women. In a period of television censorship, Lynn Poole made a daring decision to provide a frank look at the cancer of the cervix and the breast. The show taught women to examine themselves for lumps and interviewed women who had survived mastectomies. Poole proudly told reporters that Johns Hopkins University had received not one complaint for this program.[74] Instead, letters poured in thanking him. One woman told him, " My daughter watched the program with two other girls. Thank for teaching her facts I could not have taught her myself."[75] On the final episode of *The Johns Hopkins Science Review*, an emotional Lynn read aloud a letter, wherein a man thanked him for the cancer series: "My wife took warning and saw the doctor. You saved her life."[76]

Poole invited women to appear on camera as well. *The Saturday Evening Post* joked that women on the show were bikini-clad showpieces for science. [77] A closer examination of individual programs reveals a rather richer variety of woman's participation, although admittedly shaped by gendered norms. In fact, almost every episode of *The Johns Hopkins Science Review* began with images of men and women working together in laboratories at Johns Hopkins University. Women were frequently featured in episodes as nurses, patients, laboratory assistants and technicians. Poole

[74] Geier, *Ten Years with Johns Hopkins*, 38.
[75] Ibid.
[76] "A visit to our studio," "From studio to your home," "Seven years old," Johns Hopkins Science Review. DuMont. January 7, 1952, January, 14, 1952, March 6, 1955. VHS. Johns Hopkins Television Programs.
[77] Another characterization of women's participation on the Science Review is seen in *The Saturday Evening Post's* review of the series. The lead-in for the article reads: "A strikingly pretty blond model, attractively dressed in high-heeled pumps and a towel is rehearing on one side of Station WAAM's big television studio in Baltimore…" I would contend that such commentary served the author's purpose of catching the attention of his audience, not generalizing the treatment of women by the show's creators. Robert M. Yoder, "TV's Shoestring Surprise*,"* 92.

treated these guests with the same respect that he gave his male guests. While introducing his guest Dr. Cornelia Snell on the aforementioned episode on detergent, he noted that she was an accomplished chemist and a leading member of the American Chemical Society.[78] In "The Artist and the Doctor," Poole presented Annette Burgess as a skilled medical illustrator at Johns Hopkins University, praising her abilities as an expert.[79] He expounded upon her ability to carefully recreate an eye on paper and a giant human nose out of wax. Even Ramona Albert, animal trainer, was praised by Poole for her abilities to teach dogs. For laughs, Poole played up his inability to control a spaniel as Mrs. Albert quickly trained a terrier.[80]

Additionally Poole encouraged girls and young women to appear on the *Science Review*. In "Kids Look at Science," a group of elementary school students performed their own episode of *The Johns Hopkins Science Review*.[81] In this episode, one little girl read the scientific method aloud. As "Dr. Boyer," one another student talked to the children about "her work" as a mechanical engineer. Another girl pretended to be a hydrologist and explained the importance of intercity drainage. Two other episodes of *The Johns Hopkins Science Review* featured high school students presenting award-winning experiments from local science fairs. In each of these episodes, Poole chose an

[78] "How clean is clean." Johns Hopkins Science Review. DuMont. November 3, 1952. VHS. Johns Hopkins Television Programs.
[79] "The artist and the doctor."Johns Hopkins Science Review. DuMont. December 17, 1951. VHS. Johns Hopkins Television Programs.
[80] "How to lead your dog's life." Johns Hopkins Science Review. DuMont. June 16, 1952. VHS. Johns Hopkins Television Programs.
[81] "Kids Look at science" Johns Hopkins Science Review. DuMont. October, 29, 1951. VHS. Johns Hopkins Television Programs.

equal number of young men and young women.[82] One of the students, Jean Spencer, presented her work on black widow venom. Poole especially praised her:

> I hope you won't mind me paying you a compliment, because like these other scientists of tomorrow, you have really used your own curiosity, your own imagination, and I think quite a bit of scientific skill in working this out. [Poole looks into the camera] It takes a great deal of skill to do the thing that Ms. Spencer has done…that's real scientific research. [83]

Poole's compliment showed his interest in Spencer's work, not her sex. Poole was supportive any young person who expressed interest in science, regardless of gender. In another installment of "Scientists of Tomorrow," Poole suggested that Mary Jeanne Creek, a high school senior and Westinghouse Scholarship winner, apply to Johns Hopkins School of Medicine.[84] Poole also encouraged other young women watching the show to consider attending Johns Hopkins.[85] Even the illustrations for Poole's companion to the series, *Today's Science and You,* were inclusive of women. The final drawing, depicting scientists in a laboratory, feature a young woman peering into a microscope.[86] (See Fig. 3). Poole's vision of postwar laboratories seemed to encourage gender inclusivity.

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[82] In the first "Scientists of Tomorrow" episode," two girls and two boys were chosen. One boy and one girl presented in the second episode. "Scientists of Tomorrow," "Scientists of Tomorrow," Johns Hopkins Science Review. DuMont. October, 8 1952. March 3, 1954. VHS. Johns Hopkins Television Programs.
[83] "Scientists of Tomorrow," Johns Hopkins Science Review. DuMont. October, 8 1952. VHS. Johns Hopkins Television Programs.
[84] "Scientists of Tomorrow," Johns Hopkins Science Review. DuMont. March 3, 1954. VHS. Johns Hopkins Television Programs.
[85] Ibid.
[86] Lynn Poole, *Today's Science and You*, (Whittlesey House: 1952), 197.

The women in Poole's audience were often charged with another task: keeping their families safe. Following the Second World War, American women were encouraged to protect their families from threats of communism and nuclear attack. In this vision, women retreated into their split-level ranch homes to create stable, contained households, with happy children and sane husbands. As mothers and wives, they still looked for ways to exercise their civic responsibility. In 1953, the Ford Foundation launched a study that questioned if thousands of women could be retrained to be scientists, which would create a stockpile of "scientific womanpower."[87]

The *Johns Hopkins Science Review* addressed the fears of the all-American housewife. First, *The Johns Hopkins Science Review* staunchly promoted a philosophy of scientific freedom.[88] A free country, Poole suggested, supported all of the endeavors of its scientists. In *Today's Science and You*, a companion to the *Science Review* he wrote:

> We who live in this country are fortunate to have the freedom of democracy, which allows us to explore every and all fields of science. This exploration and experimentation leads to discoveries which benefit free men everywhere.[89]

He praised the American Association for the Advancement of Science for its devotion to scientific and humanitarian advancement.[90] Criticizing scientific research conducted in

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[87] Rossiter, *Women Scientists in America*, 59.
[88] As John Krige has explained, at the time, American politicians were concerned about supporting scientific laboratories in other countries with Communist sympathies. The Rockefeller and Ford Foundations struggled to allocate funds to support laboratories with truly 'American' ethos. John Krige, *American Hegemony and the Postwar Reconstruction of Science in Europe,* (Boston: MIT Press, 2008), 127.
[89] Poole, *Today's Science and You*,196.
[90] The President of AAAS at the time, Detlev W. Bronk, was also the president of Johns Hopkins University. Poole, *Today's Science and You*, 7.

countries under nondemocratic rule, Poole proclaimed, "Fundamental research must be continued – if it is stifled, the great well from which great discoveries flow will run dry."[91]

The Johns Hopkins Science Review also offered viewers with a new way to "look over the shoulder of the scientist."[92] As Lisa Cartwright has suggested, "Practices of looking are not passive acts of consumption."[93] In this way, *Johns Hopkins Science Review* invited their viewers to participate in a form of surveillance. The proverbial Mrs. Jones could tune in and watch Hubert Alyea, professor of physics at Princeton University, perform experiments. She learned a little bit of atomics, but she also learned that Prof. Alyea was harmless, albeit, a bit absentminded.[94]

The act of watching affirmed a positive view of postwar science that was safe and friendly. *The Johns Hopkins Science Review* intended to keep citizens, worried about atomic warfare, trusting 'their' scientists. Scripts for the *Science Review* praised scientists for their dedication, remarkable patience and curiosity.[95] Poole might even talk with his

[91] Poole, *Today's Science and You,* 197.
[92] Lynn Poole, *Science via Television.* (Johns Hopkins Press: 1950) 1.
[93] Lisa Cartwright, *Practices of Looking: An Introduction to Visual Culture, (Oxford University Press: 2005),* 42.
[94] I invoke Alyea here because he was as especially interested in creating a positive public image of science His public televised lectures, like the one seen on Johns Hopkins Science Review, inspired Walt Disney to write Fred MacMurray's character in "The Absent Minded Professor" (1961). W. Barksdale Maynard, "Hubert Goes to Hollywood," *Princeton Alumni Weekly*, March 18, 2015. Retrieved from https://paw.princeton.edu/issues/2015/03/18/that-was-then/.
[95] "Great Men of Science," Johns Hopkins Science Review. DuMont. May 5, 1952. VHS. Johns Hopkins Television Programs.

guests about their family.[96] The appearance of real scientists, engaging in everyday science, allowed Poole with weekly opportunities to foster a positive image of science.

The women of *The Johns Hopkins Science Review* were onscreen and in the audience. As a virtual community, their active presence shaped the topics of program. As real people, their presence on the screen was trifold; they encouraged other women to trust the postwar scientific community, to purchase new forms of domestic technology, and to enter the scientific profession themselves. While these women may have lacked scientific credentials, they were participants in a postwar vision of everyday science. A television critic observed in a review of the *Johns Hopkins Science Review*, "Truly, science in these grim days is everyone's business." [97]

The Production of Television (and Self)

For Johns Hopkins University, Lynne Poole proved to be the ideal producer of inclusive, everyday science programming. When he joined Johns Hopkins in 1945, Poole was a jack-of-all-trades. A former professional dancer, with no scientific background, Poole had studied Greek, aesthetics, and theater at Western Reserve University. [98] He even staged musicals to entertain soldiers during World War II.[99] Before working at Johns Hopkins, Poole had served as the first director of adult education at the Walters Art

[96] "The Master Glassblower," Johns Hopkins Science Review. DuMont. October 8, 1951. VHS. Johns Hopkins Television Programs.
[97] John Crosby, "Radio and Television," *New York Herald Tribune*, Mar 20, 1953, 17.
[98] Kirkley, "Debut on Series He Created."
[99] "Hopkins Pioneer, Lynn Poole, Dies." 1969.*The Sun (1837-1990)*, Apr 16, 2.

Gallery in Baltimore.[100] Poole's skills on stage and in the gallery translated impressively well onto television.

In this section, I seek to highlight the importance of Poole's contribution to the creation of the American 'science series' and role of the science host. Subsequent chapters will follow the development of this genre; here, on a simple soundstage, was its humble beginning. I argue that Poole successfully fashioned himself as a friendly non-specialist for his audiences. But his feigned onscreen ignorance hid his shrewd understanding of show business. Behind the scenes, I propose, Poole wielded his skills as a theatrical professional to create an 'illusion of actuality' for his audience and to assert himself as a science communicator on a national stage.[101]

In 1948, the same year that *The Johns Hopkins Science Review* launched, television insider Thomas Hutchison published a beginner's guide to television production. He advised producers to hire men to host their local programs. "Who are we playing to in television, the husband or the wife?" Hutchinson queried, "Of course we are playing to both, but it is doubtful that many men look at programs that their wives don't want to see and usually, in the long run, women would rather look at attractive men than at other women."[102] Other television executives took the hint. Some former stars of radio,

[100] Ibid.
[101] Poole, *Science Via Television*, 80.
[102] Thomas H. Hutchinson, *Here is Television: Your Window to the World,* (New York: Hastings House, 1948), 122.

like Edward Murrow, were lucky; they had suave voices and a rugged appearance.[103] Lynn Poole's main competitors, Arthur Godfrey (CBS) and Milton Berle (NBC) ran their own comedy variety programs weeknights at 8:00 pm. Marsha Cassidy has argued that these men offered their female viewers a "modulated form of masculinity that not only incorporated boyishness, naughtiness, and humor but also included those traits traditionally associated with women's "sweetness," gentleness toward children and animals, deference to others, empathy, and attentive listening."[104] These hosts of the small screen downplayed culturally masculine traits (i.e., loudness, crude humor, aggressiveness) to cultivate the personal of the well-respected, urbane television personality.

Additionally, the men who hosted these programs were careful to create personas that were 'average' and 'relatable.' [105] These mild-mannered men of mediocrity might have been your next-door neighbor; they were non-threatening enough to invite into your home.[106] A 1957 article in *TIME Magazine* derided the cookie-cutter personalities being turned out by the major networks as 'the bland leading the bland.'[107] Yet, as Hutchinson advised his readers in 1948, their hosts should be tepid, but talented. Most importantly, they shouldn't upstage their guests. Television, after all, promised to provide audiences

[103] Thomas Doherty explains that Edward Murrow recruited a team of CBS reporters, dubbed "Murrow's Boys," who fit this description perfectly. "They were, almost to a man, singularly attractive swains, urbane, wasp, bred to a patrician coolness congenial to the medium." Thomas Doherty, *Cold War, Cool Medium: Television, McCarthyism, and American Culture,* (New York: Columbia University Press, 2005), 164.
[104] Marsha Cassidy, *What Women Watched: Daytime Television in the 1950s*, (Austin: University of Texas, 2015), 76.
[105] Karen McNally, "Hollywood stars vs. variety show hosts: The incompatible case of Frank Sinatra on 1950s television," *European Journal of American Culture* 31 (2012): 110.
[106] Ibid., 110.
[107] Ibid., 117.

with passing celebrity encounters. “There are few people who wouldn't be thrilled,” Hutchinson remarked:

> if they could casually remark to their next door neighbor, "Come on over tonight, Bing Crosby is coming to our house, as our guest, and he's going to sing." Radio brought Bing's voice to our home, so did phonograph records. But television brings the man himself, his personality, his charm.[108]

Sweet, mild-mannered, and good-looking, the ideal host of a 1950s television program was trusted enough to bring the outside world into the private space of a postwar home.

Poole fit the bill of the ideal TV personality. Every episode of *The Johns Hopkins Science Review* began with an image of him, Science Coordinator, small and lithe. His voice was smooth and urbane, with a slight drawl warming every word. With tufts of white hair and a conservative suit, Poole appeared comfortably mature.[109] Like other television performers of the 1950s, Poole and his guests looked through the camera to catch the eye of their viewers.

Each program with Poole thanking his viewers for sending him letters and telegrams. Humble and self-effacing, Poole highlighted the wisdom of his scientific colleagues on every matter. Poole told his viewers that most of the episodes result from his own ignorance on a topic.[110] His scientific guests received the highest praise for their

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[108] Hutchinson, *Here is Television*, 142.
[109] “Lynn Poole, Won Early TV Prizes,” *The New York Times,* April 16, 1969, 47.
[110] “What do you know about wood?” Johns Hopkins Science Review. DuMont. August 18, 1952. VHS. Johns Hopkins Television Programs.

intelligence, perseverance, and selflessness.[111] Alongside such men, the elfin Poole faded into the background, allowing his guests to hold center stage. Although he became nationally famous, Poole presented himself as average and approachable. Historian Marcel LaFollette describes him as "cool, reserved, at ease – yet he always conveyed deep concern that every viewer understand what the experts were saying."[112]

Poole's appealing televisual persona was important because it threw *The Johns Hopkins Science Review* into relief as a program that had more in common with a daytime talk-show than with a dull science lecture. While Poole's main competitors were charismatic clowns, *The Johns Hopkins Science Review* came across as a middle-brow, educational program that didn't take itself too seriously. Poole even incorporated small skits into some episodes to get laughs.[113] As discussed in the previous section, Poole won fans for his approach to everyday science. However, the unassuming Poole of the camera was merely a television persona. Poole publicly presented himself as an unskilled layman on screen, but this belied his role as the dramatic force behind the production of *The Johns Hopkins Science Review*.

Television sets in the 1950s were still objects of wonder to some viewers. *The Twonky* (1953), a science fiction comedy, depicted a television that walked, smoked, and

[111] For example see "Highlights of science from nine universities," Johns Hopkins Science Review. DuMont. August 18, 1952. VHS. Johns Hopkins Television Programs.
[112] Marcel LaFollette, *Science on American Television*, (Univ. of Chicago: 2013), 12.
[113] Famously, Poole gave John Astin, a Johns Hopkins student, a bit part on a *Science Review* sketch as a carnival barker. The role gave Astin enough of a credential to get into an actor's union. He went on to be an accomplished television actor, well-known for his turn as Gomez Addams in the *The Addams Family* (1964). Rob Hiassen, "Test Tube TV: Cooked up in JHU lab by a p.r. whiz" *The Sun,* December 11, 1996. 1E.

shot lasers out of its antennae.[114] Many entertainers also drew the curtain back to educate their viewers about their fantastic world. One popular film, *Singing in the Rain* (1952) told the story of Hollywood stagecraft.[115] *The Burns and Allen Show*, a competitor for the *Science Review's* 8:30 PM time slot, featured a married couple starring on their own fictional television show.[116] Poole suspected that viewers would be interested in the production of the show. He intentionally hosted several episodes of the *Science Review* that took them 'behind the scenes,' introducing them to unseen cast and crew.[117] In many ways, these programs today seem self-serving, as pure-promotional vehicles for the show. But Poole intended them to demystify the world of television and to cultivate their trust in science.

Poole's written work and speeches about television coalesced into *Science via Television* (1950).[118] *Science via Television* was both a textbook for other television educators and an effective piece of publicity for Poole. The book's meticulous overview of the *Science Review's* production provides other television producers with useful information on the mechanics of constructing science television series. Poole held several roles in this hive: he was the host, the producer, and the writer of every script. A host, Poole explains, was indispensible to the show's onscreen character. "Since the guests on

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[114] *The Twonky*. Directed by Arch Oboler, (1953, United Artists).
[115] *Singing in the Rain,* Directed by Gene Kelly, (1952, Metro-Goldwyn-Mayer).
[116] Lynn Spiegel, "Installing the Television Set: Popular Discourses on Television and Domestic Space, 1948-1955" in *Private Screenings: Television and the Female Consumer*, ed. Lynn Spiegel and Denise Mann (Minneapolis: Univ. of Minnesota, 1992), 16.
[117] "A visit to our studio," "From studio to your home," "Seven years old," Johns Hopkins Science Review. DuMont. January 7, 1952, January, 14, 1952, March 6, 1955. VHS. . [117] "What do you know about wood?" Johns Hopkins Science Review. DuMont. August 18, 1952. VHS. Johns Hopkins Television Programs.
[118] Poole, *Science via Television.* 13.

a science program are generally untrained television performers," he explains, "it is necessary to have one person who can regularly act as guide, prompter, timekeeper, and general assistant to the scientist."[119] In the early days of production, Poole and his collaborators were unsure of what to call this role; they considered using the titles of moderator, interlocutor, and master of ceremonies.[120] In the end, they settled upon the phrase, "science coordinator."[121]

Poole worried that about whether a science program could fascinate the general public. He held a deep respect for the intelligence of his audience. Viewers, he contended, resented being treated like children by condescending network executives. In fact, Poole argued that, owing to the relative popularity of scientific lectures and exhibitions, his audience was quite well educated. "They should be given credit for their knowledge," he remarked in *Science via Television*.[122] Poole's challenge was to create a believable, entertaining program that kept them watching. As Hutchinson explained his manual for television production, audiences usually arrived at a play excited to see a production and "in sympathy with the performer."[123] A television viewer, on the other hand, frequently turned on a television program without any sort of expectation of what they might see. Poole was worried that a science program would put off such a viewer. "Nothing will confuse televiewers more than to see a disconnected series of

[119] Poole, *Science via Television,* 17.
[120] Ibid., 17.
[121] Ibid., 17. Poole mentions that another science program in the Minneapolis area, "Headlines in Chemistry," also used this title.
[122] Ibid., 24.
[123] Hutchinson, *Here is Television*, 141.

demonstrations, no one bearing any apparent relation to the others," he bemoaned, "The lay audience will mutter, "what is this?" "What are they trying to prove?" "I don't understand this at all." All of which adds up to turned dials and lost viewers."[124] Poole tasked himself with finding a way to keep create an alluring aura around a potentially dry program.

The Johns Hopkins Science Review, Poole explained, had to be as entertaining as vaudeville, but it also needed to be genuine:

> Reality is another goal toward which the scriptwriter must strive. The science program attempts to create an atmosphere of here and now, an atmosphere leading the viewer to the feeling that he himself is beside the demonstrator. The script can be so constructed that the audience is magic-carpeted away from home and into the laboratory.[125]

The scientist talking easily with Poole might have walked through the television screen and into their home. To an audience member, the experiments conducted in a studio might have been conducted at home, using ordinary household objects.[126] As Lynn Spigel notes, "At its most ideal, television promised to bring to audiences not merely an illusion of reality as in the cinema, but a sense of 'being there,' a kind of hyperrealism.[127] Poole's episodes that took viewers 'behind-the-scenes' performed an important function; they demonstrated the 'reality' of the television production. Audiences in the 1950s were

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[124] Ibid., 31.
[125] Poole, *Science via Television*, 79.
[126] Poole pioneered the use of mousetraps and ping-pong balls to explain nuclear fission (famously used by Walt Disney Studios in *Our Friend the Atom* (1957). Schmidt. "Hopkins' Ten Years in TV."
[127] Spiegel, *Make Room for TV,* 137.

being sensitized to a new type of virtual witnessing.[128] Paradoxically, Poole utilized his past as a performer to create a 'hyper-realistic' television program. Such a careful attention to detail translated to an enjoyable, watchable science program. But, if audiences believed that they were watching scientists in action, they missed a crucial piece: Poole was largely running the show, not his scientific experts.

As a showman, Poole had many tricks up his sleeve to keep his viewers interested. To keep the illusion that viewers were watching scientists in the midst of a laboratory, not on a sound stage, the actual location of the sound stage was seldom mentioned.[129] Sometimes, when showing a short film, *The Johns Hopkins Science Review* showed a scientist loading fake film onto a dummy projector, when, in fact, the film was projected from the production booth.[130] Similarly, duration of time was almost never discussed on the *Science Review* (i.e. the length of on-screen demonstrations) because Poole feared that it would break "the illusion of actuality."[131] To the readers of his book, Poole warned, "the science subject may be the most astounding in the world, but if it comes on in lugubrious pedantic fashion, the viewers will switch to another program."[132]

His biggest act of deception concerned the scientists themselves. In other locally broadcast education programs, scientists were merely brought on to read aloud scripts

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[128] David Kirby, *Lab Coats in Hollywood: Science, Scientists, and Cinema,* (MIT Press, 2011). 23-27.
[129] Although Poole chose to allow his viewers to see-behind-the scenes, he didn't want to break the illusion of the show without due cause. Ibid., 79.
[130] Ibid., 54.
[131] Ibid., 80.
[132] Ibid,, 108.

about their demonstrations.[133] But Poole had no background in science himself and needed input from his guests in order to write the script. A typical thirty-minute episode of *The Johns Hopkins Science Review*, he explained, took around two hundred hours of preparation.[134] Poole's greatest challenge was writing a script that seemed natural, but was actually meticulously planned.[135] The process started with several meetings between the scientist and Poole to brainstorm the theme of each episode and to create an outline of the program. "In the telling, this work sounds dull, mentally enervating," Poole admits, "In the doing, it is exciting and stimulating, because this procedure presents a challenge to all and offers a continuing creative experience for the writer."[136] Such a description legitimized Poole's task and strengthened his image to other broadcasters as a professional. By positioning science communication as a difficult skill, he supported the image of himself as a talented specialist. Poole's scientific guest stars were collaborators, but Poole managed their every move.

In newspaper articles, Poole insisted that the proverbial Mrs. Jones would only trust a real scientist on television; she would never be fooled with an actor playing the role.[137] Yet Poole admitted in *Science via Television* that *he* wrote all the lines of his scientific guests. As Poole penned the script, he strove to channel his scientific guests. "If you attempt a science show script, subjugate your own personality," Poole suggested.

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[133] Ibid., 70. He cites shows in Minnesota and California.
[134] Ibid., 6.
[135] "Informality is indeed the keynote on a science program…" Ibid., 62.
[136] Ibid., 69.
[137] Harold Brown, "Television: College's Show Brings Science to the Home: Sugar and Ice Cream Aid Demonstration." *New York Herald Tribune*, Jan. 7. 1951, D5.

"Be a chameleon."[138] In other words, Poole toned down his own on-screen presence in order to play up the importance of his scientific guests and the topic of the show. Again, Poole relied on close relationships with scientists to draft scripts with genuine dialogue. "Care and caution must be exercised in the writing of a script for presentation by a non-professional performer," Poole remarked:

> Will the words and phrases fall naturally from a scientist's lips?...Perhaps that speech is punctuated with a drawl, a twang, or a folksy note, or it may be characterized by a clipped precision.[139]

Poole recommended that writers spend a considerable amount time with scientists until they were certain that their scripts would be infused with their guests' personalities.[140]

Yet Poole himself proclaimed that there was no obfuscation in this method of writing. To the contrary, he defended himself with the claim that television writers were helping their subjects and their audiences. " It is extremely difficult for the scientist to explain his work in everyday terminology," Poole explained:

> He is accustomed to discussing projects with colleagues, laboratory technicians and students, all of whom understand his language...Part of the fun of preparing a science program is the necessity for mental gymnastics in either evading words altogether or finding simple synonyms for tongue-twisting, multisyllabic terms.[141]

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[138] Poole, *Science via Television*, 77.
[139] Poole, *Science via Television*, 77.
[140] Ibid., 69.
[141] Ibid., 24.

In such a justification, Poole continued the then long-held notion that scientists were special and existed in a sphere apart from the rest of their community.[142] Poole's explanation reified the two-spheres model of science communication and validated his place as a scientific interlocutor, a professional who could easily step between two worlds. To him, the non-scientist was the ideal scientific storyteller. His framing of the *Johns Hopkins Science Review* as a conduit into the scientist's world deepened the perceived divide between the general public and scientists.

Even though Poole insisted that scientists could not explain themselves without the help of writers, he assured other scriptwriters that scientists were a joy to work with. He greatly extolled the patience of his guest stars.[143] " You'll find that a scientist, who will agree to do a program at all," Poole intoned, "will be cooperative in doing it your way, if it is honest, factual, and dignified."[144] Scientific guests were eager to visit television studios, Poole observed, but unsure of how to interact with members of the crew. He suggested giving these guests a quick tour of the studio and introducing them to the crew: "The performers then [will] have a total picture of the operation and will feel themselves to be part of a team, a group working together to center attention on this one

[142] Historians and sociologists of science writing in the 1990s, such as Stephen Hilgartner, Roger Cooter, and Stephen Pumfrey, promoted a new interlocking model of popularization. They suggested that 'popular science' is a common understanding of science collaboratively created by scientists and non-scientists. See Stephen Hilgartner, "The Dominant View of Popularization: Conceptual Problems, Political Uses," Social Studies of Science, 10. No 3 (1990), 519-539. 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 (1994), 237-267.
[143] Poole, *Science via Television*, 70.
[144] Ibid., 78.

specific program."[145] Poole wanted his guests to visualize themselves as members of the *Science Review* crew, and to know their proper place within a production.

As for filming scientists, Poole echoed his earlier assertion that they were not naturals on television, although they were quick studies. The scientist who worked in laboratories felt the most at ease. "Why should a scientist be nervous?" Poole queried, "On a science show he is working with apparatuses which are as familiar to him as sunlight and he feels at home."[146] But, Poole was quick to emphasize, that scientists weren't usually ill at ease in front of a camera. Ironically, he found that scientists who were used to lecturing a classroom of students had the most difficultly performing for a camera because they presented materials in their own set manner.[147] Additionally, they had a nauseating habit of swaying "cobra-like" in front of the camera.[148] Former vaudeville player, dancers, and actors like Poole were ideal performers for early television programs. Quick on their feet, they were used to paying attention to a variety of external cue – as well as handling improvisational accidents that happened on stance.

As a former professional dancer, Poole understood how to direct individuals' actions on a stage, so he choreographed all the movements for his guests. He told them what props they could bring with them ("A beaker containing clear liquid will look like an empty container") and suggested appropriate on-screen attire ("A broad plaid or

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[145] Ibid., 159.
[146] Ibid., 156.
[147] Ibid., 156.
[148] Carroll V. Newsom. *Television policy for education; proceedings of the Television Programs Institute held under the auspices of the American Council on Education at Pennsylvania State College*, 174.

heavily checked suit is bad").[149] Poole physically instructed his guests' movements as well. He jokingly told reporters that he had kicked a physicist in the shins to end a demonstration.[150] On one episode of the *Science Review*, Poole motioned towards his guest Sir Alexander Fleming and said, "I see you have brought along the original mold of penicillin." Fleming grinned and replied, "Yes, isn't it a coincidence? Or did you tell me, four or five times not to forget it? "[151]

Throughout *Science Via Television*, Poole reminded his viewers that the television host, the lay communicator, played an important part in helping these scientists present to the public. "As the producer encourages and compliments the guest," Poole observed, "the latter relaxes and his acting loses its self-conscious quality."[152] Such comments highlighted the significance of having trained actors (like Poole) coaching scientists on how to perform on television. Poole joined the ranks of other acting professionals who coached non-theatrical types. Robert Montgomery, a well-known MGM actor, taught President Eisenhower how to make an on-screen appearance in the mid 1950s. According to Montgomery, he helped "help project Mr. Eisenhower's own personality and thoughts in a natural manner as possible."[153] Quickly becoming one of Eisenhower's PR gurus, Montgomery could spend up to eight hours preparing Ike for a single speech.[154] *Newsweek* reported that Montgomery succeeded in "relaxing the president and giving him

[149] Poole, *Science via Television,* 47, 138.
[150] Leo Geier, *Ten Years with Johns Hopkins*, (Johns Hopkins Press: 1958), 5. Also, Brown, "Television: College's show Brings Science to the Home." *New York Herald Tribune (1926-1962),* Jan 07, 1951.
[151] Yoder, "TV's Shoestring Surprise," 92.
[152] Poole, *Science via Television*,156.
[153] Doherty, *Cold War, Cool Medium*, 100.
[154] Heldenfels, R.D. , *Television's Greatest Year: 1954*. (New York: Continuum Intl Pub Group, 1994), 178, 96.

professional confidence."[155] Poole did much the same for the scientists of Johns Hopkins University. With a little help, his scientists could become agile actors on a scientific screen (See Fig. 4).

Ironically, while the scientists were presented at the center of the program, their presence is the most ephemeral. Poole left no behind correspondence with them. His descriptions of the scientists themselves are complicated at best. His scientific guests, according to Poole, are intelligent, yet awkward; their speech is learned, yet incomprehensible. Even as he beatified their role in society, Poole painted them as somewhat incompetent in communication. Their reflection has been skewed by Poole's attempt to scaffold his own reputation. Without correspondence, it's hard to recover their perspective. In 1950, a *TIME Magazine* reporter recreated Poole's first attempts to establish a television program:

> When Public Relations Director Lynn Poole first began talking about his idea around the Johns Hopkins University faculty club, some members of the science departments were frankly dismayed. "Appear on a television show?" they cried when Poole approached them. "Certainly not." Most of them pleaded that they were too busy; others candidly damned television as a pest and a bore.[156]

At the time, some of Poole's colleagues seemed less than pleased with the school's foray into television. Forty years later, one scientist at Johns Hopkins was still not impressed

[155] Ibid.
[156] This is literally the only instance that I can find from scientists at the time commenting on the program. "If you don't like Milton," *TIME.* Nov. 20, 1950, 85.

with the program. Interviewed in the 1990s, he called it "a helluva waste of time."[157] Another scientist more favorably recalled the program, adding that Poole "had a great personality."[158]

Arguably, while Poole proposed collaboration, his version of the ideal science television program privileged non-scientists like himself. Poole's explanation of the writing behind the production revealed his own perception of himself as a unique type of science communicator. Indeed, as I will discuss in future chapters, Poole's ability to create a scientific program reminiscent of popular variety shows laid the groundwork for future non-scientific television hosts. Poole's descriptions reiterated stereotypes of scientists as awkward, insular, and poor communicators. Individuals with backgrounds in the humanities, he seemed to claim, could best understand what the public wanted and employ the dramatic tricks to keep them interested. *Science via Television* insisted that a great television program could be created with a team of interdisciplinary professionals, if led by an individual whose talents lay in the arts, not the sciences. Yet, Poole's techniques possibly alienated his scientific colleagues, even as it increased his worth to corporations and other broadcasters.

Hidden Collaborators

The Johns Hopkins Science Review depended on careful collaborations with outside stakeholders; it was not a one-man show. Poole worked with a team of twenty

[157] Rob Hiassen, "Test Tube TV: Cooked up in JHU lab by a p.r. whiz" *The Sun,* December 11, 1996. 1E.
[158] Hiassen, "Test Tube TV".

people to create weekly episodes.[159] The women of *The Johns Hopkins Science Review* were, in many ways, invisible technicians.[160] Paradoxically, their active participation is confirmed by their unseen contributions to a seamless, naturally flowing program. It is difficult to recover traces of their existence on the program, although the importance of their work should not doubted.[161] But the activities other participants are much more visible. *The Johns Hopkins Science Review* heavily relied upon individual businessmen to help finance the program. Poole also worked with local and international broadcasters and producers to enhance the reputation of the show. Finally, Poole worked closely with his wife Gray Johnson, a local journalist, to write novelizations of broadcasts and other science books for children.

As discussed in the first section of this chapter, commercial investors were eager to sponsor television programs. “Television,” wrote film historian Richard Schickel in 1960, "is essentially the medium of the marginally affluent"[162] Corporations wanted to entice those same viewers to purchase products from them. The *Science Review* had no official commercial sponsor. Without visible underwriters, *The Johns Hopkins Science Review* appeared to be more independent, less commercial, and more educational. The producers of the show could truly profess to be about the science, not an advertisement

[159] “Education By Television,” *The Johns Hopkins Magazine*, (October 1951): 17. This number is based on a photo, featured in the Johns Hopkins Magazine, of the *Science Review* crew.
[160] Stephen Shapin, “The Invisible Technician,” *American Scientist*, 77, (1989): 554-563.
[161] Poole, to his credit, never tried to erase their presence. In articles and books, Poole thanks two of his secretaries, Mary Jane Taggart and Avice Stevens, for their work typing scripts for the program. Additionally, these secretaries are mentioned in a magazine article. “Education By Television,” *The Johns Hopkins Magazine*, (October 1951): 10.
[162] Baughman, *Same Time, Same Station,* 218.

for a new technical appliance or medicine. But, in the show's first year, Poole was able to convince a local chemical company to fund three months of production.[163]

Subsequently, DuMont, the network that aired the show, footed the bill for the program. In 1952, they paid the University $15,000 to produce the program.[164] WAAM Studios also chipped in with a yearly $10,000 contribution.[165] "Even so, $25,000 a year for a network show is peanuts," proclaimed television critic Robert Yoder in *The Saturday Evening Post*. "By television standards, [the Review] has little or no money, spending less in a full year than many shows spend in one evening. It does without professional actors, gets along with the simplest of sets."[166]

Moreover, Johns Hopkins University publicly rejected offers from businesses wishing to sponsor the program. As Poole's assistant Leo Meier explained in the official history of *The Johns Hopkins Science Review*, "The University must be selective. It doesn't want the 'middle' commercial, and the advertising has to remain institutional with no product being offered for sale."[167] Pharmaceutical companies were especially interested in assisting financially with the program, but the University found it "impossible to accept sponsorship."[168]

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[163] Geier, *Ten Years with Johns Hopkins*, 26.
[164] Geier, *Ten Years with Johns Hopkins*, 26.
[165] Geier, *Ten Years with Johns Hopkins*, 26.
[166] Robert M. Yoder, "TV's Shoestring Surprise," 91.
[167] Geier, *Ten Years with Johns Hopkins*, 26.
[168] Geier, *Ten Years with Johns Hopkins*, 26.

Poole thought that a visible commercial sponsor would have tainted the image of the *Science Review.* Part of the charm of *The Johns Hopkins Science Review* was that it *was* run on a shoestring budget. "People shy away from educational television," Lynn Poole boasted to Yoder, "because they think it costs a mint of money. Well, it doesn't here."[169] Poole encouraged scientists on his program to use household items for demonstrations. Poole claimed that, actually, using household items, not laboratory items, was a boon because it made science more relatable for his audience.[170] Once, Poole's scientists used puff wheat to simulate electrons; another time, chocolate ice cream to demonstrate how liquid nitrogen could freeze semi-solids.[171] Additionally, the low-budget scale of the show, especially paired with the unassuming Poole, lent the program a more homespun ambience. "The *Review,"* Yoder surmised, "was an awkward country girl competing with the big city's smoothest."[172]

Lynn Poole worked closely with local businesses in other ways. "In their constant battle to get along without money," Yoder marveled, "Poole and his assistants have become among the most talented borrowers on the Eastern Seaboard."[173] Local merchants lent Poole most of the technical equipment and props for the program. In exchange, Poole would deliver them on-air praise of their products.

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[169] Yoder, "TV's Shoestring Surprise*,"* 92.
[170] Even though the *Science Review* used a lot of "everyday" materials in their demonstrations, many of their scientists brought along their own scientific equipment. Don Herbert, the creator of *Watch Mr. Wizard,* took this challenge to heart and used only non-scientific equipment in his program. This method of presentation will be discussed more thoroughly in the next chapter, which will cover *Watch Mr. Wizard.*
[171] Brown, " Television: Brings Science to the Home."
[172] Yoder, "TV's Shoestring Surprise*,"* 90.
[173] Yoder, "TV's Shoestring Surprise*,"* 90.

Famously, a New York jeweler, Baumgold Brothers, Incorporated, lent Poole $250,000 in diamonds for a show on the refinement of diamonds and their industrial value.[174] Experts appeared on the program to talk about diamonds, free of charge. In return, Poole wrote "Diamonds for Beauty and Work," a show that was, in effect, a thirty-minute educational commercial for Baumgold Brothers, Inc.[175] "Diamonds really do take care of us, don't they?" Poole concluded at the end of the episode, "Would you like to see more of the photographs we have shown you today, and have a chance to re-read the program and go over it again?" The Baumgold Brothers were happy to send interested viewers free transcripts of the program.[176]

The transcripts took the shape of a promotional booklet, a small seven by four inch leaflet. It was, unabashedly, a commercial tie-in. "This telecast has been acclaimed as one of the most worthwhile programs in television," proclaimed the writer of its brief foreword:

> For this, each week, it selects an organization or business industrial firm […] regarded as outstanding in its field… Understandably, then, we are proud of the contribution we have made to a popular understanding of science.[177]

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[174] Ibid., 90.
[175] Lynn Poole, *Diamonds for Beauty and Work,* (Davidson Printing Corp: circa 1950). Pamphlet. Personal Collection.
[176] Although no other known examples of such commercial pamphlets exist, *The Johns Hopkins Science Review* sponsored the distribution of pamphlets, mainly from federal entities. See episodes, "X-ray marks the spot," "What you should know about biological warfare," and "The metallurgist" VHS. Johns Hopkins Television Programs.
[177] Lynn Poole, *Diamonds for Beauty and Work,* (Davidson Printing Corp: circa 1950). Pamphlet. Personal Collection.

Besides twenty-six pages of text, the booklet also contains four pages of photographs from the program. Most of the photographs show diamonds being mined, milled, ground, and processed in a factory setting. On the back page, titled "From the Mine to Milady," a young woman displayed diamond rings and a lavish necklace. Women were probably the intended audience for this advertising.[178] By participating in this advertising, Lynn Poole became both an educator and a salesman. His *Science Review* taught consumers about 'scientific' commercial goods.

Poole worked hard to win fans in his local broadcasting community. In between his duties as the producer of the *Science Review* and the director of JHU's public relations department, Poole talked up educational television to nearby broadcasters and educators at luncheons and parties.[179] In 1952, he participated in a national academic conference, held at State College, Pennsylvania, beating the drum for educational television.[180] A central message of *Science via Television* was to convince other educators that they could collaborate with their local network affiliates to produce high-caliber television programs about science. In the book's opening chapter, Poole explained that *The Johns Hopkins Science Review* was just one of many small science television programs that were broadcast in cities like L.A., Philadelphia, and Minneapolis.[181] Poole

[178] Indeed, scrawled across the top of the brochure is the name "Rose Green," suggesting that woman had requested the pamphlet.
[179] Geier, *Ten Years with Johns Hopkins,* 50. For evidence of Poole's outreach activities, see "Advertising Women to hear Lynn Poole," *The Sun*, Jan. 8 1951, 16; "Lynn Poole Awarded Achievement Honor," *The Sun*, Jul, 9, 1964, 14.
[180] Newsom. Ed. *Television policy for education,* 171.
[181] Poole*, Science via Television*, 3.

cautiously suggested that educational television had a bright future ahead of it, if different communities of people could work together:

> The educational program can be popular if both the educators responsible for it and the studio personnel will get together on a middle ground of tolerance for each other's individual but divergent problems.[182]

But high quality science programs would require not just empathy, Poole warned, but intense collaboration and laborious preparation. "When the two together have coordinated on program material and format, they can, and must, spend time setting the stage," he advised, "Unless this procedure is followed, the public service program will develop into the step-child of television.[183]

Poole had the upmost respect for his broadcasting brethren. He warmly said to his educational colleagues, " We are particularly fortunate in having such a station as WAAM in Baltimore; the station is owned by men who feel that television must be something other than vaudeville and wrestling."[184] Poole helped to establish the WAAM Television Fellowship at Johns Hopkins University in 1952. The yearly stipend, worth around $5,000, was meant to support an individual for nine months of study. Ideally, WAAM Fellows would take classes on literary criticism, writing, and communication at the University and continue onto a career in film and television. Robert Saudek, the director of NBC's cultural variety program, *Ominbus*, worked with Poole to select the

[182] Poole, *Science via Television,* 126- 127.
[183] Poole*, Science via Television*, 127.
[184] Newsom. Ed. *Television policy for education,* 172.

candidates.[185] The WAAM Television Fellowship represented an effort, from the University, to nurture established ties connections between educators and broadcasters. In Poole's optimistic vision, future generations of broadcasters would elect to foster non-commercial, educational programs like *The Johns Hopkins Science Review*.[186]

Baltimore broadcasters welcomed Poole into their community as one of their own. In 1953, Poole was given a lamp from the executives at WAAM, complete with a homemade shade adorned with images from *Science Review*, to commemorate his fifth year on television.[187] In 1969, shortly after his death, members of the newly established Maryland Center for Public Broadcasting dedicated a conference room in his name. Frederick Breitenfeld, Jr , then Executive Director, explained to Poole's wife:

> In 1958, I was teaching in a small high school and I became interested in noncommercial broadcasting. The first book I owned on the subject was *Science Via Television* and I read it with a fervor. I'll never forget my feeling then about television, about the book itself and about Lynn Poole.[188]

Although Poole began as an outsider, he gradually built up a national reputation as a pioneer in educational broadcasting and a champion for the cause.

The Johns Hopkins Science Review also created fervor abroad. In May 1951, representatives from French broadcasting stations queried Poole about possibly obtaining

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[185] Fellowship brochure, Record Group Number 10.020, Office of Public Information, Ferdinand Hamburger Archives, , Johns Hopkins University.
[186] Lynn Poole, "Television: A New Challenge," *College Public Relations*, January 1949, 3.
[187] Gray Johnson to Mrs. E. Goodall. November 30, 1970. Lynne Poole Papers.
[188] Frederick Breitenfeld to Gray Johnson. June 16, 1969. Lynne Poole Papers.

copies of the program.[189] Poole happily obliged and, working with representatives from UNESCO, distributed copies of *The Johns Hopkins Science Review* to television stations in 15 other European countries.[190] The next year, *The Johns Hopkins Science Review* was picked up by the Canadian Broadcasting Company and became the first American program to be regularly aired in Canada.[191]

As the popularity of the *Science Review* grew, Poole began to host visiting colleagues from England, France, Mexico, Brazil, and Lebanon. As Poole explained in the final episode of *The Johns Hopkins Science Review*, broadcasters from around the world visited the University to learn how to produce educational programs in their own countries.[192] In 1951, *The New York Times* reported that the Mexican station XHTV had commissioned their very own *Science Review*, expressly modeled on the American program.[193]

The British Broadcasting Corporation (BBC) was also eager to partner with Poole and WAAM. Mary Adams, head of the BBC's talks department, met Poole during a trip to the United States in 1952. Together, the two agreed to a co-production of three episodes of *The Johns Hopkins Science Review*.[194] The production of these episodes marked several firsts; it was heralded as the first trans-Atlantic collaboration, as well as

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[189] Geier, *Ten Years with Johns Hopkins*, 7.
[190] Ibid., 7.
[191] Ibid., 7.
[192] "Seven years old". Johns Hopkins Science Review. DuMont. March 6, 1955. VHS. Johns Hopkins Television Programs: 1948-1960, Special Collections, Milton S. Eisenhower Library, The Johns Hopkins University.
[193] H. Evers Jacobs, "Television in Mexico," *The New York Times*, April 29, 1951.
[194] "TV Exchange Plan is told," *The Sun*, April, 8, 1952, 11.

the first time that British television programs were broadcast on American networks. For the first time, the Royal Society allowed television cameras into its hallowed halls.[195] Abroad, as at home, Poole successfully positioned himself as an interpreter of science. Through his articles, speeches, and books, Poole crafted his identity as a scientific entertainer. Surprisingly, with no formal experience in broadcasting, Poole became a sought-after specialist on education television, approached by broadcasting experts around the world. His skill as a dynamic communicator propelled him to short-lived stardom on television screens.

But the person who was Poole's most trusted collaborator was his wife, Gray Johnson (See Fig. 5). When they moved to Baltimore from California in 1946, the Pooles had been married for five years. Johnson, several years older than Poole, was a successful free-lance journalist. P. Stewart Macaulay, Poole's boss, warned Poole, after he had accepted the job, "I know that Gray will find it difficult to settle down in a sedate Baltimore environment after her years in the free and easy West. Be sure to warn her that a certain dignity and reserve is expected of wives of persons attached to the University."[196]

[195] Audrey Bishop, "TV Done Leisury in Britain," Lynn Poole's Scrapbook: 1952-1953, Record Group Number 10.020, Office of Public Information, Ferdinand Hamburger Archives, , Johns Hopkins University.
[196] P. Stewart Macauly to Lynn Poole, Dec. 5, 1945. Lynn Poole's Scrapbook: 1945-1960, Record Group Number 10.020, Office of Public Information, Ferdinand Hamburger Archives, , Johns Hopkins University.

Macaulay needn't have worried about Johnson's place within the Johns Hopkins community. She was originally from Baltimore and familiar with the University.[197] By all accounts, Johnson successfully juggled the task of being an independent writer and the wife of a university administrator. Former colleague Wilbert Locklin remembered that the Pooles hosted elegant dinner parties to introduce Johns Hopkins members to famous scientists, like Wernher von Braun.[198] Ross Jones, who acted as assistant to JHU President Milton Eisenhower in the 1960s, also recalled Johnson as a vivacious, intelligent woman.[199] In addition to their dinner parties, the Pooles made a point to befriend young members of the Johns Hopkins administration, helping them settle into the community.[200] "The variety of guests in their home," a colleague of Poole recalled, "may include college students, prominent corporation executives, entertainers from legitimate theater and ballet, deep sea divers or struggling unknown artists."[201] While her husband worked for Johns Hopkins, Johnson wrote for Baltimore's *The Evening Sun*.[202] But she was also affiliated with broadcasting. In 1956, Johnson won a $5,000 prize from Fund for the Republic for a television documentary script, "Desegregation: Baltimore Report."[203] Gray Johnson carved out a separate identity for herself in the Johns Hopkins community.

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[197] Gray Johnson to Mrs. E. Goodall, October 12, 1970, Printed Material, Lynne Poole Papers.
[198] Wilbert Locklin, interviewed by Mame Warren, December 23, 1999. Hopkins Oral History Collection. Ferdinand Hamburger Archives, Sheridan Libraries, Johns Hopkins University.
[199] Ross Jones, interviewed by Ingrid Ockert, October 20, 2015.
[200] Ibid.
[201] Geier, *Ten Years with Johns Hopkins*, 62.
[202] Kirkley, "Debut One Series He Created."
[203] Ibid.

The Pooles were very much a creative couple.[204] Their gender-neutral names caused some issues. Poole quipped to reporters, "I keep getting mail addressed to Miss Lynn Poole and she gets mail and telephone calls for Mr. Gray Johnson."[205] But despite such mix-ups, they were devoted to each other.[206] While Johnson is never explicitly credited on episodes of *The Johns Hopkins Science Review*, she was clearly involved in the show's ongoing production. As Warren Jay Wightman, a student worker on the Johns Hopkins Science Review, later noted, Johnson helped Poole dream-up on air experiments.[207] In an interview for *The New York Herald,* Poole suggested that he considered his wife the ideal TV viewer. He often would rewrite scripts for *Science Review* until Johnson was satisfied with them.[208] *Science via Television*, Poole's magnum opus, is dedicated to her. Several years later, the Pooles called it their first written collaboration.[209] Their second collaboration was *Today's Science and You* (1952), discussed earlier in this chapter. Editors from McGraw-Hill approached Poole to write it, initially, but he insisted on Johnson's involvement, explaining, "My wife is the writer in

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[204] The "creative couple" is not an unusual pairing in the history of science. Historians of science have frequently recorded how two individuals (generally heterosexual) have intertwined their personal and professional interests. Some examples include Marie-Anne Paulze and Antoine Lavoisier, Marie Sklodowska and Pierre Curie. The edited volume *Creative Couples in the Sciences* provides the first study of these scientific lives. Deborah Coen also describes the intertwined family and professional lives in her study of the Viennese Exner family. Helena Pycior, ed. *Creative Couples in the Sciences*, (New Brunswick: Rutgers University Press, 1996). Deborah Coen, *Vienna in the Age of Uncertainty*, (Chicago: Univ. of Chicago Press, 2007).

[205] Lowell Sunderland, "Lynn and Gray Poole: Twenty-Fifth Book Due for Publication," The Sun, "Sep. 30, 1966, B1.

[206] Ross Jones, interviewed by Ingrid Ockert, October 20, 2015.

[207] Disappointingly, Wightman offers no elaboration on this subject. He died in 2016, before I learned of his work on the program. Warren J . Wightman, "Recollections of The Johns Hopkins Science Review TV Series," 2008, Ferdinand Hamburger Archives, Sheridan Libraries, Johns Hopkins University.

[208] Don Ross, "Science for the Layman on Johns Hopkins Show," *The New York Herald Tribune,* May 30, 1954, C6.

[209] James Bready, "Books and Authors," *The Sun*. Sep. 22, 1957, FE6.

the family."[210] In the end, both Pooles penned the book, but "the publisher preferred to use Poole's name only."[211] An inscribed copy of the book cheekily noted Johnson's involvement, calling her "his silent co-author."[212] Poole cited his wife's efforts in the opening pages of the book:

> To my wife, Gray Johnson Poole, my deepest gratitude. Because of her constant help, her faith, and the hours of work she spent on the manuscript she has made this book as much hers as mine.[213]

Poole and Johnson started collaborating more regularly on books in 1952. They switched to a publisher that credited them both: Dodd, Mead, and Company.[214]

Eventually, the Poole's writing partnership became a full-time job for Lynn. In 1955, after a financially devastating year for the DuMont channel, *The Johns Hopkins Science Review* was canceled on March 6. The struggling network folded itself later that year.[215] Poole's friends in the commercial and broadcasting communities couldn't save the program. Poole appealed to executives at ABC to create another national television program that spotlighted exciting careers in science. They were sympathetic, but not interested.[216] Poole's affiliates at WAAM agreed to run the new program, titled *Tomorrow's Careers*. *Tomorrow's Careers*, also renamed *Johns Hopkins File 7*,

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[210] Mildred Weiler Tyson, "Prolific coauthors: A writing team," *The Christian Science Monitor,* June 2,1967, 16.
[211] Ibid.
[212] See Poole, *Today's Science and You,* author's personal collection.
[213] Poole, *Today's Science and You*, 8.
[214] Tyson, "Prolific Co-authors,"16.
[215] Heldenfels, *Television's Greatest Year: 1954*, 178.
[216] Val Adams. "TV planned on Teen Careers." *New York Times,* Feb 21, 1955.

broadcast locally until 1960.[217] But *Tomorrow's Careers* never achieved the fame of *The Johns Hopkins Science Review*.

Poole suffered a heart attack in 1957. Soon after, he started to decrease his activities at Johns Hopkins. After Poole retired from his career on television, he and Gray devoted their full attention to writing books.[218] Together, Poole and Johnson wrote 19 books, mostly about science, for elementary school readers. Some of these books were later translated into Spanish, German, Swedish, Tamil, Persian, Telugu, Malayam, Kannada, and Arabic.[219] Their partnership would be echoed in later successful science series couples, such as Carl Sagan and Ann Druyan. In their last interview, in 1967, Johnson gamely told a reporter that, "There is no retirement in our profession."[220] Poole died a few years later in 1969 of another heart attack. Johnson passed thirty years later.[221]

Conclusion

At the end of the series in 1955, *The Johns Hopkins Science Review* appeared on 24 stations around the Unites States.[222] Pool and his associates had won ten national

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[217] "Johns Hopkins Television Programs, 1948-1960," Last modified in 2004. http://old.library.jhu.edu/collections/specialcollections/jhuxmlkineFind.body.html.
[218] James Bready, *Books and Authors*, *The Sun*. Sep. 22, 1957, FE6; Mildren Weiler Tyson, "Prolific coauthors: A writing team," *Christian Science Monitor*, June 2, 1967, 16.
[219] Kirkley, "Debut One Series He Created."
[220] Tyson, "Prolific Co-authors,"16.
[221] "Hopkins Pioneer, Lynn Poole, Dies: Author, TV Innovator was Its Public Relations Chief," *The Sun*, April 16, 1969, C28. "Gray Johnson Poole, 98, journalist, author." The Baltimore Sun, August 29, 2005. Retrieved from http://articles.baltimoresun.com/2005-08-29/news/0508290043_1_poole-mrs-kensington.
[222] Wayne Oliver, "Johns Hopkins 'Science' Passes its Fifth Milestone," *The Washington Post*, March 19, 1953, 37.

television honors for their program, including two Peabody awards.[223]

Additionally, Poole launched a new genre: science television. As mentioned in the first section of this chapter, television was young medium in the late 1940s. There was plenty of room for eager visionaries to jump into the fray and try their hand at television production. Because of perceived similarities between theatrical and television productions, television producers trusted those with a background in the arts to create programs. Lynn Poole's diverse background in the arts gave him the skills that he needed to write and produce a dynamic television production. *The Johns Hopkins Science Review,* crafted to appear like a daytime talk show, was meant to appeal to both men and women. Poole borrowed established tropes of the day (debonair host, short interviews) to create a science program that was suited for the 1950s. From the onset, Poole established a strong rapport with his viewers, especially female viewers. To do so, he emphasized scientific demonstrations and experiments that could be done at home – "everyday science." "Everyday science" proposed an inclusive vision of science that everyone could follow, especially non-scientists.

Poole managed the creation of an intricate, yet invisible network of storytellers – scientists, businessmen, and broadcasters. Even as he recruited scientists on his show, he carefully maintained control over the ways that they appeared on camera. Similarly, Poole worked closely with corporate sponsors, yet maintained the illusion of commercial impartiality. His efforts in Baltimore ultimately endeared him with local broadcasters, who accepted him as one of their own. *The Johns Hopkins Science Review* also

[223] Geier, *Ten Years with Johns Hopkins*, 8.

established American broadcasters as scientific storytellers on the international stage. Not to be forgotten, Gray Poole, his wife, was Lynn Poole's most important unseen collaborator. Her involvement in the series and its supporting materials emphasizes the importance of women in the growing field of television broadcasting.

Of all the scientific storytellers who worked on *The Johns Hopkins Science Review,* Lynn Poole's reflection appears the sharpest. On film, he seemed modest, charming, yet a layman; off camera, he became an expert on American science communication. He initially created an aura of credibility through his associations with scientists; broadcasters' confidence in him grew as *The Johns Hopkins Science Review* rose to fame. Eventually, they embraced him as one of their own. Similarly, scientific corporations and government departments used The *Johns Hopkins Science Review* as a vehicle for public relations.[224] Poole created *The Johns Hopkins Review* as a nexus to weave together professionals from the scientific, educational, broadcasting, and business communities.

Poole still saw himself beholden to the desires of his audience. He seemed to have a great respect for his viewers; in all the interviews he gave, Poole never belittled their intelligence. The only people that Poole didn't quite see as partners were children. "I

[224] For examples, see the following episodes: "The atomic submarine," "The peaceful atom." "The magnificent microscope," Johns Hopkins Science Review. DuMont. VHS. Johns Hopkins Television Programs.

don't like to have children on my program," he admitted in an interview.[225]

Children were featured in several episodes of *The Johns Hopkins Science Review*, such as episodes on the great outdoors, nutrition, and the science of toys.[226] A group of children were even so enamored of the program that they hosted their own "Science Review" at a community school, which Poole obligingly filmed.[227] But Poole, who had no offspring of his own, didn't seem to have worked well with young children. He complained that they were difficult to coach and unpredictable on camera.[228] So Poole had no complaints when another program, aimed at explicitly at kids, started in 1951 – NBC's *Watch Mr.Wizard*.

[225] Lynn Poole, "Television, Today's Mirror," Lynn Poole's Scrapbook: 1945-1960, Record Group Number 10.020.
[226] "The Master Glassblower," Johns Hopkins Science Review. DuMont. October 8, 1951. VHS. Johns Hopkins Television Programs.
[227] "An Early Christmas in the Sixth Grade," *The Johns Hopkins Magazine,* (October 1953): 7-16.
[228] Geier, *Ten Years with Johns Hopkins*, 24.

ILLUSTRATIONS

All images removed due to copyright concern

Fig. 1. Studio Portrait of Lynn Poole. Featured in Canadian paper, "Radio and TV: See Your Studies." *Saturday Night*, April 10, 1951. Lynn Poole's Scrapbook: 1951-1952, Record Group Number 10.020, Office of Public Information, Ferdinand Hamburger Archives, Sheridan Libraries, Johns Hopkins University.

Fig. 2. Lynn Poole of *The Johns Hopkins Science Review*, as seen on a TV in San Francisco, February 1952. Lynn Poole's Scrapbook: 1952-1953, Record Group Number 10.020.

Fig. 3. "Today' science is exciting and vital to us all." Lynn Poole, *Today's Science and You,* 197. Illustrated by Jeanne Bendick.

Fig. 4. Lynn Poole stands with guest professors from Brown University, discussing proper skin care in "Only skin deep," broadcast June 10, 1954. Lynn Poole's Scrapbook: 1952-1953, Record Group Number 10.020.

Fig. 5. Lynn Poole and Gray Johnson sign copies of their books. Lowell, Sunderland, "Lynn and Gray Poole: Twenty-Fifth Book Due for Publication." *The Sun*, Sep 30,1966, B1.

CHAPTER TWO

The Scientific Wizard: Watch Mr. Wizard, 1951-1965

In 1957, Lynn Poole, the former host of the *Johns Hopkins Science Review*, wrote an article extolling the virtues of a new science educational program, NBC's *Watch Mr. Wizard*. Jocular actor Don Herbert hosted the program every Saturday morning, with the help of a fresh-faced boy and girl. The titular Mr. Wizard promised to teach his young viewers, " the magic of everyday living." Poole praised Herbert:

> If, in the next ten years, the supply of scientists should happen to catch up with the tremendous demand, some of the credit may well belong to Mr. Wizard, for the program now has some three million regular viewers…As a basic introduction to the fascinations of science, "Mr. Wizard" is hard to beat.[229]

Poole's glowing words marked *Watch Mr. Wizard* as the successor of the *Science Review*.[230] As Poole had shown on his program, an emphasis on "everyday science" made scientific topics relatable to the average viewer. Most importantly, using familiar household items made viewers and corporate partners invested in educational programming. Herbert seemingly agreed. In a speech, Herbert reasoned, "Everything you

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[229] Jack Cluett and Lynn Poole. "The Wonderful Wizard of TV," *Science World*, April 30, 1957. Box 6, Folder 5 "Newspaper Clippings, 1957." Mr. Wizard Papers, Lemelson Center, National Museum of American History. (hereafter the Mr. Wizard Papers).

[230] Warren Wightman notes that Herbert knew Poole professionally, at least. "In 1970 Don Herbert did some demonstrations for a videotaped series of science lessons that I was producing for the New York State Education Department. He told me that Poole had died of a heart attack a year earlier." Warren Wightman, *Recollections of the Johns Hopkins Review TV Series,* 2008.

and I eat, hear, use, like, dislike, dream of and think about has been altered by science. If science is so much involved in our lives, why can't we get involved in science?"[231]

From 1951 to 1965, *Watch Mr. Wizard* rose to success as an educational science show for children. While Lynn Poole entertained adults and older teenagers, Don Herbert enchanted their younger brothers and sisters. Almost 60 million children were born in the U.S. between 1946 and 1960.[232] Collectively known as the 'baby boomers,' this group of individuals shifted American tastes, policy, and culture almost immediately. Don Herbert transformed Poole's serious 'everyday science' into fun, child-friendly experiments for these young viewers. He demonstrated how scientific storytelling could be focused on children. Curiously, Herbert avoided the usual tricks of entertainment and his television program sought to create a fun, realistic narrative of science. His primary innovation was the integration of children into a science education series. However, Herbert's real insight as a storyteller was to create a relatable scientist-character as a central part of the program, not just the master of ceremonies. Herbert's patient, paternal persona of Mr. Wizard entranced children and their parents. Through the television program, Herbert organized a community of young television viewers, all eager to follow his scientific exploits. Unexpectedly, Herbert tapped into a new market, revealing the commercial potential of a science television series for children. General Electric and others

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[231] "Television versus science," Workshop on Television Techniques, Council for Advancement of Science Writing, 1967, Box 2, Folder 10, Mr. Wizard Papers.
[232] Marilyn Irvin Holt*, Cold War Kids: Politics and childhood in postwar America, 1945-1960*, (Lawrence: Kansas, 2014) 17.

collaborated with Herbert to promote their own products to young baby boom families. By the mid-1960s, the children's science television series was positioned to become a successful form of scientific storytelling. Herbert attempted to build upon the popularity of *Watch Mr. Wizard* with *Experiment*, a science film series for older teenagers and adults.

Like the previous chapter, this second chapter moves through three parts. In the first section, I acquaint readers with the origins of the program and Mr. Wizard himself, Don Herbert. In this section, I argue that Herbert quickly rose to fame because of several factors. First, as soon as the show premiered, newspaper journalists were eager to write positive articles about him. These articles helped promote *Watch Mr. Wizard* to young parents, who were looking for trustworthy television programs to watch with their children. Secondly, Herbert used his television as a platform to present a new, child-centric vision of science education. Herbert approached scientific storytelling as an educator. He filmed episodes of *Watch Mr. Wizard* through the eyes of a child. Like Lynn Poole, he also believed in the importance of teaching audiences about 'everyday science.' Unlike Poole, Hebert directly brought science into the home by creating multiple onstage sets that resembled a kitchen and a living room. To help his at-home audience engage with his science lessons, Herbert hired young children to help him facilitate his demonstrations. These techniques encouraged a vision of science as normalized activity of daily life and scientists as normal people. Herbert's ideas about on-screen storytelling endeared him to children and their parents.

In the second part of this chapter, I explore the ways ramifications of Herbert's popularity. I begin by sketching a comparison between Herbert and another talented storyteller of the era, Walt Disney. Disney and Herbert crafted similar charismatic personas for their audiences. Although Herbert eschewed magical imagery, he and Disney recognized the importance of creating a welcoming virtual community for their young viewers. Then I expand into a discussion with an examination of the fan mail that Hebert received. As artifacts, these pieces of fan mail offer historians evidence of fan's emotional responses. The diverse identities of these letter writers suggest that, like *The Johns Hopkins Science Review, Watch Mr. Wizard* promoted an inclusive vision of science education. Finally, I discuss the presence of the corporate underwriters for the program, namely the Cereal Institute. Herbert's success on *Watch Mr. Wizard* helped him foster new collaborations with corporate advertisers.

In the final section of the chapter, I detail the final years of *Watch Mr. Wizard*. As Herbert moved the studio's physical location from Chicago to New York City in the mid-1950s, he cultivated a new network of associates: scientists. Herbert struck up alliances with scientists at New York University and Rockefeller University, who helped out with the program as consultants. Unlike Poole, who micro-managed the involvement of his scientific guests, Herbert welcomed advice of university professors. Similarly, university scientists respected Watch Mr. Wizard and recognized it as a powerful influencer of popular opinion. As NBC's interest in *Watch Mr. Wizard* waned, Herbert became

interested in creating a new television program. He extensively collaborated with university professors on its production. Although this series only lasted one season, *Experiment* demonstrated how scientists and educators could respectfully regard each other as scientific storytellers.

Casting the Wizard's Spell

In the beginning, Herbert had to work some television magic. A reporter on the television beat wrote in 1951 that, "It's no secret that TV people held educational shows in same high esteem that they held, say, arsenic."[233] Although other science programs like the Franklin Institute's *The Nature of Things (1948)*, *Science in Action* (1950), and *The Johns Hopkins Science Review* (1948) were on-air, producers were still reluctant to create educational programming. Herbert was then an unemployed actor in Chicago, Illinois, with a degree from a teachers college. After thinking up the "Mr. Wizard" program in 1950, he spent a year pitching it to local television producers. One producer told Hebert, "I would watch the show, but the general public won't. It's too educational."[234] Herbert envisioned *Watch Mr.Wizard* as a quasi-fictional educational show. He presented the weekly 30-minute educational program as a magic show that starred the fictional "Mr. Wizard." His two young assistants, neighbors "Betsy" and "Willy," were young child actors. The program was set in the front room and kitchen of Mr. Wizard's house, located somewhere in idyllic American suburbia.

[233] "Mr. Wizard and Mr. P." April 1, 1951. "Articles 1951"Box 5, Folder 11, Mr. Wizard Papers.
[234] Donald Herbert, *My Life as Mr. Wizard* (unpublished manuscript), 81. Mr. Wizard Papers.

Each episode followed the same formula: Mr. Wizard used common household items to perform several experiments that explained a scientific principle. During the episode, the child viewers of the program learned that Mr. Wizard's 'magic tricks' could be broken down into understandable scientific phenomena. For example, in a program about the solubility of liquids, Mr. Wizard lit a handkerchief with a match, but it didn't burn. The trick was that Mr. Wizard had soaked the kerchief in isopropyl alcohol and water; the alcohol burned off while the water protected the cloth. The two liquids had mixed together, but retained their separate properties.[235] The show was performed live, with ad-libbed banter between Mr. Wizard and his assistants. Yet, Herbert would script each program and rehearse with children beforehand; the children were merely instructed to act as if they had never witnessed the experiments before. With such sleight of hand, Herbert could successfully create the illusion of reality for his audience.[236]

The producers of NBC's Chicago affiliate WNBQ loved this approach. They gave Herbert permission to hire a staff of directors and assistants. The first episode of *Watch Mr. Wizard* aired on March 3, 1951. Local parents and their children embraced the show. Larry Wolters, a respected columnist with *The Chicago Tribune*, wrote, "Herbert, I think, helps to give boys and girls that appreciation for science which Dr. Marlin Perkins [the future host of *Wild Kingdom*] gives them for nature and animals."[237] At first, only 14

[235] "Solutions Around the House," *Watch Mr. Wizard: Volume 7*, directed by Lynwood King (1958; Watch Mr. Wizard, West Hills, CA, 2006), DVD.
[236] "That the show is a performance by two actors is usually not appreciated because of the informal atmosphere. But it is a performance that depends on the skill and personality of the actors and their ability to ad-lib the development of the plot that helps hold the attention of the viewer" Ibid, 181.
[237] Ibid., 12.

local stations carried *Watch Mr. Wizard*. Herbert's wife, a public relations consultant, placed promotional material for Mr. Wizard in newspapers across the country. Herbert credited her efforts with the show's meteoric rise in popularity.[238] In November of 1951, *TIME Magazine* profiled the show. In 1954, Mr. Wizard was shown coast-to-coast on 104 stations.[239] "We must be doing something right," Herbert proudly observed.[240]

Indeed, Herbert had caught the eye of newspaper writers. Descriptions of the television program in periodical pages invariably featured glowing profiles of Herbert. A typical sketch as such:

> The TV star, who stands 5' 10'' and weighs about 175 lbs, has brown-wavy hair and blue eyes. In his spare time he plays golf and badminton and collects records. He and his family live in an old, narrow, gray-stone, three story Chicago house built in 1871. He conducts his research and experiments on the six-room ground floor, which serves as a laboratory, library, office, and carpentry shop.[241]

Hundreds of articles were written about Herbert during the 1950s.[242] As a whole, they stressed Herbert's good nature, his looks, and his fun approach to teaching. These articles

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[238] Ibid., 8.
[239] Herbert, 14; Zuma Palmer, "Mr. Wizard Travels Coast to Coast," *Citizen News*, December 6, 1954. Box 6, Folder 2. "Newspaper clippings, 1954." Mr. Wizard Papers.
[240] Herbert, *My Life as Mr. Wizard,* 14.
[241] "Children's Mail Thrills Herbert," Box 6, Folder 3 "Clippings, 1955." Mr. Wizard Papers.
[242] "The press clippings of the Chicago years eventually fill a 8 ½ X 11 inch notebook that's three inches thick." Herbert, *My Life as Mr. Wizard,* 86.

also discussed his presence as the leader of the happy "Mr. Wizard" workshop.[243] Sometimes Mr. Wizard wrote about his opinions of children's education; other times, he revealed basic experiments that children could do with their parents at home.[244] A few journalists talked about Don Herbert's family life, featuring pictures of him, his wife, and their young children.[245] One article quoted his wife ("blonde Mrs. Herbert"), divulging that, "Don has a closet which would be the joy of any child…He has a greater collection of glasses than a bar, bottles of all descriptions, tin caps of all sizes, numerous balloons, rubber bands and toys."[246] A number of articles highlighted this childlike curiosity. The flurry of newspaper articles underscored the obvious: Herbert, as Mr. Wizard, had become a celebrity of the 1950s.

The intensity of interest into Herbert's personal life might strike the reader as odd, but it was necessary to develop his persona as the ideal science teacher and a trustworthy American. As Don Meier, the director of *Watch Mr. Wizard* and its contemporary *Zoo Parade*, put it, "The personality must be a professional man, not an actor. The personality must have the charm of a person you would personally like to know and invite into your

[243] "TV's 'Mr. Wizard' Awes Audience with Teamwork," Traveler, Boston, May 1955, Box 6, Folder 3; "Producing 'Wizard' Show a Pleasant Task," Journal Flint, June 6, 6, 1955, Box 6, Folder 3; Mr. Wizard Papers.
[244] Child's Life, "Mr.Wizard's Modern Magic" October 1952,; TV Guide, December 12, 1952, "You Too Can Be a Wizard!"; Box 5, Folder 12; Mr. Wizard Papers.
[245] "Mr. and Mrs. Wizard," *Radio and TV Mirror,* July 1955., Box 6, Folder 3; "Mr. Wizard, Champion of Simple Science, Makes Hit with Kid," *Plain Dealer*, August 21, 1954, Box 6, Folder 2. "Newspaper clippings, 1954." Mr. Wizard Papers.
[246] Zuma Palmer, "Mr. Wizard Travels Coast to Coast," *Citizen News*, December 6, 1954. Box 6, Folder 2. "Newspaper clippings, 1954." Mr. Wizard Papers.

own home."[247] This advice applied to scientists, too. Historian Katherine Pandora suggests that domestic myths of scientific experts at home make them seem more relatable.[248] As detailed in the previous chapter, 1950s television personalities walked a narrow line between disclosing their private and their public lives. They needed to come across as experts in their field, but also as lovable neighbors.

Communications scholar Declan Fahy has dubbed these science personalities "celebrity scientists." Fahy has argued that celebrity scientists emotionally resonate with the zeitgeist of the time.[249] Poems and songs were written about Charles Darwin for example.[250] With every caricature and glowing interview, Albert Einstein shot to fame in the United States as a beloved absentminded professor.[251] "As well as scientific credentials," Fahy suggests, "what also mattered was how [these scientists] communicated... and how interesting they were as personalities."[252]

But where Lynn Poole, as the host of *The Johns Hopkins Science Review*, had served as a 'science coordinator,' Herbert was an actor playing a scientist. Herbert became routinely confused with the character that he portrayed on television. Although

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[247] Don Meier, "Education with the Right Person, Formula Means Fun and Dough" *Chicago Picture,* April, 5, 1952, Box 5, Folder 12. "Newspaper clippings, 1952." Mr. Wizard Papers,
[248] Katherine Pandora, "Knowledge Held in Common: Tales of Luther Burbank and Science in the American Vernacular," *Isis* 92 (2001): 498.
[249] Declan Fahy, *The New Celebrity Scientists: Out of the Lab and into the Limelight*, (London: Rowman and Littlefield, 2015), 206.
[250] Ibid., 1.
[251] Ibid., 2. Also, Matthew Radcliff, "Absentminded Professor or Romantic Artist? The Depiction of Creativity in Documentary Biographies of Albert Einstein," *Journal of Popular Film and Television,* 36 (2008).
[252] Ibid., 6.

Herbert was not a scientist, he became a famous scientific celebrity in his own right. The mass media painted him as both a typical parent and an educator. His persona was wholesome and approachable. As a child-like teacher, Mr. Wizard could babysit the kids for an hour and entertain them with magic tricks. But he was also a grown-up who could talk to Dad about the latest advances in electric motors.

With his magnetic persona, Herbert caught the eye of adults, and, more importantly, their children. "My daughter Vickie and I congratulate you on two years of amazing wizardry," Milton Berle, the famous vaudeville star, wrote Herbert in 1952, "In the Berle family, you have one hundred percent of the audience."[253] In the fifties, parents like Berle worried about which television programs were safe for their children.[254] Tasked with raising the perfect postwar children, they hunted for the ideal television series that was both educational and entertaining. Don Herbert's approach, which promised to make science fun, struck a chord with these anxious parents of the Cold War. Their children were equally enthusiastic about Mr. Wizard's books and science kits.

Don Herbert developed a public persona as a trustworthy, friendly, and entertaining educator. One reporter wrote, "[Herbert] did exactly the sort of thing the science teacher would do if he had all the money time, help, and interested students and

[253]Telegram from Milton Berle, undated, 1952, Box 5, Folder 12, "Newspaper clippings, 1952," . Mr. Wizard Papers.
[254] Although sociologists never provided conclusive results, many newspaper pundits debated the impact of television on American families in the early and mid-1950s. Carmen Luke, *Constructing the Child Viewer: A History of the American Discourse on Television and Children, 1950-1980,* (New York: Praeger, 1990), 63.

didn't have to worry about the grades."[255] Like the other adults in his audience, Herbert expressed his skepticism about television. "I am not convinced that television is an ideal medium to teach with," he mused in an interview in 1961, "To teach, you want a student to learn. You want something to be going on in his head and you can't, I believe, accomplish that with television because television is a passive medium. The most television can do is open some doors."[256]

Herbert carefully couched his goals in comforting rhetoric; he wanted to reassure parents that they had more control over their children than he did. In an op-ed, he talked about ways that parents could teach science to their own children. "Don't be afraid to look things up. There never was a parent who knew all the answers to his children's questions."[257] As historian Rebecca Onion has noted, American parents have long worried about their ability to prime a student's young curious mind for a lifetime of productive, scientific achievement.[258] Herbert encouraged parents and children to collaborate together on the ultimate science project: a child's mind.

Don Herbert's natural rapport with children won him the respect of his audience. Unusually for fifties' children's program, Mr. Wizard did not address the camera

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[255] "Dramatic Touch Makes Science Appealing, Mr. Wizard Shows," *La Crosse Tribune,* Thursday, June 10, 1953. Pg 22, Box 6, Folder 1. "Newspaper clippings, 1953." Mr. Wizard Papers.
[256] John Crosby, "Post Dispatch," St. Louis, February 27, 1961, Box 6, Folder 9. "Newspaper clippings, 1961." Mr. Wizard Papers.
[257] "How to Answer Your Ten Year Old," *TV This Week*, July 20, 1957, Box 6, Folder 5. "Newspaper clippings, 1957." Mr. Wizard Papers.
[258] Rebecca Onion, *Innocent Experiments: Childhood and the Culture of Public Science in the United States,* (Chapel Hill: University of North Carolina Press, 2016) 22.

directly.[259] There was no studio audience. Instead, Herbert thought of ways that a child in the audience could think of herself as the experimenter.[260] He and his directors accomplished this by filming the action of an experiment from a child's point of view. "In some of the programs," Herbert explained, "the camera actually becomes the child and the audience supposedly saw exactly what the child saw."[261] Amazingly, Herbert never broke the fourth wall. Instead, he focused his attention on his assistant.

Much as the ideal parent would have made the child the center of their world, Herbert placed the child at the center of Mr. Wizard's world. The onscreen child helper was an important component of the show. Henry Feinberg, Herbert's assistant, recalls that the child on the program also served as a proxy for the child at home.[262] Herbert never criticized, shouted at, nor talked down to his assistants. A journalist watching a rehearsal observed, "[Willy] wasn't speaking the lines from memory as actors usually do. He was asking and answering questions as naturally as if he were chatting with a friend."[263] The sense of camaraderie between the star and the child was essential. Herbert explained in articles that he enjoyed working with the kids and always made sure that they felt the same. "Only when they are really having fun in front of those millions of

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[259] Herbert tried addressing the camera directly, but felt that it made him seem too pedantic. Herbert, *My Life as Mr. Wizard*, 2.
[260] Herbert's analysis echoes David Kirby's theory of "virtual witnessing." As Kirby has explained, virtual witnessing allows non-scientists create an understanding of a scientific experiment through a visual recreation done on television or on film. The viewer believes that they have 'witnessed' science in action. David Kirby, *Lab Coats in Hollywood: Science, Scientists, and Cinema,* (MIT Press, 2011). 25-26.
[261] Herbert, "Essential Inner Nature of Science,"1969, 24
[262] Henry Feinberg, Interview with author, December 18, 2015.
[263] " "Mr. Wizard" TV's Science Teacher," *Junior Scholastic* articles 1956; Somewhat confusing to modern viewers, all the actors on *Watch Mr.Wizard* used a script, but 'ad-libbed' their lines. Herbert called this the 'Chicago Style' of television, "carefully-prepared, but spontaneous shows." Herbert, 2.

people," he told reporters, "do I know for sure that the children (and perhaps the adults too) watching us are having fun too."[264] Herbert treated his child guest stars as equal partners in scientific discovery.

The world of the child was recreated in the sets of Mr. Wizard. In a children's book about the series, Mr. Wizard invited neighborhood children to visit his home and sample his wife's homemade jam.[265] Surprisingly, the early programs were set in a kitchen or in Mr. Wizard's living room laboratory.[266] Herbert argued that the familiarity of the set and the props were important to the show's tone. "We don't use flasks when I can use a milk bottle," he noted, "We don't want to distract people with strange looking equipment or frighten them away by giving the impression that what's coming will be over their heads and, therefore, dull."[267] By using the tools of the home, Herbert made science seem approachable and familiar to children in his audience. "Mr. Wizard would ask the questions that you might ask at home," his assistant Henry Feinberg recalled.[268] A child's parents could be just as smart and scientifically savvy as Mr. Wizard. 'Normal' people could be scientists too.

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[264] TV's Mr. Wizard Says Young Helpers give his program the Natural Look. *Traveler,* Jul 12, 1954, Box 6, Folder 2. "Newspaper clippings, 1954." Mr. Wizard Papers.
[265] Ruby Hubley Thayer, *Mr. Wizard's Junior Science Show*, (Chicago: Rand McNally & Company, 1957), 3.
[266] Jack Mabley, "Mr. Wizard a Top Show for Kids," *Chicago Daily News,* Wednesday, Oct. 24, 1951. "Newspaper clippings, 1951." Mr. Wizard Papers.
[267] "Mr.Wizard Keeps It Simple," *Chicago Sun-Times*, March 3, 1955. As cited in Herbert, *My Life as Mr.Wizard,* 121.
[268] Feinberg, Interview with author, 2015.

To understand the commercial success of *Watch Mr.Wizard*, it's useful to understand how other filmmakers talked about science in the fifties. Science educational films, produced by companies like Bell Labs, were not uncommon in the 1950s, but Herbert's approach was unusual. In an attempt to appeal to children, these programs incorporated magical imagery like talking suns and magical genies. Herbert chose to step away from this approach. Instead, he emphasized that *Watch Mr. Wizard* was based on fact, not fiction.

It might now seem odd that Herbert positioned a show about science around the idea of 'magic,' but magical rhetoric was often invoked in early twentieth century science education.[269] Two of the most successful science films made in the 1950s teemed with dragons, gods, and genies. Disney Studio's *Our Friend the Atom* (1957) featured the enchanted animation that made Walt Disney a household name.[270] The television special begins with the host Heinz Haber, a German scientist, opening a picture book.[271] "We had a science story," Haber tells the audience, "but suddenly we realized that it was almost like a fairytale." This motif is repeated throughout the hour-long episode, as Haber blends

[269] Melanie Keene, *Science in Wonderland: The Scientific Fairy Tales of Victorian Britain,* (Oxford: Oxford University Press, 2015); Spencer Weart, *Nuclear Fear: A History of Images*, (Cambridge: Harvard University Press, 1989).
[270] Mark Langer, "Why the Atom is our Friend: Disney, General Dynamics and the USS Nautilus," *Art History,* 18, (1995): 71.
[271] Haber was also an alum of *The Johns Hopkins Science Review* and later a well known popularizer of science in Germany. Ralf Bülow, "Das neue Universum des Klaus Bürgle," in *Technology Fiction: Technische Visionen und Utopien in der Hochmoderne*, ed. Uwe Fraunholz et. All (Dresden: 2012), 290.

history and myth, to create an appealing representation of atomic energy as a mysterious, magical force.[272]

Bell Telephone Systems, a conglomerate of telecommunication services, also produced a mythological narrative around scientific principles. Executives at Bell reached out to celebrated director Frank Capra to create the *Bell Laboratories' Science Series*.[273] Best now known for his opus *It's a Wonderful Life* (1946), Capra was enthusiastic about preparing such films. After meeting with creative minds like Willy Ley and Aldous Huxley, Capra imagined a succession of stories that mixed magic, religion, and the natural world. In films like *Our Friend Mr. Sun* (1956), live-action science professors taught animated gods about scientific progress.[274]

Don Herbert, similarly, understood that magical imagery could be a crucial and fun tool for science educators, and an attractive narrative to advertisers. As he later explicated, "Since the word 'science' scares people away, we made use of the word 'magic ' which attracts. Our main purpose is to entertain as large an audience as possible and as a vehicle for entertainment we use science or fact."[275] Herbert assumed that his audience thought of science as "magic." He later told reporters that: " There are many demonstrations in the physics laboratory that are actually magic until the reason for them

[272] *Our Friend the Atom* was also published as a Technicolor storybook with three different editions. Heinz Haber, *Our Friend the Atom*, (New York: Golden Press, 1956).
[273] Capra, *The Name Above the Title: An Autobiography,* 440.
[274] Luciano and Coville, *Smokin' Rockets,* 180.
[275] "Don Herbert, Former City Resident, Producing one of Major TV Program," June 22, 1952, Box 5, Folder 12, "Newspaper clippings, 1952." Mr. Wizard Papers.

is known."[276] Hence Herbert explained at the start each program that his lesson would explain "the magic and mystery of science in everyday living." "Do you like mysteries and magic?" he asked his audience, "If you do, why not investigate the mysteries and magic in the world around you?"[277]

While Herbert borrowed some mystical rhetoric, he carefully delineated between magic and science. He wrote in a newspaper op-ed column, "TV viewing can be helpful if what [viewers] see reflected on the TV tube is a true picture of the real world. It can be harmful if what they see gives them an inaccurate distorted and therefore unreliable picture of the real world."[278] Herbert stressed the importance of children understanding the reality of their surroundings, and not confusing fact and fiction. "Always tell the truth to a child," Herbert counseled parents in a newspaper editorial. "The moon isn't made of green cheese, and chances are you wouldn't tell him so."[279] *Watch Mr. Wizard* featured no enchanted wands, friendly genies, or animated familiars. Later books about the *Mr.Wizard* series stressed that children could perform scientific magic tricks, but that the supernatural world did not exist.[280] Subtly, the presentation of science as realistic, without the tricks of animation, was constructed as an edifying and empowering approach to

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[276] Ibid.
[277] Don Herbert, "Mr. Wizard's Science Secrets," *Science Digest,* Nov. 1952, volume 32, number 5, Box 5, Folder 12, "Newspaper clippings, 1952," Mr. Wizard Papers.
[278] "His Taste Test Based on Honesty." *Chicago Sun Times,* June 27, 1954, Box 6, Folder 2, "Newspaper clippings, 1954." Mr. Wizard Papers.
[279] "How to Answer Your Ten Year Old," *TV This Week*, July 20, 1957, Box 6, Folder 5." Mr. Wizard Papers.
[280] Ruby Hubley Thayer, *Mr. Wizard's Junior Science Show*, (Chicago: Rand McNally & Company, 1957); One 1983 *Mr. Wizard* book featured the image of an actual wizard on the front cover. Herbert was horrified and later editions were published with a different jacket. Herbert, *My Life as Mr. Wizard,* 166.

science education. Children could be trusted to understand the natural world on their own.[281]

Enchanted Audiences

Curiously, Herbert's approach mirrored another successful entertainer of the 1950s: Walt Disney. Disney had established himself in the 1930s as a producer of safe and wholesome entertainment.[282] Like Herbert, Disney presented himself as a Peter Pan-like adult, as a father who hadn't forgotten his own childhood.[283] "Knowing that incessant tension also is fatal to work, calling for intelligence, imagination and humor," *The New York Times* reported in 1934, "Disney tries to give his artists and writers two days a week for play."[284] To further cultivate the aura of expertise, Walt Disney Studio's public relations materials compared the animation studios to scientific laboratories.[285]

[281] Rebecca Onion suggests that other science communicators and entertainer shared Herbert's firm instance of fact amid fiction. E.C. Gilbert, the industrial toyman, refused to talk to children about 'toys'; Porter Chemical Company's Chemcraft encouraged mystical rhetoric and gently reminded its young scientists that 'chemical magic' was actual science. Onion 79, 93.
[282] "Walt Disney was the inoculant against infection by the working-class and immigrant roots of Hollywood producers, a prophylactic against the vices they could not help but transmit through their films." Nicholas Sammond, *Babes In Tomorrowland: Walt Disney and the Making of the American Child, 1930-1960.* (Durham: Duke University Press, 2005), 78.
[283] The boyish radiance of scientific celebrities has a longer history. Katherine Pandora notes that Luther Burbank had a similar public persona. Katherine Pandora, "Knowledge Held in Common: Tales of Luther Burbank and Science in the American Vernacular," *ISIS*, 92, (Sept. 2001), 484-515.
[284] Ibid., 118.
[285] A producer wrote in 1943 that, "More experts, scientists, and technicians operate under Disney's roof than in any other one organization in the universe." Ibid., 117.

Incidentally, Disney had established himself as a scientific expert of sorts by the 1950s with his films, the *True-Life Adventures* series.[286] Started in 1948, each of these films captured a glimpse of animals in the 'wild,' such as bears, elk, and, infamously, lemmings.[287] Disney marketed these 16mm films to schools, science museums, and city centers. A curator at the Buffalo Museum of Science gushed:

> I had the pleasure of attending a preview of your feature-length film, 'The Living Desert.' We feel you have not only given us an interesting and colorful story that should be most attractive to any audience, but you have reached an extremely high level in teaching the public some ecology . . .[288]

Disney's success as a scientific storyteller came through his ability to leverage and manage community experts. It was a two-way exchange; local educators were thrilled to work with the popular Disney Studios, while community screenings at schools authorized Disney's presence as an educator.[289]

Mr. Wizard's popularity could be compared with the Disney-mania that swept the country in the mid-1950s. Herbert also used professional networks to gain a reputation as an educator. As discussed previously, he worked alongside university professors in both

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[286] Greg Mitman offers a thoughtful analysis of Disney's True Life Adventures in the fifth chapter of his book on natures series. Greg Mitman, *Reel Nature: America's Romance with Wildlife on Film,* (Cambridge: Harvard University Press, 1999).
[287] Disney's "White Wilderness" (1958) popularized the myth that lemmings innately, and tragically, will run off cliffs. Nicholas Sammond argues that Disney's characterization of the lemming had much more to do with postwar paranoia about homogenous society than with the realities of ethology. Sammond, *Babes in Tomorrowland,* 204.
[288] Ibid., 313.
[289] Ibid., 313.

Chicago and New York.[290] Educational materials, like guides and filmstrips, were distributed to public schools, courtesy of the Cereal Institute. Additionally, Herbert befriended another Chicagoan celebrity, *Zoo Parade's* Marlin Perkins, director of the Lincoln Park Zoo.[291] The two men even collaborated on a short-lived quiz show, dubbed *Curiosity Club*.[292] In 1952, when they asked their viewers to name a brightly colored parrot, over 89,000 children wrote in with their suggestions.[293]

But Herbert's most influential idea was the "Mr. Wizard Science Club." Television clubs were popular in the early 1950s; Walt Disney launched his popular "Mickey Mouse Club" on October 3, 1955.[294] Overnight, a nation of "Mouseketeers" coalesced around their television sets and begged their parents for official Mouseketeer ears, records, and paper dolls.[295] Membership was inclusive; children could join the club by switching the channel to ABC, every night at 5:00 PM. Nicholas Sammond argues that such clubs were successful because they reimagined the public television program as a semi-private, intimate viewing experience.[296] A television club became a safe site for children to interact with their cherished idol.

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[290] "Everything he does is checked first for scientific accuracy by Dr. Wilbur Beauchamp, associate professor of the teaching of science at the University of Chicago." Mr. Wizard has Skillful touch with Science," Larry Wolters, *Chicago Tribune.* June 1951, Box 5, Folder 11. Box 5, Folder 11, "Newspaper clippings, 1951." Mr. Wizard Papers.
[291] "Larry Wolters, "Mr. Wizard Awarded a 'Peabody,' *Daily Tribune*, April 15, 1954. Box 6, Folder 2.
[292] "New Curiosity Show Has Perkins At Top," *Chicago Tribune,* May 11, 1951, Box 5, Folder 11.
[293] Herbert, *My Life as Mr. Wizard*, 118.
[294] James Baughman, *Same Time, Same Station: Creating American Television 1948-1961*, (Baltimore: The Johns Hopkins University Press, 2007), 265.
[295] Coleman, Barbara, "Through the years, we'll all be friends", *Visual Resources*, 14 (1999), 299, 300.
[296] Sammond, *Babes in Tomorrowland*, 350.

Science clubs for children were not unusual in the United States. The Porter Chemical Company started one of the very first clubs in 1918 to promote their popular brand of chemistry kits. E.C. Gilbert's company followed suit.[297] Rebecca Onion suggests these clubs were pitched to parents as ways for boys to "learn group dynamics and managerial skills."[298] And, of course, to sell chemistry sets.

The first Mr. Wizard club started in 1952, three years before Disney's and without any adult involvement. A group of children in Jacksonville, Florida wrote to Herbert asking him for a club charter.[299] (See Fig. 2) Herbert formally announced the creation of the Mr. Wizard Club during an episode in the spring of 1952, to "promote knowledge of practical science among school children of all ages."[300]

Each club member received membership cards, a club charter, and monthly instructions for fun experiments (See Fig.3).[301] To join, members had to make the following pledge:

1. To increase my knowledge of science and improve my scientific skill.
2. To understand the importance of science to my health and daily living.
3. To give service to my country and community.

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[297] Onion, 88,89
[298] Onion, 90.
[299] Sept. 17, 1951, Maraleitta Dutton, to Fred Abood, Box 6, Folder 1.
[300] "Mr. Wizard Video Clubs Grow Fast," May 3, 1953, Box 6, Folder 1
[301] To renew their membership, children sent in a dollar every year. "Solutions Around the House," *Watch Mr. Wizard: Volume 7*, directed by Lynwood King (1958; Watch Mr. Wizard, West Hills, CA, 2006), DVD.

4. To observe the rules of good health, which are: Eat three well-balanced meals a deal, beginning each day with a good breakfast.

The charter helped to create community values for the children involved in the club. These values focused on cultivating an appreciation of science and emphasized the importance of science in a child's world. Mr. Wizard's imagined neighborhood was filled with loyal kids who wanted to become both smart scientists and good citizens. An estimated 50,000 children carried Mr. Wizard cards just a year later.[302] By 1955, 75,000 children had signed up for the Mr. Wizard Club.[303] An estimated 90,000 boys and girls owned a copy of *Mr. Wizard's Science Secrets* by 1956.[304] Officially, each club had eight members, but many of the clubs were made up of a mixture of parents and children.[305] Entire elementary classrooms joined "Mr. Wizard's Club."[306] Although the clubs were initially concentrated in the Chicago area, they quickly spread across the United States.[307]

Thousands of children wrote to Mr. Wizard between 1951 and 1965.[308] A close reading of Mr. Wizard's fan mail reveals the ways that children connected Mr. Wizard's demonstrations to the science in their everyday lives. Most of the letters, Herbert noted,

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[302] "Watch Mr. Wizard," January 7, 1953, Variety, Articles, 1953
[303] "Watch Mr. Wizard," January, 1, 1955, Variety, Articles, 1955
[304] "Mr. Wizard Sparks Youth Interest in Science," Feb 14, 1956, Box 6, Folder 4, "Newspaper clippings, 1956." Mr. Wizard Papers, Archives Center, National Museum of American History.
[305] "Faye's Guest," Indianapolis Times, August 8, 1955, Box 6, Folder 13. "Newspaper clippings, 1955." Mr. Wizard Papers.
[306] Mr. Wizard Clubs grow to 1,500 in 35 states. Children's Television Magazine, Sept 1953. "Newspaper clippings, 1953." Mr. Wizard Papers.
[307] "Faye's Guest," Indianapolis Times, August 8, 1955, Box 6, Folder 13. "Newspaper clippings, 1955." Mr. Wizard Papers.
[308] There are no numbers explaining just how many letters that Mr. Wizard received, but given how large his fan club was, it seems reasonable to infer that Mr. Wizard had thousands of letters over fourteen years. In his personal papers, around 50 letters remain. Most are positive, several are negative. These letters are taken as being representative of the letters that might have existed in the larger collection.

asked him about experiments performed on the program. Some wanted to talk him about science.[309] " Can you tell me what a saddlelight [sic] is?" one child queried.[310] "Breakthroughs are good for science, but bad for windows," a girl observed.[311] Others wrote in to express their delight at the weekly program. "I AM 8 years old [sic] and I have poleo," wrote one little boy:

> I have nothing to do and I saw your show. My mom does not no that I am writing I would like to know much that handmade mikerskope cost? I would like to have it but I can not build it.[312]

Some children literally wanted to talk to Mr. Wizard. An embarrassed mother of a five year old thanked Herbert in one letter after her tyke phoned the Herbert household.[313] Herbert and his secretaries would respond to letters from his fans, giving them advice on where to purchase materials for experiments. Children were unafraid to ask Mr. Wizard questions or to even make demands. One group of ardent fans wrote in, concerned that the program's scheduling conflicted with weekly screenings of Superman. They requested that Mr. Wizard change his program's timeslot.[314] They saw Mr. Wizard as one of them, an adult who understood their priorities and their world.

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[309] "Faye's Guest," *Indianapolis Times*, August 8, 1955, Box 6, Folder 13. "Newspaper clippings, 1955." Mr. Wizard Papers.
[310] Anonymous, Jan. 3, early 1950s, Box 33, Folder 1, Mr. Wizard Papers.
[311] "The Essential Inner Nature of Science," October 23, 1969, page 1. Box 2, Folder 14. Mr. Wizard Papers.
[312] Quite a few of Mr. Wizard's fans were also victims of polio. In one letter, a woman thanked Mr.Wizard for entertaining her son, who would likely never be able to leave his bed. Mrs. Gothering to Mr. Wizard, October 29, 1952. Also Anonymous, December, 4, 1952, Mr. Wizard Papers.
[313] Mrs. Ralph Simon, to Don Herbert, Nov. 23, 1952, Box 33, Folder 1, Mr. Wizard Papers.
[314] Michael La Rovero to Don Herbert, Dec. 7, 1953, Box 33, Folder 1, Mr. Wizard Papers.

Overwhelmingly, his fans appreciated that Mr. Wizard worked alongside children their own age. "Sometimes other science programs are very dull," another boy admitted, "When you have children on your program (because I am a child), because you have to explain it to the child it makes it more interesting."[315] Kay Walker, another viewer, reported that, since she had started to view the program, her grades in science class had improved. She credited Mr. Wizard, but also wanted him to thank his assistants Buzz and Betsy; they explained science in a way that she could understand.[316] Herbert's intuition, that children would enjoy other children teaching them science, had paid off.

One clear trend arises from an examination of Mr.Wizard's fan mail: both boys and girls enjoyed *Watch Mr. Wizard*. Herbert made sure that the show was inclusive; he intentionally rotated between a boy and a girl assistant every week. "After working with a lot of children," he remarked in 1961, "I think girls tend to be better equipped to be scientists than boys. It's too bad most of them don't go on with it."[317] Herbert wrote articles that appeared in magazines like *American Girl* and *Campfire Girl*, encouraging girls to conduct their own experiments.[318] "I just wanted to wright you [sic] and to tell you how greatful I was to you for wrighting to me and giving that information about Nature and chemistry," Mary scribbled back to Mr. Wizard after he had answered one of

[315] Robert Berger to Don Herbert, Feb. 1, 1957, Box 33, Folder 1, Mr. Wizard Papers.
[316] Kay Walker to Don Herbert, Feb. 7, 1955, Box 33, Folder 1, Mr. Wizard Papers.
[317] John Crosby, "Post Dispatch," St. Louis, February 27, 1961, Box 6, Folder 9. "Newspaper clippings, 1961." Mr. Wizard Paper.
[318] Campfire Girl, December 1960, "Wizardy for Parties," American Girl "The World of Sound,"1960, Box 6, Folder 8. "Newspaper clippings, 1961." Mr. Wizard Papers.

her letters.[319] One group of girls wrote to Mr. Wizard to express their interest in the show. Every Saturday morning, they explained, they met at the house of Cynthia Regan for breakfast and to watch Mr. Wizard. Then, they recreated the experiment of the week.

> We have lots of fun and we feel that we are learning something at the same time. We especially like to watch your show the week you have the little girl Susan helping you because we are around the same age and we feel that she is one of our friends.[320]

Cynthia and her friends wondered whether it would be possible to meet Susan. They related to the little girl on the television screen. Another fan, Marsha, wrote Mr. Wizard in 1964, to convey her gratitude after her science fair project, inspired by an experiment from one of Mr. Wizard's science books, won a prize in a NYC science fair.[321] Girls watching the program felt like Mr. Wizard wanted them to be scientists just as much as their brothers and fathers. Adults were eager to encourage their daughters to experiment science and follow in the footsteps of Susan, Rita, Irene, Betsy, and Mr. Wizard's other friends. The vice president of NBC wrote Herbert in 1958, asking advice on what science books he could give his eleven year old granddaughter, "an enthusiastic" fan of the program.[322] Young girls, like young boys, could serve as the sorcerer's apprentice.

Parents were also part of the Mr. Wizard community. If the letters in the archive are any indication, women frequently wrote letters to Mr. Wizard, usually on behalf of

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[319] Mary Mills to Don Herbert, 1956, Box 33, Folder 1, Mr. Wizard Papers.
[320] Cynthia Reagan to Don Herbert, November 17, 1955, William Hedges to Don Herbert, January 13,1958, Box 33, Folder 1, Mr. Wizard Papers.
[321] Marsha Patraka to Don Herbert, May 6, 1964, Box 33, Folder 2, Mr. Wizard Papers.
[322] William Hedges to Don Herbert, January 13,1958, Box 33, Folder 1, Mr. Wizard Papers.

their young children. They watched the program with their young children and tried to incorporate the lessons from the program into their daily activities. "Today, as we were washing up after lunch," Carolyn D. Hill explained to Don Herbert:

> I stuck an ordinary string dish mop, wet with water and "Tide" washing powder, into a jar containing the remains of some French's mustard. To our amazement and delight, the mop immediately turned bright pink! Brin shouted: "Mommy does magic like Mr. Wizard!"[323]

These mothers (and a few fathers) credited Mr. Wizard with creating a space on television for wholesome, educational family entertainment. They were relieved when their children wanted to spend twenty minutes on Saturday mornings watching Mr. Wizard explain electricity, not violent cartoons. Mr. Wizard helped the parents of young baby boomers adapt to a new world of science.

Even adults without children enjoyed Mr. Wizard. Young high school and middle school teachers, usually women, wrote in to Don Herbert, asking for advice on lessons plans or requested copies of films for their own students. "You have the true educational approach of relating past experience with present experience," praised Bernice Steele, "The concept to be learned seems to spring from the learner than from the instructor."[324] A few fans wrote in just to tell Herbert how much they enjoyed the program, even though they knew it was meant for children. "How I wish yours was a daily program," one housewife lamented, "to replace some of the inane soap-opera time-killers cluttering up

[323] Carolyn D. Hill to Don Herbert, August 9, 1957, Box 33, Folder 1, Mr. Wizard Papers.
[324] Bernice Steele to Don Herbert, March 4, 1958, Box 33, Folder 1, Mr. Wizard Papers.

the air waves!"[325] After Sputnik flew across open skies in 1957, several adults commended Don Herbert for his patriotism in teaching science. Deputy General Counsel William Compton of the Army told Herbert, " We need to awaken such an interest [in science] if this country is to survive."[326] Frank Baxter, the host of *Bell Laboratories' Science Series,* echoed this sentiment: "Congratulations to you on your magnificent work in bringing science to the boys and girls of America long before Papa K's [*Khrushchev]* Sputnik woke up our country to the need of scientific training."[327]

As Mr. Wizard, Don Herbert provided the role of the science expert for kids, in the 1950s and 1960s. But Herbert also won the hearts of their parents by proving that he was a trustworthy television authority at a time when adults were looking for expert guidance. His approach, placing the child at the center of the television program, resonated with the child-rearing approaches of contemporaries like Dr. Spock and Walt Disney. Herbert's presence precipitated the formation of a community of children and adults, focused at discovering the science in their daily lives.

Don Herbert charmed children and their parents with his child-centric approach to television. Young children adored his creation, the sympathetic scientist-character Mr. Wizard. As seen in the first chapter, it was quite usual for local broadcasters to sponsor science series. But, as the first national children's science series, *Watch Mr. Wizard*

[325] Mrs. Neal Chapline Swalm to Don Herbert, Dec. 5, 1963, Box 33, Folder 2, Mr. Wizard Papers.
[326] Surprisingly, Sputnik seemed to have little impact on the overall tone of Mr. Wizard. Only a few of the episodes were about rockets. William R. Compton to Don Herbert, October 21, 1958. Box 33, Folder 1, Mr. Wizard Papers.
[327] Frank Baxter to Don Herbert, March 10, 1961, Box 33, Folder 2, Mr. Wizard Papers.

provided a new way for advertisers to encourage young boys, girls, and their parents to purchase scientific products. Herbert, through his fame as Mr. Wizard, served as a spokesman for the Cereal Institute, a national conglomerate of cereal manufacturers, and General Electric.

Because of this characterization, which celebrated the exciting world of 'real' science and technology, the character of "Mr. Wizard" proved especially popular with corporate executives. The Cereal Institute, a conglomerate of 10 food-product companies including Quaker Oats, General Mills, and the National Biscuit Company, underwrote the show until 1956.[328] Ambitiously, the organization strove to have "every man, woman, and child, in the US eating nutritionally adequate breakfasts."[329] Such a goal would mean a $4 billion annual increase in sales for the breakfast industry.[330] The Cereal Institute gave Herbert complete creative license over the show, but requested that he incorporate a 'breakfast message' into every episode. Herbert did so. Often, he and Willy would take a breakfast break, where they would tell their friends at home to make sure to include "fruit, cereal, milk, bread, butter, and other food for variety like eggs or breakfast meat" in every meal.[331] The Cereal Institute hoped that Mr. Wizard's instant messages would encourage children to eat breakfast and their mothers to buy cereal products.

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[328] Herbert, 83.; "Cereal Institute has a TV Winner in 'Mr. Wizard," *Advertising Age,* December 24, 1951. Box 5, Folder 11. "Newspaper clippings, 1951." Mr. Wizard Papers.
[329] Ibid.
[330] "Competitors cooperate to build $4-billion more sales through education," *Tide,* December 14, 1951. "Newspaper clippings, 1951." Mr. Wizard Papers.
[331] Herbert, *My Life as Mr. Wizard,* 11.

The Cereal Institute's investments paid off.[332] Ten months after *Watch Mr.Wizard* debuted, the Institute polled mothers about the eating habits of their children. Among the mothers whose children watched the show, almost 70 percent agreed that breakfast was the most important meal of the day. Only 47 percent of the control group, women who had never watched the show, agreed with this statement.[333] One mother, Betty Jane Farrell, wrote to Herbert in 1954. She reported:

> My children, I have four, and I have learned much from your demonstrations and experiments. . . My children use your formula to check up on their breakfasts each morning from our standards. Yours is the best children's program on television thus far. [334]

Herbert himself was surprised by the ability of small children to absorb the subtle advertisement. He recalled, decades later, that adults would approach him and recite this list from memory.[335]

Advertisers in the 1950s wanted to prime young children for a lifetime of commercial consumption.[336] To achieve this, some corporations blurred the boundaries between private and public space for the purpose of commercial profit.[337] The Cereal Institute sponsored an educational activity guide and a 16mm film for elementary

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[332] Ibid.
[333] Cereal Institute has a TV Winner in 'Mr. Wizard," Advertising Age, December 24, 1951. Box 5, Folder 11. "Newspaper clippings, 1951." Mr. Wizard Papers.
[334] Betty Jane Farrell, March 8, 1954, Mr. Wizard Papers.
[335] Herbert, *My Life as Mr. Wizard,* 11.
[336] Lizabeth Cohen, *A Consumer's Republic: The Politics of Mass Consumption in Postwar America,* (New York: Alfred A. Knopf, 2003), 320.
[337] Lizabeth Cohen has written on the conversion of malls (private spaces) into community centers. Cohen, *A Consumer's Republic*, 261-274.

students; these were meant for distribution in public schools (see Fig. 4).[338] A message of public health was intertwined into a program focused on subjects like physical sciences and technology. In this film, Mr. Wizard taught Betsy and Willy the fundamentals of electromagnetism; he demonstrated how to set up a telegraph, build an 'electric' swing, and wire an electromagnet. Not so discreetly, the writers of the teaching guide emphasized the connections between healthy minds and a nutritionally balanced breakfast. In one suggested activity, children decoded a message that revealed five food groups. Surprisingly, the Institute did not directly link the energy of the human body to the potential energy of a magnet: instead, they stressed, that, " since science plays an increasingly important part in the development of our modern foods, many subjects in the fields of biology, chemistry, and botany will come up relating to breakfast foods."[339] The relationship between the Institute and the series demonstrated a success in the patronage of a science educational program.

General Electric's advertising department approached Don Herbert in 1954. Herbert had caught the eye of David Burke; his young son adored Mr. Wizard's experiments.[340] The corporation sponsored a weekly dramatic anthology series, *The General Electric Theater,* aired on rival channel CBS. Hosted by suave Ronald Reagan, the program staged live theatrical productions with A-List celebrities like Jack Benny and

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[338] "Teacher's Film Guide: Watch Mr. Wizard" (1953), Box 6, Folder 1, "Newspaper clippings, 1953," Mr. Wizard Papers.
[339] Ibid.
[340] Herbert, *My Life as Mr. Wizard*, 94. Burke would lead the collaborations between GE and Disney on 'The Carousel of Progress. "The Horizon's Story Part III: Disney's House of Magic," Progress City, USA accessed June 1, 2016 from http://progresscityusa.com/2011/09/01/the-horizons-story-part-iii-disneys-house-of-magic/

Henry Fonda.[341] Burke wanted Herbert to host a 3-minute commercial that would play between acts; "The Progress Report" would showcase new innovations in consumer appliances like refrigerators, mixers, clocks, and saws.

Herbert eagerly accepted the job. Although the job was taxing, involving weekly trips between Chicago, New York City, and GE facilities all of the United States, Herbert relished the opportunity to work with a variety of scientists and directors. Herbert, in this new role, was the "Progress Reporter," a mixture of his Mr. Wizard persona and a technology guru. He was still a trustworthy science teacher, but also represented the savvy, postwar consumer. The advertising journal *TIDE* unraveled the power of Herbert's appeal:

> Frequently, when dealing with a technical subject on the GE Theater, Herbert will explain the idea to a boy or to a girl. GE reasons that if Herbert were to talk directly the audience in simple terms, the audience might feel he was talking down to them. However, when he talks to a child, thinks GE, people understand, listen, remember. [342]

Herbert's method of delivery, focused on honest and direct communication, charmed audiences. As the Progress Reporter, Hebert established the same rapport that he had established on his own show. The Progress Reports came across not as commercials, but short and interesting lectures on exciting scientific developments. Herbert's television

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[341] Herbert, *My Life as Mr. Wizard,* 97.
[342] "GE's formula for top tv ratings," Tide, December 14, 1956, Box 6, folder 4. "Newspaper clippings, 1956." Mr. Wizard Papers.

program demonstrated that educational television could be entertaining; his entertaining adverts proved that commercials could be educational.

Like the Cereal Institute, General Electric was pleasantly rewarded for its gamble. 33 million people watched the program every week; many of them were impressed by Herbert's three-minute lessons.[343] A study of public perceptions of GE's commercials in 1956 revealed that Mr. Wizard's Progress Reports were the most popular spots for the company.[344] Fans of the program looked forward to Don Herbert's appearance twice a week. One mother praised Mr. Wizard's appearance on both programs:

> Dear Mr. Wizard, My Boys (aged 3 to 5) asked me to write and tell you how much they like your program. They sit as still as little mice and listen to every word… I look forward to your talks on the General Electric Channel.[345]

As noted previously, Don Herbert managed to present science in an honest way that appealed to the whole family. His accessible manner allowed him to co-host *The General Electric Theater* for eight years until its cancellation in 1961.

As Mr. Wizard, Don Herbert won the respect of viewers and their local television stations. He built the foundations of *Mr. Wizard Studios* relying upon the skills that he had developed as a small-bit radio actor. Herbert's television program rose to fame with

[343] Hebert, *My Life as Mr. Wizard,* 97.
[344] "GE's formula for top tv ratings," Tide, December 14, 1956, Box 6, folder 4. "Newspaper clippings, 1956." Mr. Wizard Papers.
[345] Louise H. McCormick, Jan. 9, 1955

the help of glowing, well-placed newspaper articles and support from nationally-based companies like General Electric.

A Wizard Amid Scientists

By the mid-1950s, Don Herbert had achieved national fame for his role as the friendly neighborhood scientist. Like Walt Disney, he had established himself as an expert showman and communicator. Things were going well for Herbert. He had moved his family and crew to New York City in 1956, which allowed him to more easily fly between cities for his "Progress Reporter" gig. Herbert hired some new staff and moved his equipment into a three-story townhouse.[346] He would soon consider how he could leverage the fame of *Watch Mr. Wizard* into a new television series for adults.

After the move, the Cereal Institute cancelled its sponsorship of the program. NBC became the main patron of *Watch Mr. Wizard*.[347] Herbert was already greatly indebted to the broadcasting network; NBC donated cameras and other equipment for the program.[348] *Watch Mr. Wizard* served an important function for the television network. According to FCC regulations, stations were required to carry a certain number of 'public service' programs each year.[349] Additionally, following the quiz show scandal of 1958,

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[346] Herbert, *My Life as Mr. Wizard,* 130.
[347] "The Truant Teacher," *TIME Magazine,* November 19, 1951. Box 5, Folder 4. "Newspaper clippings, 1951." Mr. Wizard Papers.
[348] Lizabeth Cohen notes that network ownership of individual programs was increasingly common in the later 1950s. Cohen*, A Consumers' Republic*, 304. Herbert, *My Life as Mr. Wizard*, 83.
[349] William A. Bluem, *Television in the Public Interest*, (New York: Hasting House, 1961)13-14.

CBS and NBC looked for a way to burnish their trustworthiness.[350] Robert Sarnoff, the president of the NBC, told the *Saturday Evening Post* in that his network devoted around a fourth of its programming to news, public affairs and educational subjects.[351] NBC executives classified *Watch Mr. Wizard* as a 'public service program,' which meant that small NBC-affiliates could run the show free of charge.[352] But, as historian Michele Helms argues, large networks like NBC also underwrote television series for another reason. Large networks could stymie the growth of locally produced television programs by supplying small affiliates with national material.[353]

But, when the Cereal Institute dropped their affiliation, NBC executives told Herbert that he needed to partner with a new non-profit institution to qualify for 'public service' status. Herbert reached out to nearby New York University. They connected him with Dr. Morris Shamos, the chair of the physics department. Shamos also assisted CBS with their educational series *Sunrise Semester*. He became *Watch Mr. Wizard's* official science advisor. NBC called the new collaboration, "a part of a new cooperative effort between NBC and NYU geared to 'help young people to enter careers in science and to extend the educational values of the program'."[354] Herbert and Shamos got along famously. (See Fig. 5) Shamos lent Herbert scientific equipment, like oscillators, to be

[350] James Baughman, *Same Time, Same Station*, 298.
[351] Robert Sarnoff, "What Do You Want from TV," Saturday Evening Post, 1961.
[352]Herbert, *My Life as Mr. Wizard*, 83.
[353] Hilmes, *Only Connect,* 166.
[354] "Advocates Science in Primary Grades" (Vindicator, Youngstown Ohio, Mar 2, 1958) Adrian M. Slifka, Box 6, Folder 6.

used on the program.[355] The two men collaborated on writing scripts for the show and brainstorming ideas for new experiments. Shamos and Herbert also worked outside of the show to host workshops for science teachers in the New York area.[356]

But even though he played one on TV, Don Herbert never pretended to be a scientist. As Herbert told reporters in the first years of the program, "I know that some people worry about how to describe what I do and what I am, but it never bothers me in the least."[357] Herbert initially described himself as an entertainer, but gradually came to accept a label as an educator. He had, after all, been educated as a teacher at the LaCrosse State Normal College, where he earned his bachelor's degree in 1939.[358] Only five percent of twenty-five year olds had earned a bachelor's degree in 1940, marking Herbert's collegiate education as unusual.[359] Journalists, however, enjoyed promoting Herbert as the antithesis of the stereotypical scientist:

> He doesn't resemble the conventional television conception of a man of science, with beard, and white jacket, surrounded by laboratory gear, test tubes, retorts, and Bunsen burners….He's young and handsome, he's friendly and gifted in explaining scientific phenomena as he demonstrates them.[360]

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[355] Herbert, *My Life as Mr. Wizard,* 158.
[356] "Advocates Science in Primary Grades."
[357] Ted Holmberg, "Science on TV by Mr. Wizard," Ted Holmberg, Rhode Island TV Radio and Records, February 19, 1961. Box 6, Folder 9.
[358] The name of the school is now the University of Wisconsin-La Crosse. "Guide to the Mr. Wizard Papers," February 9, 2015. Finding aid at the Lemelson Center, National Museum of American History.
[359] "Educational Attainment in the United States: 2009," U.S. Department of Commerce, Economics and Statistics Bureau, U.S. Census Bureau. from http://www.census.gov/prod/2012pubs/p20-566.pdf
[360] "Mr. Wizard has Skillful touch with Science," Larry Wolters, Chicago Tribune. June 1951, Box 5, Folder 11.

The persona of "Mr. Wizard" was conceptualized as a prototypical new type of scientific expert, one that could relate to general people. Again, such a characterization reified old stereotypes of what scientists were: stuffy, cold, and secretive. A study conducted by the Rockefeller Foundation in 1958 found that 40% of Americans thought that scientist were odd and particular people.[361] Similarly, *Cat's Cradle*, a popular book written by Kurt Vonnegut in the early 1960s, satirized scientists as isolated within their highly protected industrial laboratories.[362]

Herbert disagreed with these stereotypes. In his role as Mr. Wizard, he saw himself trying to dispel these prewar stereotypes for the next generation. In an op-ed, Herbert wrote, "The truth of the matter is that scientists are human beings just like everyone else. Most scientists are reasonably complex beings with wives and families, bills on the first of the month, and an elemental desire to stay alive in a steadily shifting world.[363] Unusually for the period, Herbert was voicing an opinion that "scientist" was just a professional title, not a moral vocation.[364] By normalizing science as a profession, Herbert connected research laboratories with the everyday science of the home. Still, Herbert personally valued the work of research scientists. In the same op-ed, he promoted the importance of the scientist in the postwar world: "The most importance difference

[361] Shapin, *The Scientific Life,* 78.
[362] Ingrid Ockert, "Ice-Nine, Isolation, and Innocence: An investigation into the insular nature of American scientific communities in the 1940s and 1950s as seen within Kurt Vonnegut's *Cat's Cradle,"* as presented at "Modern Chemistry and Material Science: Artefacts Tell the Story," October 2013, Chemical Heritage Foundation, Philadelphia.
[363] Don Herbert, "Stereotypes in Science," *TV and Radio Magazine,* April 14-20, 1957, Box 6, Folder 5, Box 5, Folder 4. "Newspaper clippings, 1957." Mr. Wizard Papers.
[364] Steven Shapin has argued that, by the 1970s, the characterization of the 'scientist' was no longer linked to intrinsically moral traits. Steven Shapin, *The Scientific Life: A Moral History of a Late Modern Vocation*, (Chicago: University of Chicago Press, 2008).

between his work and others is – our future is in his hands. He deserves our thanks and respect."[365]

Scientists also liked *Watch Mr. Wizard*. Paul Klopster, the assistant director of the National Science Foundation, told reporters that, "Don Herbert and his Mr. Wizard programs probably do more to interest young people in science research than any other popular medium of science promotion."[366] In 1955, the American Chemical Society awarded Herbert a citation for his work encouraging "youngsters" to pursue an interest in physics and chemistry.[367] Herbert, wrote journalists, was doing his best to grow a "bumper crop of young scientists and engineers."[368]

Like Herbert, science educators were deeply concerned about educating future generations of scientists. In the mid 1950s, scientists in universities worried there weren't enough students studying science and becoming scientists. The Korean War had stoked these fears; at the onset of the war, it became apparent that weren't enough scientists to conduct military research for companies like General Electric and Westinghouse.[369] Civil servants at National Science Foundation surmised that, nationally, there was a surfeit of scientists due to low birth rates of the 1930s. Still, policy analysts and politicians were

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[365] Don Herbert, "Stereotypes in Science," *TV and Radio Magazine*, April 14-20, 1957, Box 6, Folder 5, Box 5, Folder 4. "Newspaper clippings, 1957." Mr. Wizard Papers.
[366] "Wizard Sparks Youth Interest in Science, February 1956," Box 6, Folder 4. Box 5, Folder 4. "Newspaper clippings, 1956." Mr. Wizard Papers.
[367] "Chicago Dateline" *TV Guide*, April 1955, Box 6, Folder 3. Box 5, Folder 4. "Newspaper clippings, 1955." Mr. Wizard Papers.
[368] "Wizard Sparks Youth Interest in Science," February, 1956, Box 6, Folder 4. Box 5, Folder 4. "Newspaper clippings, 1956." Mr. Wizard Papers.
[369] John Rudolph, *Scientists in the Classroom: The Cold War Reconstruction of American Science*, (New York: Palgrave Macmillan, 2002), 59.

concerned that a low supply of scientists, and presumably not enough military research, could actually pose a threat to national security.[370] Years before Sputnik was launched, science educators and bureaucrats were pondering a solution to a scientist shortage. Many NSF officials blamed the deficit upon middle and high school teachers – who, they believed, lacked the tools to properly instruct the scientists of tomorrow.[371] Many science teachers still taught lessons from a 'life adjustment' curriculum. 'Life adjustment' curriculums were developed in the 1930s and focused on teaching students about the science of their daily lives. As historian John Rudolph explains, "Its goal was to provide classroom experiences that would meet the daily personal and social needs of all students, particularly those not served by the existing academic and vocational curricula at the secondary level."[372] It was "everyday science" by any other name. A high school textbook might suggest that a student understand physics by examining the motor of a tractor or learn biology through baking a loaf of bread.[373]

Critics believed, however, that the 'life adjustment' curriculum helped to prepare students to be future consumers, not future scientists. Jerrold Zacharias, a professor of physics at MIT, led the effort to develop a new line of classroom films and science textbooks for high school students. In 1956, Zacharias began to brainstorm a new approach for physics education.[374] Supported by NSF director Alan Waterman, Zacharias

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[370] Ibid.
[371] Ibid, 60.
[372] Ibid,18.
[373] Ibid, 20.
[374] A sister program, the Biological Science Curriculum Study, was also created, although it was greatly overshadowed. See the sixth chapter of Rudolph's *Scientists in the Classroom.*

suggested that new classroom materials, like textbooks and laboratory notebooks, should foster a deep respect for the scientific method. Students should be taught how to think like scientists and they should work with actual scientific instruments during class.[375] For example, instead of learning how a refrigerator worked, students would be instilled with "the power of scientific research and logic" through experimenting with the physics of pendulums.[376] Indeed, the first annual report of the Physical Science Study Committee (PSSC) noted one of their main goals was to exclude "household physics" from textbooks.[377] Additionally, a series of films were created, with actual university professors, demonstrating important scientific principles, such as the transmission of light particles.[378] No longer learning about science that was directly applicable to their lives, students would be taught the pre-collegiate skills necessary to prepare them for university coursework. Zacharias believed that his materials would help present a more realistic, appealing picture of scientific life that would encourage students to become scientists.

The appearance of Sputnik in 1957 created an ideal situation for these educators. Suddenly, panicked congressmen publicly worried about the intelligence of American students compared to their Soviet counterparts. These rising concerns helped pass legislation to fund reforms in science education curricula in American high schools.[379] Gerald Grant, a journalist for *The Washington Post,* observed, "One of Sputnik's most important by-products may have been that it drew back the sheepskin curtain separating

[375] Rudolph*, Scientists in the Classroom,* 130.
[376] Ibid., 135.
[377] Ibid., 116.
[378] Ibid., 129.
[379] John Rudolph*, Scientists in the Classroom,* 109.

university scholars and teachers in the 'lower' schools."[380] The *Boston Globe* reported, "Physics for high schoolers is getting to be fun—and fascinating—in a new method for teaching it."[381] Elbert Little, the executive director of the PSSC, surmised, " In an age when many teenagers can take apart and put together a hot-rod car, high school science must offer more interesting experiments than the usual weights, measures and pulleys."[382] Little, Zacharias, and Waterman firmly believed that their inquiry-based approach to science education would create more scientists than the "everyday science" approach of an earlier generation.

Don Herbert quickly adapted to science educators' new pedagogy. Although Don Herbert's *Watch Mr. Wizard* was rooted in "everyday science," its experimentally based approach still resonated with the new teachings of the PSSC. In fact, as Herbert later observed, *Watch Mr. Wizard* almost seemed ahead of its time.[383] So, while high school science textbooks drastically changed, *Watch Mr. Wizard* continued to remain beloved by educators, parents, and children. Over the years, Herbert carefully cultivated a network of friends at research universities, a group that shared his own proclivity for education and public outreach. "Many scientists realize that they have a responsibility to communicate to laymen," he told science teachers in 1967, "and science reporting is done by skilled, experience people."[384] Herbert even encouraged young scientists to consider their own talents for storytelling. Charles Walcott, a young professor at Harvard, dropped by

[380] Gerald Grant, "…Of Sputnik," *The Washington Post,* October 1, 1967: F3.
[381] "High Schools Discover that Physics is Fun and Fascinating," *Boston Globe*, May 4, 1958: B34.
[382] Ibid.
[383] Don Herbert, "Essential Inner Nature of Science, 1969," Box 2, Folder 14, Mr. Wizard Papers.
[384] Ibid.

Herbert's studio in the early 1960s to ask Herbert for advice about getting into television. Herbert gave him some encouraging words but Walcott's visit also helped Herbert. Walcott studied the auditory experiences of spiders and, as he explained his experiments to Herbert, the older Mr. Wizard was fascinated. "[All his research] came about," Herbert later wrote, 'because of a scientists' desire for knowledge for the sake of knowledge with no practical end in view…Seeing knowledge for the sake of knowledge is one of the reasons science has contributed so much to our lives."[385] Gradually, Herbert was becoming less focused on performing scientific demonstrations for children on television. Instead, Herbert became more and more interested in learning how scientists actually conducted their research.

By 1964 Herbert still enjoyed his work as a children's educator, but he was frustrated by broadcasters' lack of interest in educational programing for adults. Why do [adults] become so indifferent to one of the most profound influences in their lives?" he wondered.[386] Herbert wondered if he could develop a successful show for adults. Perhaps influenced by the PSSC, he wanted to feature the work of actual scientists in their laboratories. By revealing their struggles, Herbert believed that he could teach his viewers about the importance of the scientific process.[387] Herbert suggested to his collaborators within the studio that a scientist's quest for knowledge could be just as dramatic as a sailor's quest for treasure. As Herbert would later comment, " If science is

[385] Don Herbert, "Essential Inner Nature of Science, 1969," Box 2, Folder 14, Mr. Wizard Papers.
[386] "Workshop on Television Techniques Council for Advancement of Science Writing", 1967, Box 2, Folder 10. Mr. Wizard Papers.
[387] Herbert, 166.

so important in our daily lives, why not find an intriguing scientific problem, present the scientist as the real (and believable) protagonist and get the viewer involved in the suspense of the scientist's actual experiments?"[388] Herbert assumed that such a program would mimic the dramatic suspense of popular crime dramas. Herbert's new idea was an innovative twist on the NSF's new interest in inquiry-based science education.

With idea in hand, Herbert approached General Electric, IBM, General Foods, CBS, and NBC. This time, no corporate executives were interested.[389] But, since moving to New York, Herbert had developed alliance with many allies in the scientific community, at Rockefeller University and New York University. With the help of the Mr. Wizard staff, Herbert filmed a pilot film, about scientists researching white blood cells. Herbert shopped the film around to find a sponsor for a regular series.

Dr. Warren Weaver, the head of the Alfred P. Sloan Foundation, thought that he could convince the National Science Foundation to support the program. Warren helped Herbert organize an advisory committee that included Dr. Marc Kac, a professor of mathematics at Rockefeller, Dr. Robert Morrison, a biologist at Cornell, and Dr. Loren Eisely, the head of the anthropology department at the University of Pennsylvania. The committee suggested films about astronomy, chemistry, geo-science, mathematics,

[388] Don Herbert, "Television versus science," 1967, Box 2, Folder 10. Mr. Wizard Papers.
[389] Herbert, *My Life as Mr. Wizard,* 166-167.

physics, botany, biology, medicine, anthropology, and archeology.[390] Working with this committee, Herbert wrote a grant for the new series and submitted it to the NSF.[391] It was a fortuitous move for Herbert.

In April of 1965, the vice president of NBC News called Herbert. *Watch Mr. Wizard* would not be renewed for another season.[392] The days of live personalities, like Mr. Wizard, on children's television were numbered. Animated cartoons, with techniques pioneered by Hanna-Barbera Studios, had become increasingly cheap to produce. Television studios bought canisters of animated film by the pound.[393] Luckily, the very same week, Herbert and his scientific collaborators were awarded a $250,000 grant from the NSF and the Sloan Foundation to produce eight science films.[394] Suitably, the new series was titled *Experiment*.

Herbert envisioned the scientists as the protagonists of *Experiments,* filmed on a journey of scientific discovery. In the formal proposal for the series, he clarified:

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[390] Ibid., 20-23.
[391] "Experiment Proposal, circa 1964," 3. Box 28, Folder 1. Mr. Wizard Papers.
[392] "Discovery 65,"NBC's new series was created by Robert and Jeanne Bendick. Ironically, Bendick was contemporary of Hebert. She was well known as an illustrator of children's science books and had worked with Lynne Poole and Gray Johnson on *Today's Science and You*. Paul Gardner," Discovery 65 to Take Children on a TV Tour of the World," July 19, 1965. *New York Times.*
[393] By pure coincidence, one of NBC's newest cartoons, *Tooter Turtle,* featured a cartoon lizard also named Mr. Wizard. Schneider, 61.
[394] Gardener, "Discovery 65…" ; Herbert*, My Life as Mr. Wizard*,181.

> The basic objective of each program will be to give the viewer enough information about the scientist and his work to enable him to understand and identify with the scientist and his search.[395]

Unlike *Watch Mr. Wizard*, Herbert only had a minor on screen role in each film; the scientists were the narrative focus of each episode. Casting the scientist as the film's central protagonist, Herbert thought, would enable the viewer to identify with the scientist's struggles in the laboratory. "Consequently, as the scientist probes the unknown," Herbert explained, "the audience will become involved in the quest."[396] Herbert surmised that recreating the excitement of laboratory work would emotionally hook the average viewer. He noted that scientific jargon terms would be avoided, but he was wary of oversimplifying scientific terms for his viewers as well.[397] *Experiment* was aimed at the "mature, intelligent layman."[398]

It would take a village to create each episode of *Experiment*. As in *Mr. Wizard*, Herbert hosted each program. But, this time, Herbert let the scientists take center stage. In the program's NSF grant, Herbert described how the featured scientist would closely work with the episode's writer: "Throughout the individual scientist will have complete control over his own story from initial research to the final filmed result."[399] Letting the scientist maintain control over the script and the production would allow the films to be scientifically accurate. Additionally, Herbert thought that this technique would put his

[395] "Experiment Proposal, circa 1964," 3. Box 28, Folder 1. Mr. Wizard Papers.
[396] Ibid., 3.
[397] Ibid., 3.
[398] Ibid., 8.
[399] Ibid., 7.

scientific stars at ease. Herbert was eager to collaborate with scientists at universities around the United States. By 1964, he had tentatively planned one hundred episodes to be filmed at Harvard, Boston College, IBM, General Electric, Princeton, and Yale. He imagined working with astronomers, botanists, zoologists, doctors, and physicists.[400]

While filming the first series, Herbert and his collaborators visited laboratories at Cal Tech, Stanford, and Rockefeller University. The episodes for the series were dramatically titled, such as "Attack Patterns of Sharks" and "Laser – Light of the Future."[401] The final episode – an exciting look into the life of a geologist - whisked Herbert and his crew away to the island of Kīlauea, where the crew filmed a dramatic volcanic eruption.[402] *TIME Magazine* heralded the "Return of the Wizard": "It turns out now that the kids' loss is the grownups' gain. The opening *Experiment* and the seven others to follow are modest masterpieces that even the least scientifically minded viewer can find clear and compelling."[403] Harry Harrison, of the *Philadelphia Inquirer*, praised the program. "This was no drowning lecture," he lauded, "but exciting adventure-cum-enlightenment impressively filmed in color in the Atlantic."[404] Beginning on Sept. 18, 1966, *Experiment* was broadcast in 99 cities affiliated with the National Education Television network (NET), the forerunner to Public Broadcasting System.[405]

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[400] Ibid., 22.
[401] "Experiment." 1964. Box 27, Folder 7. Mr. Wizard Papers.
[402] Ibid.
[403] "Return of the Wizard," October 7, 1966, TIME. 1964. Box 27, Folder 7. Mr. Wizard Papers.
[404] October 14, 1966
[405] "Experiment." 1964. Box 27, Folder 7. Mr. Wizard Papers.

However, while assembling the *Experiment* team, Herbert made a serious miscalculation. National Education Television was headquartered in New York City, with its own science producer. As Herbert ruefully remembered, "The entire *Experiment* project was developed and underwritten without his involvement-- an obvious political mistake."[406] Despite supportive reviews, the NET flagship refused to sponsor the program or distribute it. Without their participation, the Sloan Foundation and the National Science Foundation also withdrew their support. Mr. Wizard's *Experiment* had come to an end.[407]

Conclusion

With his television program, Don Herbert had helped to create a new genre of science television for children: edutainment. *Watch Mr. Wizard* satisfied parental demands for an educational, non-violent show for children. Furthermore, Herbert's educational approach, focused on his child-actor guests, harmonized with a postwar philosophy of childcare. During the early 1950s, *Watch Mr. Wizard* offered a welcoming and safe vision of 'everyday science' to young viewers and their parents. Much like Mr. Rogers, another celebrated television host, Mr. Wizard offered an ear to curious children and provided the encouragement that they needed to become scientists themselves. He

[406] Herbert, *My Life as Mr. Wizard*, 196.
[407] Coincidentally, in cities like Boston, Seattle, and Philadelphia, *Experiment* was broadcast at the same time as NBC's new series *Star Trek* (Thursday, 8:00 – 9:00 PM). How this affected the viewership of *Experiment* is unknown, but likely had some impact. "News Clippings 1964-1967", "Experiment." 1964. Box 28, Folder 2. Mr. Wizard Papers.

also reached out and forged alliances with another group of scientific storytellers, scientists themselves.

By the end of *Watch Mr. Wizard*, television literally looked different. The 1967-1968 prime-time television season was the first to be broadcast entirely in color.[408] Additionally, television studios had shifted away from 'live' broadcast to pre-recorded episodes. This allowed directors to reliably visit locations outside of the studio. Television programs became more edited and sophisticated, looking more and more like Hollywood features. These tools lent themselves well to a new trend: wildlife documentaries.

Spurred on by the popularity of news documentaries and rising concerns about the environment, a smattering of nature programs appeared in the 1950s and 1960s, inviting American viewers to virtually wander the wilderness. Telegenic lions, dolphins, and bears won the hearts of audiences with their amusing antics and heartwarming adventures (e.g. *Born Free,* NBC, 1966; *Flipper*, NBC, 1964-1967; *Gentle Ben,* CBS, 1967-1969).[409] Marlin Perkins, Mr. Wizard's old friend from Chicago, started a new show on NBC in 1963, *Mutual of Omaha's Wild Kingdom*.[410] Each week, Perkins (and his viewers) would visit animals living within their habitats in North America, Africa, Australia, and Asia.[411] Don Meier, former producer for *Watch Mr. Wizard*, promised NBC executives that the

[408] "Full color on networks seem certain in 1967," *Broadcasting,* January 2, 1967, 83. from http://www.americanradiohistory.com/Archive-BC/BC-1967/1967-01-02-BC.pdf
[409] Cynthia Chris, *Watching Wildlife*, (Duluth: Univ. of Minnesota Press, 2002), 68.
[410] Mitman*, Reel Nature*, 150.
[411] Chris, *Watching Wildlife*, 60

outdoor-action feel of *Wild Kingdom* would give an "even greater impact of reality and thrill of immediacy for the audience."[412]

Non-American broadcasters also presented their vision of the natural world to audiences. French oceanographer Jacque Cousteau's documentaries were first seen on *Omnibus*, a highbrow anthology series sponsored by the Ford Foundation, in 1956.[413] In 1968, Cousteau launched his own series, *The Undersea World of Jacque Cousteau*.[414] Cousteau's films introduced Americans to the wonders of the ocean. Although the scientific purpose of Cousteau's journeys were never explicitly clear, Americans were entertained by the capers of Cousteau's crew and wowed by the beauty of the ocean voyages. In 1965, the *National Geographic Society* launched a ten-year series of specials for CBS (1965-1973) and ABC (1973-75). Borrowing upon *National Geographic's* reputation for rugged exploration, these specials showcased adventurous scientists, on location, around the world. Although she only appeared twice, English primatologist Jane Goodall's role on these films catapulted her to fame.[415]

No beakers. No explosions. No lab coats. The only scientists seen on television screens in the late 1960s wore khaki vests. Even fans of *Mr. Wizard* wondered about this shift. Peter K. wrote to Herbert in 1969:

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[412] Mitman, *Reel Nature,* 149.
[413] Chris, *Watching Wildlife*, 56
[414] Ibid.
[415] Chris, *Watching Wildlife,* 65.

> Why is it then that so few instructive shows in science are left on television? What ever happened to shows like *Meet Mr. Wizard* and the Bell Telephone Science series? [sic] Please, as one who knows the influential and interested people in the television industry, do something to bring back the interesting and instructive science series.[416]

The audience for programs about scientists, test tubes, and experiments had not disappeared. The children of the fifties became the twentysomethings of the 1960s. They still wanted to watch science on TV.[417]

Herbert himself didn't have a good answer for his fans.[418] Herbert still wondered how educators and entertainers could entrance the most skeptical audience: adults. A speech from 1969 illustrates Herbert's concern: that American adults professed a disinterest in science. "When these students are graduated into the adult world," Herbert ruminated, "they will join the great majority of the public who more or less shrugs their shoulders at science."[419] But the idea behind Herbert's *Experiment,* a documentary-series

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[416] Peter M. Koch, April 28, 1969. Box 33, Folder 1, Mr. Wizard Papers.
[417] His former fans fondly remembered Herbert. Some even wrote him to explain how "Mr. Wizard" inspired them to make their own discoveries in undergraduate classrooms. As adults, these viewers recognized his impact upon their own educational development and continued to look at him for guidance. Decades later, Steven Spielberg even asked Herbert to cameo in *E.T.* Henry Feinberg, Interview with author, December 18, 2015.
[418] Herbert would continue to appear on television, in commercials, television programs, and small shorts until 1990. Together with the NSF, he produced short programs called "How about …" In 1983, Hebert revived his popular show on Nickelodeon, "Mr. Wizard's World." The "Mr. Wizard" persona is still spoofed by programs like *Saturday Night Live* (Jan. 29, 2011) and *The Big Bang Theory* ("The Proton Resurgence," "The Proton Displacement," "The Proton Transmogrification," and "The Opening Night Excitation") demonstrating Herbert's continuing appeal to younger generations. Mr. Wizard Finding Aid at the Lemelson Center, National Museum of American History.
[419] "Untitled," Workshop on Television Techniques Council for Advancement of Science Writing), 1967, Box 2, Folder 10. Mr. Wizard Papers.

that followed the activity of the scientist, would be reborn a decade later in WGBH's science series, *NOVA*.

ILLUSTRATIONS

All images removed due to copyright concern

Fig. 1. Don Herbert with his "New York City" friends, Alan and Rita. Courtesy of Thomas and Kristen Nikosey, Mr. Wizard Studios.

Fig 2. Members of the first Mr. Wizard fan club, the "Pioneer Club," in Jacksonville Florida. Circa 1952. Box 8, Folder 5, Mr. Wizard Papers, Archives Center, National Museum of American History

Fig. 3 The Mr. Wizard Charter. Box 8, Folder 5, Mr. Wizard Papers, Archives Center, National Museum of American History.

Fig. 4. "Teacher's Film Guide: Watch Mr. Wizard" (1953), Box 6, Folder 1, "Newspaper clippings, 1953," Mr. Wizard Papers, Archives Center, National Museum of American History.

Fig. 5. Don Herbert and Dr. Morris Shamos pose with an atomic model. Mr. Wizard Papers, Archives Center, National Museum of American History

CHAPTER THREE

The Young Rebels: NOVA, 1971-1976

Elsa Rassbach needed a job. The young German American filmmaker had returned to the States from Berlin. She was determined to find work that combined her interests in history and politics. About two months into her search, Elsa received a call asking if she'd like to interview for a job on a new science series in Boston:

> I was a bit bewildered. "Science? But I'm really no expert in science," I said, "That doesn't matter so much," said the person at the other end of the line, "because this is really all about story-telling."[420]

Rassbach accepted the job as an associate producer for a project to be filmed at WGBH, public broadcasting television station in Boston. Her boss, Michael Ambrosino, was a charming, energetic executive at the station. He was collecting an array of young creative professionals, like Elsa, for a show tentatively dubbed, "The Science Program." Two years later, on March 1, 1974, WGBH's science series *NOVA* appeared on American television screens.[421] The television series has since won many accolades, including Emmys and Peabody Awards. It has introduced talented scientific celebrities like Brian

[420] "Elsa Rassbach," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.
[421] "Case Study: NOVA, WGBH," January 1978, Corporation for Public Broadcasting. from Michael Ambrosino's personal papers.

Greene and Neil deGrasse Tyson to millions of American households. For decades, *NOVA* was the bedrock of American scientific storytelling on television.

NOVA started, however, as an experimental program in 1971, envisioned by an assortment of talented non-scientists. The program addressed a series of concerns of the 1950s and 1960s about the distance between scientists and non-scientists. Science communicators worried that American broadcasters were not creating relevant programs for their viewers. The creators of *NOVA* proved that there was a market for television series that emphasized scientific issues, not just scientists.

This chapter seeks to trace the origins of *NOVA* as a successful, lasting television series; I focus on Michael Ambrosino's years as *NOVA*'s executive producer (1971-1976). By exploring sources as varied as interviews with founding members, personal letters, press clippings, internal reports, and episodes of *NOVA* themselves, my analysis swirls around notions of science, society, and storytelling. This third chapter tells the story of how the United States' scientific storytelling was 'jumpstarted' by an outside group of broadcasters, scientists, and journalists. Compared to earlier storytellers Lynn Poole and Don Herbert, these scientific storytellers were rebels: they dared to talk about the relationships between politics, science, and society on television.

In earlier decades, I've argued that the prime objective of a science series was to engage a certain viewer demographic; *The Johns Hopkins Science Review (JHSR)*

entertained adults, while *Watch Mr. Wizard* enticed young children. *NOVA* differed from these predecessors in several important ways. *NOVA* lacked a telegenic host and it had no idealized audience. Unlike *JHSR* and *Mr. Wizard*, *NOVA* was never tethered to the plaster walls of an artificial television studio. The directors of *NOVA* roamed across the United States looking for stories about science. *NOVA* consciously positioned itself as a show about science outside of the laboratory; science in a rapidly changing, political world. Michael Ambrosino's *NOVA* reinforced the objectivity of science, even while individual episodes highlighted the political nature of scientists.

The first section of this paper gives a brief background on the state of science communication in the 1950s and 1960s. The second section introduces Ambrosino and the formation of the *NOVA* production team. The final section examines the hallmark style of the program. As noted earlier, *NOVA* offers viewers a cornucopia of scientific films; a historian can't simply pluck a definitive, representative episode. Yet, in this final section, I review the history of two episodes: "The Plutonium Connection" (1975) and "The Race for the Double Helix" (1976). The correspondence from these two productions provides a window into television production. How do science communicators approach a controversial story? Who do they seek out as allies? Admittedly, these two films are outliers; they each feature a 'celebrity' narrator. But each case study gives readers a glimpse into the process of scientific storytelling. Using these films, I talk about the series' subsequent reception among American viewers.

Trends in science communication

In the 1960s, science communicators were pleased about the development of their profession, yet uncertain about its future. Their contributions to the field had been validated by respected organizations like the President's Science Advisory Committee. In 1963, Congressman Emilo Daddario of Connecticut remarked, " The public and the Congress must make a serious and determined effort to inform themselves of the possibilities – and the risks – of science."[422] Between 1958 and 1965, the amount of space given to 'science news' in American newspapers doubled.[423] Additionally, an informal study conducted by the Council for the Advancement of Science Writing found that eleven new science sections had been started in American newspapers since the 1950s.[424] Record numbers of science reporters, around two hundred, turned out for a session of the American Medical Association.[425]

Hillier Kreighbaum, an eminent professor of journalism at New York University, wrote optimistically about the growth of science communication. He criticized his colleagues, however, for their dry delivery of scientific news. "What science news 'consumers' want from the mass media," Kreighbaum argued, " is a bit of the essence of the experiment, not its detailed nuts and bolts."[426] But Kreighbaum thought that some journalists wavered too much between describing their scientific subjects as either a 'jolly

[422] Hillier Kreighbaum, *Science and the Mass Media,* (New York: New York University Press, 1967), 6.
[423] Ibid., 73.
[424] Ibid., 26.
[425] Ibid., 97.
[426] Ibid., 39.

good fellows' or 'Dr. Frankensteins.'[427] He believed that the average reader had become more savvy and, as a result, sought out more nuanced stories.

Looking at demographics, Kreighbaum reasoned that baby boomers, the high-schoolers of the 1960s, could be the ideal audience for a new brand of science journalism. This generation had been raised in the era of 'the new math' and revised science studies curriculums. Attending college in record numbers, baby-boomers were much more scientifically literate than their parents. Additionally, Kreighbaum characterized these young adults as highly critical of over-simplified, sensationalized news. "Unless corrected," he warned, "a contempt for the popular media [sic] could launch catastrophic changes in how people get their news, not only about science but about all types of events."[428] Kreighbaum believed these younger viewers wanted more news about the ways that science impacted their everyday lives. He thus called upon television producers to create more relevant scientific content.

During the 1960s, science programming in the United States underwent transition in content and style. After its cancellation in 1965, *Watch Mr. Wizard* was not replaced by a national children's show about science. Instead, viewers expressed interest in seeing science in the wild, and avidly consumed nature-based programing like *The Undersea World of Jacques Cousteau* (1968-1975) and *Mutual of Omaha's Wild Kingdom* (1963-

[427] Ibid., 24.
[428] Ibid., 229

1988).[429] The older form of science broadcasting, where a familiar host greeted viewers in a gussied-up television studio, had become outdated. Documentaries proved to be the popular way to converse with national audiences about science. Even the Smithsonian collaborated with producers at CBS to make a trio of documentaries showcasing their collections. Famed-television writer Rod Serling narrated the first special, titled, "Monsters! Mysteries or Myth?" which featured 'exclusive footage' of Bigfoot.[430] Aired in the mid-1970s, these documentaries were popularly received, but derided by television critics and Smithsonian curators as superficial and non-educational. Starting in 1965, National Geographic began producing one-hour specials, showcasing a scientist-explorer's exploits in foreign lands.[431] Unlike the Smithsonian specials, the National Geographic episodes blended stunning cinematography with serious scientific scripts. Their specials were much more successful and critically lauded than the Smithsonian specials. The National Geographic specials were later to be critiqued for their promotion of patriarchal narratives, but television producers at the time considered the specials as the epitome of 1960s nature documentaries.[432] Still, nature programs like *Wild Kingdom* had all the political bite of oatmeal.

[429] Marcel LaFollette, *Science on American Television*, (Univ. of Chicago: 2013), 47, 90.
[430] Ibid., 144.
[431] Ibid.
[432] Donna Harroway, *Primate Visions: Gender, Race, and Nature in the Modern World*, (Routledge, 1990), 426-434.

Additionally, the national news networks occasionally featured half-hour specials on NASA missions.[433] CBS's first special on the Space Race, "Sputnik One…The Soviet space satellite," was aired on October 6, 1957, two days after the Soviets launched their satellite.[434] Space coverage was intermittent for the next few years, usually in three or eight minute bulletins during nightly news broadcasts. In one unusual instance in 1969, CBS, NBC, and ABC covered the Apollo 11 mission for almost 30 hours straight.[435] However, network executives were repulsed at the notion of allocating regular coverage of NASA and planetary research; it was just too expensive.[436] Defending how little air-time was given to planetary science, Richard Salant, president of CBS News, claimed in 1966 that, "Space, in short, now requires selectivity in the telling."[437] William Sheehan, a former ABC News president and NASA's former associate director for communications, put it a different way. He later explained, "People on the business side and the entertainment side [of television] looked upon television as a money-making machine, rather than an educational machine or news machine."[438]

Even when Don Herbert and Lynn Poole had been on television, science programs lacked any careful nuance. One rare exception in the 1950s came from *See It Now,* known for its hard-hitting political reporting. Led by television journalists Edward R. Murrow and Fred Friendly, the program famously called-out Senator Joseph

[433] Alfred Robert Hogan, "Televising the Space Age: A Descriptive Chronology of CBS News Special Coverage of Space Exploration from 1957 to 2003," (M.A. diss., University of Maryland College Park, 2005).
[434] Ibid., 76.
[435] Ibid., 56.
[436] Ibid., 49.
[437] Ibid., 102.
[438] Ibid., 56.

McCarthy for his anti-Communist vendetta against American citizens.[439] Although *See It Now* was focused on reporting current affairs, Murrow and Friendly chose to dedicate fifteen episodes, over the show's seven year run, to scientific and medical issues.

Two of these episodes focused on physics (November 24, 1957 and March 30, 1958); one episode highlighted the promises of nuclear energy, while the other explored the perils of radioactivity.[440] To gauge interest in the project, Friendly reached out to scientists across the physics community.[441] *See It Now's* head writer Arthur Morse spent two months on the road, traveling to Pittsburgh, Oakridge, Detroit, Chicago, San Francisco, and Salt Lake City to visit laboratories and universities.[442] After Morse compiled a list of potential subjects, he wrote to Friendly to report on their 'television' potential and on what their appearance would symbolize to viewers. For instance, Morse thought that Ernest Lawrence, founder of the Berkeley Laboratory and winner of the 1939 Nobel Prize, would be the ideal subject to represent basic research. But he noted that Lawrence was "shy of cameras, has never been on TV, and will require some personal intervention by a friend." On the other hand, Morse considered that Louis

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[439] Thomas Doherty, *Cold War, Cool Medium. Television, McCarthyism, and American Culture.* (New York: Columbia University Press, 2003), 14.

[440] "Atomic Timetable: Part One," Edward Murrow and Fred Friendly. 24. November. 1957. See It Now, New York, CBS. ; "Atomic Timetable: Fallout" Edward Murrow and Fred Friendly. 30. Mar. 1958. See It Now, New York, CBS.

[441] Friendly had won a name for himself in the journalism community after he wrote, produced, and directed a radio series titled "The Quick and The Dead" for NBC in 1950.. "The Quick and the Dead" was a quasi-documentary series that traced the recent history of nuclear weapons and power. Friendly, who had personally witnessed the aftermath of Nagasaki and Hiroshima, crafted a powerful narrative about the destructive potential of physics. He consulted William Laurence, one of *The New York Times*' science reporters and a confidant of physicists, as he wrote the script. The program received overwhelming praise from the popular press. Ralph Engleman, *Friendlyvision: Fred Friendly and the Rise and Fall of Television Journalism*, (Columbia University Press, 2009), 64-71.

[442] Arthur Morse, to Fred Friendly, 25. Nov. 1957, folder 370, box 109, Edward R. Murrow papers, 1927-65, Digital Collections and Archives, Tufts University.

Alvarez, "the handsome assistant director of Berkeley" to be the perfect interview subject. In the second ninety-minute episode, focused on radioactive fallout, pro-nuclear scientists, like Edward Teller and Willard Libby were given equal airtime alongside their outspoken opponents, Linus Pauling and Herman Muller, advocates of nuclear non-proliferation. *See It Now* showed Americans the bright laboratories of the Shippingport Atomic Harbor Station and the dry, desolate testing grounds of Tenopah, Nevada. They questioned American scientists, who were excited by the possibilities of atomic energy, as well as 'Average Joes,' who were afraid of its implications.

The interviews and reporting equally balanced both perspectives of the nuclear proliferation debate. Murrow and Friendly expected heavy criticism for their second episode; instead, they received praise from both camps.[443] The episode was well received by nuclear disarmament groups in both the United States and the United Kingdom.[444] The former head of the Atomic Energy Commission, Admiral Lewis Strauss told Murrow, "You and Mr. Friendly handled this radioactively-hot issue with fairness and thoroughness and a very great contribution to public understanding must be the result."[445] *Newsday* called the episode "another excellent example of television journalism at its best," while *The Sun* praised Murrow and Friendly for "drawing to attention things of life and death importance."[446]

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[443] Fred Friendly, *Due to Circumstance Beyond Our Control*, (Random House, 1967), 88.
[444] Tom Driberg, "Testing Time," *The New Statesmen*, 24. May 1958.
[445] Admiral Lewis Strauss, to Edward Murrow, 3. April 1958, Folder 371, Box 109, Edward R. Murrow papers, 1927-65, Digital Collections and Archives, Tufts University.
[446] Barbara Delatiner, "On Television: The Terrifying Story of Atomic Fallout," *Newsday*, 31. Mar. 1958, pg 1C ; Donald Kirkley, " Atom Tests and Their Effects," *The Sun*, 30. Mar. 1958, SF11.

After *See It Now* was cancelled in 1958, Friendly continued working at CBS on a monthly documentary series, *CBS Reports*.[447] In 1963, *CBS Reports* produced a documentary about Rachel Carson that introduced her and her book *Silent Spring*, a book about the ecological dangers posed by pesticide DDT, to millions of Americans. Historian Zuoye Wang has credited the subsequent outcry of Americans with the regulation of agricultural pesticides. [448] *See It Now* carefully spotlighted respected scientific speakers from different sides of the political spectrums. This technique demonstrated the tensions that existed within the scientific community over a seemingly apolitical subject. Additionally, this approach normalized the healthiness of debate about the political nature of particular scientific issues.

E. G. "Ted" Sherburne, another prominent science communicator of the 1960s, also advocated for more cutting-edge science on television. In the mid 1950s, Sherburne worked for an early hub of television innovation in Boston, WGBH-TV.[449] Sherburne served as the station's program manager until 1957. Later, after moving to Washington, he was chosen to lead the Public Understanding of Science (PUS) Division of the American Association for the Advancement of Science (AAAS).[450] As the Director of PUS, Sherburne became an active promoter for science communication.

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[447] Engleman, *Friendlyvision*, 227.
[448] Zuoyue *Wang. In Sputnik's Shadow*: The President's Science Advisory Committee and Cold War America. (New Brunswick: Rutgers University Press, 2008), 209.
[449] "Ted Sherburne – In Memory," last modified November 23, 2010, http://wgbhalumni.org/profiles/s/sherburne-ted/
[450] Ibid.

In 1963, Sherburne published an article in *Journalism Quarterly*.[451] He claimed there was more science on television than a precursory glimpse at *TV Guide* might have implied. In fact, Sherburne suggested, if communicators included the instances of science that were discussed on daytime and primetime programs, they would be pleasantly surprised. Sherburne pointed out:

> The viewer does not learn science because the program is listed as science or because the presentation is designed to be informative. For it matters not if the viewer learns science and attitudes toward it from "Dr. Kildare" and… "Science Fiction Theater," just as much as he does from a strictly educational attempt.[452]

Sherburne urged his readers to accept that their viewers wanted to be entertained by television, not educated by it. (In fact, Sherburne wondered, why not create a dramatic soap opera about Chicago's famed Rad Lab, á la Dr. Kildare?) But science communicators needed to broaden their definition of 'science.' Sherburne challenged his colleagues to present science in such a way that it connected to everyday human activity. "Science is not a subject," Sherburne concluded, "but the warp and woof and fabric of our 20th century life."[453]

Sherburne's former workplace, WGBH, was a hotspot for creative television shows about science. Among the talented people who worked at WGBH was Mary Lela

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[451] E.G. Sherburne, "Science on Television: A Challenge to Creativity," *Journalism Quarterly*, 40 (Summer 1963): 300.
[452] Ibid,. 301.
[453] Ibid,.

Grimes.[454] Grimes hosted and produced *Discovery*, a weekly program about wildlife. As a graduate student at Boston University, Grimes had studied the depiction of natural resources across 37 national newspapers. Her work was supported by a prestigious Ding Darling fellowship.[455] Grimes successfully convinced the Children's Museum of Boston and the Massachusetts Audubon Society to support an environmental television series for children. On *Discovery* (1956-1959), Grimes taught her viewers a range of skills, such as how to build campfires and to identify birds and bugs. Grimes encouraged her young viewers to participate in the program; some episodes were structured with a quiz show format and child contestants. For one episode, Grimes invited local Boston students to phone her on air and ask her nature questions.[456]

The television program was distributed across the United States on kinescopes. Mary Lela Grimes became the first woman to host a nationally viewed science series. *Discovery* proved especially popular with elementary school teachers. Grimes helped teachers in Seattle, Sacramento, and Ann Arbor craft teaching guides that could be used in collaboration with the films.[457] Although teachers favorably reviewed the films, their young students proved a bit more skeptical. A 1958 study from schools in the King County District in Seattle, Washington reported:

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[454] Mary Lela Grimes later married Ted Sherburne. "Ted Sherburne – In Memory," last accessed November 23, 2010, http://wgbhalumni.org/profiles/s/sherburne-ted/

[455] Lynette Wilson Graham, "BU Graduate stars Wildlife on "Discovery" Program," *Daily Boston Globe*, August 7, 1955, C55.

[456] "Any Question on Your Mind? Call Ch. 2 Next Friday," *Daily Boston Globe*, December 30, 1956. B23

[457] "A Teacher's Guide to Discovery," "A Teacher's Guide to Public School Television Programs (1959)," "A Study of the Discovery Series (Seattle 1958)," Mary Lela Grimes Collection, WGBH Media and Library Collection. (hereafter the WGBH Archives).

> The epitome of artificiality was reached when the TV teacher donned wet-weather fisherman's gear, entered a rowboat and asked the children to imagine that salt water existed on one side of the boat and fresh water on the other side. When she began catching paper fish, the situation was so contrived that the fifth grade pupils burst into laughter.[458]

The teachers of these middle school students, however, were satisfied with the films.[459] Seattle teachers wrote that they hoped films about the environment, like *Discovery,* could replace expensive field trips. For these educators, television series served as important teaching tools.

Another local science program filmed by WGBH was the *MIT Science Reporter*. The *MIT Science Reporter* was born from a collaboration between the studio and the prestigious university.[460] Russell Morash, a local producer and director, was in charge of the series; his on-screen host was recent MIT undergraduate, John Finch. The show began in the early 1960s and ran until 1966. During that time, Finch interviewed esteemed scientists like former presidential science adviser Vannevar Bush, psychologist Jerome Brunner, and physicist Stanislaw Ulam. On the surface, the *MIT Science Reporter* appeared similar to *The Johns Hopkins Science Review*. But *MIT Science Reporter* had a much lower budget. Because film was so expensive, they only had the budget to shoot a

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[458] "A Study of the Discovery Series (Seattle 1958)," 12, from the Mary Lela Grimes Collection, WGBH Archives.
[459] Ibid., 63.
[460] Karen Klinger, "MIT 'Science Reporter' Looks Back on Pioneering TV Role, Cambridge Community Television," June 16, 2011, accessed on February 20, 2018 from https://www.cctvcambridge.org/MITScienceReporter.

single take of an interview. Eventually, they were able to secure a small grant from NASA that allowed them to travel. Still, despite interesting episodes about the cuisine for astronauts and the inventive structures of Buckminister Fuller, the series folded after Morash moved onto another series, *The French Chef* (featuring Julia Child).

The Michael Ambrosino Show

The creative atmosphere of WGBH produced another innovator: Michael Ambrosino. As the first executive producer of *NOVA*, Ambrosino played a pivotal role in its early history. A corporation for Public Broadcasting assessment commented, "*NOVA* and its creator, Michael Ambrosino, are inexorably intertwined."[461] Ambrosino doesn't fit the stereotype of a ruthless producer in a sharkskin suit. Rather, as one journalist has described him, "with his horn-rimmed glasses, crew neck sweater, and khaki pants, Ambrosino seems more like a benevolent and affable professor than one of the heavies of broadcasting."[462] Ambrosino's personal charisma and style of management produced the needed momentum to jump-start a new kind of science series on public television.

The son of an Italian green grocer, Ambrosino grew up in Long Island. As a high school student, he played drums in a dance band and enjoyed science and mathematics.[463] When he entered Syracuse University in 1948, Ambrosino wavered between two majors: physics and drama.[464] He chose to pursue a life in theater. Handsome, with a strong chin

[461] "Case Study: NOVA, WGBH," January 1978, 20, from Michael Ambrosino's personal papers.
[462] Neil Miller, "Class Acts: The Renaissance Producer of PBS," 72, no. 4 (April 1980), *Boston.*
[463] Michael Ambrosino, "A Well Seasoned Life," from Michael Ambrosino's personal papers.
[464] Ibid.

and thick black hair, Ambrosino landed a few roles and learned the actor's profession. In time, Ambrosino also figured out he was better at being a stage manager and organizing productions, earning his actor's equality card during three summers in stock companies.

Ambrosino was hired as the assistant to the general manager at WGBH in 1956.[465] Over the next two decades, Ambrosino would serve a number of roles at WGBH, including Associate Director of Programming, Manager of School Broadcasting, and Founding Director of the Eastern Educational Network. From the beginning, Ambrosino was involved in creating shows with a scientific bent. One of his first tasks was to direct a show about Antarctic exploration, hosted by Jesuit Father Daniel Lineham.[466] In 1958, Ambrosino launched *The 21 Inch Classroom*, a tele-classroom for the greater Boston area. The first episodes of the series focused on a chemistry lesson. In the late 1960s, Ambrosino gained local notoriety as the host of his own program, *Michael Ambrosino's Show,* a weekly program showcasing Boston's social and cultural events.

By 1970, Ambrosino was looking for a change of pace and an opportunity to learn new television techniques. Forty years old, and with three small children, he took a risk and applied for an overseas fellowship awarded by the newly formed Corporation for Public Broadcasting (CPB).[467] After an interview, Ambrosino was invited to spend a year

[465] Ibid.
[466] Ibid.
[467] Ibid.

abroad in London at the British Broadcasting Corporation (BBC).[468] He helped the staff of *24 Hours* craft their coverage of episode about the 1970 US Elections and produced episodes featuring Mick Jagger and Germaine Greer. Most importantly, Ambrosino used his flexibility as a CPB fellow to circulate and connect with fellow broadcasters. He enjoyed the work environment of the BBC, later commenting, "Precious time was always spent examining what they were doing and uplifting the staff members doing it.[469]" This belief, of the importance of rewarding dedicated young filmmakers, would be emphasized in Ambrosino's own production team.

One BBC television program particularly impressed Ambrosino: *Horizon,* a documentary-styled, regularly aired science program on BBC 2. Started in 1964, the *Horizon* team was a loosely knit group of BBC insiders, documentary filmmakers, and popular science journalists. Aubrey Singer, the head of the BBC's Science and Features department, shepherded the program.[470] He disliked the didactic tone of the BBC's other educational science programs and worried that, after a time, every program about science blurred together. [471] As Francis Gladstone, another producer at the BBC, characterized it, "If there had been any science on [other channels], it was usually Julian Huxley sitting at a table, being very pure science…The lives of scientists and the people that science affected were

[468] Ibid.
[469] Ibid.
[470] Singer's role at the station is unclear to me at this point of publication. While Boon credits him with starting *Horizon*, interviews from Ambrosino and Gladstone deemphasize his day-to-day influence on the series. Gladstone states, "Administratively you are right, to the extent that Bob Reed was under him. That said, *Horizon* was created by Bob Reed. You get more clarity if you keep to Bob Reed and leave Singer out of it. I never met him in the offices of Horizon." Francis Gladstone, email correspondence with author, March 21, 2018.
[471] Timothy Boon, " 'The televising of science is a process of television': establishing Horizon, 1962-1967," *The British Journal for the History of Science*, 48, (2014): 8.

completely out of it."[472] Instead, Singer suggested modeling a science series after *Monitor*, a popular arts series. He originally saw each episode in a 'magazine' format (several different stories tied together with a common theme). However, the structure of the show had evolved considerably by the time Ambrosino arrived. Each episode usually centered on one particular scientific theme (e.g., atomic physics, the environment) and involved various scientists in a documentary style. The first episode focused on the work of Buckminster Fuller and traced the appearance of Bucky balls in art galleries and laboratories.[473] Another followed an eminent ecologist as he tramped around the Berkshires.[474]

Although the themes of the *Horizo*n episodes were varied, they were linked by a similar approach. Singer and his many film editors envisioned the program as a *cultural* science program. They promoted a philosophical perspective that highlighted how science was embedded in everyday culture. One member explained, " The policy of *Horizon* will be to present science as a field of continuing human endeavor . . . and to place new developments in science in their total context – personal, social, historical, political."[475] Secondly, the *Horizon* team all professed that their program wasn't educational.[476] Rather, as a series leader explained, it was "the sort of conversation which springs up when a scientist and a non-scientific friend get talking over a beer, a

[472] Francis Gladstone, Interview with author, December 7, 2018.

[473] Ibid., 20.
[474] Ibid., 22.
[475] Ibid., 18.
[476] John Angier, Interview with author, July 29, 2016.

coffee."[477] By positioning *Horizon* as culturally relevant and entertaining, Singer and his staff created an appealing alternative to the BBC's drier educational programming for adults. Ambrosino was greatly influenced by *Horizon*'s narrative techniques. He recalls, *Horizon'*s producers "took serious subjects, made good stories about how things [were] made, and made them popular enough for the general audience."[478] During his BBC stint, Ambrosino met Singer and his *Horizon* crew, including Peter Goodchild and Robert Reid. Goodchild charitably invited Ambrosino to sit on a rough-cut screening.[479]

Robert Reid, a former chemist-turned filmmaker, developed *Horizon's* style as the series' editor.[480] Reid's role as editor was so influential that others credited him as the founder of the series. As Francis Gladstone, one of Reid's protégés later recalled, under Reid's direction: "[Reid] had the instinct to make science popular and to not make science, all with a capital S, and to look at the effects of science."[481] *Horizon* produced about ecology and medical ethics. Another BBC series called *Tomorrow's World* provided a sunny, cheerful vision of technological innovation. *Horizon* could be darker and more serious. Gladstone later recalled, "[*Horizon*] was completely different from [other BBC science programs] in that it was a humanist view of science. It took science to task…it wasn't anti-science, but it was radically different to anything that had gone before."[482]

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[477] Boon, " 'The televising of science…' ," 28.
[478] Michael Ambrosino, Electronic mail with the author, November 21, 2016.
[479] Michael Ambrosino, "A Well Seasoned Life," from Michael Ambrosino's personal papers.
[480] See Michael Ambrosino, revisions to a draft of this chapter. Author's collection. Also, Francis Gladstone, Interview with author, December 7, 2017.
[481] Francis Gladstone, Interview with author, December 7, 2018.
[482] Francis Gladstone, Interview with author, December 7, 2018.

Ambroinso was greatly impressed by *Horizon*'s vision. He also approved of its technique for management, dubbed "the strand method." It was an approach that allowed many different films to be presented each year. Some films would be made, some co-produced, some produced by freelance filmmakers and other international networks. The strand method lowered production costs, introduced fresh perspectives, and increased the quantity and the quality of *Horizon* programs. "The germ of *NOVA* did not begin then," Ambrosino remembers, "but I was certainly impressed by *Horizon*'s ability to make entertaining films on science, technology and medicine, subjects that had fascinated me for years."[483] Towards the end of his stay, Ambrosino started to mull over the logistics of creating an American version of *Horizon*.

In 1970, the BBC produced nine different, nationally broadcast series about science and technology; American broadcasters had none. Ambrosino wondered if the time was right for a series. He reached out to WGBH, and talked to them about the possibility of a series. David Ives, the President of WGBH, replied:

> Your science program group model is impressive. Also ambitious. Maybe even grandiose. But with the BBC experience to work with and build on, your plans seem feasible, if we can ever find the money for them.[484]

By May 1971, Ambrosino was preparing to return to Boston. He wrote Michael Rice, the station's Program Manager, about creating a science program. At just 29 years old, Rice was one of the youngest people to helm a public broadcasting station (See Fig. 1).

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[483] Ibid.
[484] David Ives to Michael Ambrosino, January 22, 1971, "NOVA-Misc, 1971-1988 (2 of 2)," WGBH Archives.

Ambrosino appealed to Rice's interest in creating new, dynamic entertainment. Ambrosino argued, "This project in science would begin to fill an appalling gap in PBS service. It would attempt to explain and relate science to a public that must be aware of its impact."[485] Owing to its proximity to Harvard and MIT, Ambrosino argued, WGBH was ideally situated to create a science series. Additionally, Ambrosino proposed that a science series could be co-produced with the BBC to increase quality and lower costs. At the time, WGBH already collaborated with BBC to produce the nationally popular *Masterpiece Theater,* a dramatic series. A science program could bolster WGBH's reputation as a creator of thoughtful, entertaining content.

Michael Rice agreed with Ambrosino's assessment and commissioned him to spend the next year developing the project. He had received a Rockefeller grant for "experimentation," and thought, "starting a science series was a useful experiment."[486] David Ives, Rice's boss, tempered this approval with words of caution. Ambrosino suggested that WGBH's science series should spotlight relevant, controversial topics in science, like homosexuality and birth control. Ives and Rice agreed about the importance of covering these issues, but they both expressed their concerns about how such shows could be produced. Ambrosino, for instance, had suggested an episode focused on the career of screenwriter and amateur scientist Robert Ardrey. This concerned Ives, who wrote to Ambrosino:

[485] Michael Ambrosino to Michael Rice, May 1, 1971, Michael Ambrosino's personal papers.
[486] "Michael Ambrosino," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.

> I guess I am especially worried about treating people like Ardrey as though they were scientists rather than (as I conceive them) people who are adept at developing theories out of data selected to fit. If the series is to deserve the name of Science, it must be pretty careful not to be taken in by pseudo-science.[487]

NOVA could approach cutting-edge topics, but it needed to tread carefully. Although the management of WGBH wanted to encourage Ambrosino's interests, they were somewhat skeptical. How could a serious show respectively (and objectively) cover provocative scientific issues?

While Ambrosino considered Ives' advice, he immersed himself in the world of science. He attended conferences, read books, and introduced himself to scientists. MIT Professor Philip Morrison, chosen by J. Robert Oppenheimer to work at Los Alamos on the atomic bomb, became a trusted confidant. Several months later, on September 20, 1971, Ambrosino turned in "Proposal to PBS for Research and Development Toward A Public Television Science Program Group from WGBH Boston" to Michael Rice.[488] In the opening pages, Ambrosino cites C.P. Snow's discussion of two cultures. "Political question are no longer simply a matter of politics," Ambrosino declared, "They are unavoidably bound with science and technology."[489] He called upon PBS' executives to heed Snow's questions and create a television series that brings those two cultures

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[487] David Ives to Michael Ambrosino, January 22, 1971, "NOVA-Misc, 1971-1988 (2 of 2)," WGBH Archives.
[488] Michael Ambrosino, "Proposal to PBS For Research and Development Toward a Public Television Science Program Group from WGBH Boston," September 20, 1971, "NOVA-Misc, 1971-1988 (2 of 2)," WGBH Archives.
[489] Ibid.

together. Ambrosino described the concept of "strand production" and offered a few examples of interesting *Horizon* episodes. Rice wasn't satisfied with this first draft and pushed Ambrosino to craft a more commanding mission. "I crave inspiration," Rice scribbled, "Not just the notion that we don't know how to control science, we're doomed: rather, science is beautiful !!!!! [sic] It's our whole world seen in an exquisite way."[490]

The resulting proposal passed PBS's muster; PBS executives gave Ambrosino permission to form a "Science Program Group" at WGBH. Ambrosino brainstormed with members of the *Horizon* team to put together his plan. Robert Reid, the creator of *Horizon* told Michael that the most important thing would be to secure public funding for the series.[491] The BBC was supported through mandated television subscriptions, which allowed it freedom from the interests of commercial sponsors. If he could publicly finance the series, Ambrosino would be free to produce hard-hitting documentaries. Ambrosino looked for support from private foundations and public entities.

He discovered that the American Association for the Advancement of Science was also interested in developing a science television series. They had approached David Prowitt, an executive producer at WNET in New York City, and asked him to prepare a report on the potential of a science communication series.[492] Prowitt believed that science was underrepresented on American airwaves. Prowitt had launched his own series

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[490] Ibid.
[491] Robert Reid to Michael Ambrosino, November 11, 1972, "NOVA, 1971-1976 (2 of 2)," WGBH Archives.
[492] Interestingly, WNET was the same group that refused to collaborate with Don Herbert in 1964, dooming his series *Experiment*.

SPECTRUM in 1964, but his financial backers balked over the series' attempts to cover "sensitive issues."[493] Prowitt lamented that other countries, such as France, Germany, Japan, and Italy, had superb science programming for children. Like Ambrosino, Prowitt also believed that *Horizon* was the best example of science series at the time. PBS suggested that Ambrosino and Prowitt work together on a series, but Ambrosino declined, out of his belief that the two producers had different visions for their series.[494]

A year later, by February 1973, Ambrosino was making good progress. Michael Rice wrote to David Ives that he had lunch with Ambrosino, who had been traveling between around the U.S. and the U.K. to scout out talent for a tentative science program.[495] Rice reported that Ambrosino had held 23 meetings during a four-day trip to London ("typical Ambrosino energy") and seemed to be generating mid-Atlantic enthusiasm for collaboration. But Rice was somewhat alarmed by Ambrosino's stubborn insistence that the science show would be politically focused. Ambrosino had also decided that the first thirteen shows would be a scientific sampler ("including straight science, science-in-society, and science in public policy.") Rice was concerned that viewers would become confused with this approach, especially if every episode varied in style and tone. Intriguingly, Rice suggested that Ambrosino look to *Masterpiece Theater* as the paragon of a WGBH/BBC production. Not only was *Masterpiece Theater* fiction,

[493] Michael Ambrosino to Michael Rice and David Ives, November 1, 1971, "NOVA, 1971-1976 (2 of 2)," WGBH Archives.
[494] Michael Ambrosino, revisions to a draft of this chapter. Author's collection.
[495] The following was all recalled in a letter. Michael Rice to David Ives, November 1, 1971, "NOVA, 1971-1976 (2 of 2)," WGBH Archives.

it wasn't even politically minded. The key to the program's success, Rice argued, was that, although it featured many different dramas, every episode began with the same charismatic host. The appearance of this figure ensured the continuity of the series' tone. *NOVA* might similarly benefit from a consistent guide to introduce every episode. Ambrosino was polite and, Rice thought, even enthusiastic about this notion. Still, "the persistent drift toward 'socially significant' science programs seems to be ever present," Rice fretted.

A month later, in March of 1973, the AAAS published Ambrosino's final report.[496] The 40-paged report was ambitious; it included six different projects to examine the world using science as its tool. The first project would formally create a permanent Science Program Group at WGBH. "We, the Science Program Group, have these aims," the report began:

> We want to show the way the world works …We want to show how science changes our everyday lives through technology. And we feel deeply the obligation to show how science bears on the great national issues that are too often seen only in political terms.[497]

Previous science programs, Ambrosino reasoned, lost their viewers by presupposing that they were interested in science. He wouldn't make this mistake. The Science Program Group would dramatically catch the attention of their viewers. Ambrosino's series would seek to "place the audience squarely in the process of discovery. These programs must

[496] Michael Ambrosino, "The Science Program Group for Public Television in the United States," American Association for the Advancement of Science, March 1973. WGBH Archives.
[497] Ambrosino, "The Science Program Group for Public Television in the United States," 2.

thrust the viewer into the guts of science."[498] They would feature beautiful images from the laboratory – "x-rays of the hand; the famous Edgerton milk drops; the mundane rotting peach."[499] Ambrosino's series would use the tricks of visual storytelling to spellbind viewers.

Ambrosino had high hopes that the Science Program would develop many types of programming. Future projects, Ambrosino predicted, would develop spin-off series about sociology, the history of civilization, and archeology. Ambrosino's Science Program Group could also create a science show for children. He declared:

> Television should also return reality to children…these programs will stimulate children to explore their environment in a safe and constructive fashion and will impart the sense, "I can do that with a little help and some planning."[500]

The Science Program Group would create a sense of grounded reality for children and their parents. They could even serve as a clearinghouse for scientific information for larger commercial broadcasters. Ambrosino had already worked a deal with the fledging entity, National Public Radio to help them develop short scientific pieces.[501] "In all this," Ambrosino surmised, "the project will aim at having the audience feel, 'I can understand how science works. I can make sense of the world. I have an insight I didn't have

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[498] Ibid,. 12.
[499] Ibid., 14.
[500] Ibid., 29. Michael Ambrosino's wife Lilian was one of the founders of the Action for Children's Television, a dynamic grassroots organization for educational children's programming. Through her connections, Ambrosino was connected with the founders of the Children's Television Workshop, Mr. Rogers' Neighborhood, and other titans of children's television. The AAAS Proposal notes that the Children's Television Workshop was interested in collaborating with WGBH on a science program for children.
[501] Michael Ambrosino to Michael Rice and David Ives, April 21, 1972, "NOVA, 1971-1976 (2 of 2)," WGBH Archives.

before.'"[502] Ambrosino deeply respected his audience; he wanted to create a science series that would empower them.

Ambrosino's gamble paid off. They received 'seed money' from the AAAS and other public entities supported WGBH's new science series: the Corporation for Public Broadcasting, the Carnegie Foundation, and the National Science Foundation. In addition, Ambrosino approached Polaroid to be the show's sole corporate sponsor. (Polaroid also underwrote several other WGBH productions, such as Julia Child's *The French Chef.)* They happily agreed that Polaroid would support the program.[503]

Supported almost entirely by public funds, *NOVA*'s producers could pursue whatever issues they liked, without fear their funding would be revoked as political retribution. Unlike earlier science programs, the first three seasons of *NOVA* were freed from obligations to appease commercial sponsors. Ambrosino believed in the importance of this commercial freedom. "What we do in documentary filmmaking is already so difficult," Ambrosino would later write, "that we should never, never, never trim our ideas to fit someone else's ideology or funding guidelines."[504]

Gathering the Production Staff

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[502] Ambrosino, "The Science Program Group for Public Television in the United States," 5.
[503] Ted Voss, the vice president of advertising at Polaroid, admired the work of Ambrosino's wife Lillian, who was also a television producer and a prominent advocate for children's public television; he was happy to help out another Ambrosino. He also happened to be an enthusiastic fan of *Masterpiece Theater.* "Michael Ambrosino," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.
[504] Michael Ambrosino, "A Well Seasoned Life" (6 ch.).

Ambrosino's next task was to assemble a team of professionals who would, fearlessly and enthusiastically, produce stories about science. He was looking for a group of imbued with the "curiosity to be galloping after all sorts of different things."[505] The ideal producers and directors for the WGBH science series would approach filmmaking with the same enthusiasm as a painter or a musician. But Ambrosino recognized that he was laying the foundation for a long-lasting series. Later, he reflected:

> Once started, I [didn't] want people to say, "Ah ha!" It can't succeed without Ambrosino. If it succeeds better after I'm gone, it only shows I did my job well. I trained my people and they can run it without me. [506]

To Ambrosino, it was vital to hire a collaborative group of people. Ideally, producers would train their own associate producers, thus creating successive generations of staff. This approach mimicked the structure of the BBC's Science and Features Department, the birthplace of *Horizon*. Again, such foresight marked a difference between the WGBH science series and earlier American science programs. Ambrosino imagined he'd want to leave WGBH eventually, whereas Lynn Poole (*JHSR*) and Don Herbert (*Watch Mr. Wizard)* assumed that they would be running the show in perpetuity. By hiring a team of staff directors, producers, researchers, and writers, Ambrosino created the framework for a science production company.

Ambrosino planned for three production teams.[507] (See Fig. 3). Each one headed by a different (BBC) filmmaker. A small pool of researchers and special effects artists

[505] "Case Study: NOVA, WGBH," January 1978, from Michael Ambrosino's personal papers.
[506] Ibid., 22.

would assist the teams. Episodes would be filmed consecutively; on average, each team would be allotted six months to complete a film. Ambrosino described it as, " a rugged intellectual and logistical grind."[508] Additionally, WGBH would purchase *Horizon* films from the BBC. *Horizon* could also purchase films from WGBH and show them on the BBC. This was Ambrosino's version of Singer's strand method. But, while the *Horizon* team was itself supportive of the fledgling WGBH project, *Horizon* directors were not allowed to formally consul on the project. The BBC and WGBH could co-produce and share films with each other, but BBC personnel couldn't work on WGBH films.[509] Ambrosino was faced with the challenge of enticing experienced staff away from the well-funded BBC for a short stint at a novice American company.

Ambrosino started by contacting Simon Campbell-Jones, a BBC senior producer. Campbell-Jones had spent years making *Horizon* and mentoring young talent at the BBC. Campbell-Jones remembered being summoned to meet Ambrosino at a hotel. Initially, Ambrosino wanted Campbell-Jones to serve as the series' editor, but Campbell-Jones decided that he'd rather be in charge of his own film crew. As he put it, " I didn't fancy sitting in a chair, while others went out filming."[510]

Shortly after joining WGBH, Simon Campbell-Jones had drinks with John Angier, a wry, bespectacled researcher for *Horizon.* At 28, Angier was an up-and-coming

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[507] Michael Ambrosino to Michael Rice, May 1, 1971, Michael Ambrosino's personal papers.
[508] "Michael Ambrosino," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.
[509] Ibid.
[510] "Simon Campbell-Jones," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.

filmmaker. He had gotten an undergraduate degree in physics from the University of Essex, but decided that he was more interested in dramatics.[511] Several years earlier, Angier had talked himself into a job at the BBC's Science and Features Department by writing an enthusiastic letter to Robert Reid, *Horizon*'s series editor, about how much he enjoyed *Horizon*.[512] He assisted episodes of *Horizon* and *Tomorrow's World,* the BBC's zippier, avant-garde science program. When Angier heard about the potential series in the United States, he contacted Ambrosino. Ambrosino was reticent; Angier had never made a full-length documentary. "He didn't think I was at all experienced," Angier recalled, "and he was absolutely right."[513] But, in the end, Ambrosino was hired Angier anyways as the producer of the second production team.

Ambrosino asked Robert Reid to recommend a third producer. Reid advised Ambrosino to talk with Francis Gladstone. At 32, Gladstone had been trained as a historian, but he had decided to go into filmmaking. While working as history teacher, Gladstone studied film at a New York University summer school in the early 1960s.[514] Together with his wife Josephine Elwyn Jones, Gladstone worked in the BBC's Science and Features Department (Jones was also a talented producer; she worked on Jacob Bronowski's *Ascent of Man* and co-wrote the book of the series.)[515] Like Angier and Campbell-Jones, Gladstone saw himself as part of "the school of thought, which [Reid]

[511] Michael Ambrosino and John Angier to the NOVA Staff, August 2, 1976, from Michael Ambrosino's personal papers.
[512] John Angier, Interview with author, July 29, 2016.
[513] Ibid.
[514] Francis Gladstone, Interview with author, December 7, 2018.
[515] Francis Gladstone, Electronic mail with the author, September 1, 2016.

had trained people in, [observing] a political and humanist treatment of science."[516] Gladstone's documentaries, on subjects like pesticides, offered viewers unusual perspectives into scientific culture. For one film, he and Brian Gibson, another *Horizon* director, recreated a day in the life of a teaching hospital in the 1920s. Gladstone enjoyed making historic dramatizations because he believed they could help the viewer create a bridge into the past.[517] He found the notion of Ambrosino's proposed show to be "thrilling and positive."[518] Ambrosino paired Gladstone with Elsa Rassbach, 28.[519] Both filmmakers shared a keen interest in politics and weren't afraid to shy away from controversy. Gladstone, Angier, and Campbell-Jones all intended to create films that would take American science to task.

170 budding filmmakers and journalists applied to join the still-unnamed science series; just fifteen were selected.[520] Ben Shedd, 26, arrived fresh out of USC's film school to be Campbell-Jones' associate producer.[521] Terry Rockefeller, just 23, served as his production assistant. Cary Lu, 28, a Chinese-American student with degrees in physics and biology, worked as Angier's associate producer.[522] At 37 and 42, Campbell-Jones and Ambrosino were the oldest members of the team.[523] Most of the WGBH

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517 Francis Gladstone, Interview with author, December 7, 2018.
518 "Francis Gladstone," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.
519 "Elsa Rassbach," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.
520 Michael Ambrosino to WGBH Science Program Group, December 18, 1973, from Michael Ambrosino's personal papers.
521 "Ben Shedd," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.
522 Michael Ambrosino to WGBH Science Program Group, December 18, 1973, from Michael Ambrosino's personal papers.
523 "Carole Ashcroft," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.

Science Group, meanwhile, were in their late twenties. The group was housed in the same building as the production team for *ZOOM!,* WGBH's popular children's program.

The young filmmakers, thrown together, quickly bonded. (See Fig. 4). Carole Ashcroft, Ambrosino's secretary, remembered, " Our team early on became a close knit family."[524] Rassbach recalled, "Michael created an optimal environment for our creative and intellectual work, which he watched over like a proud and nurturing father."[525] Shedd commented, "It was almost as if we parachuted into this wonderful creative incubator place and were set to work."[526] After a film shoot, producers and assistant producers gathered around secretary Betsy Anderson's desk, eagerly updating her with the progress of their documentary.[527] When the department ordered stuffed grape leaves for lunch, the staff clamored for pizza.[528] Ambrosino himself enjoyed the collaborative environment. Of his staff, he recollected, "They were constantly sharing gleams in each other's eyes because of the ideas the producers were coming up with."[529]

One thing was missing from Ambrosino's science group: a science advisory committee. In the AAAS report, Ambrosino suggested that he would recruit a group of men and women in science and communication to serve on an ancillary advisory committee.[530] Potential members of this committee included Jerold Zacharias, Director of

[524] Ibid.
[525] "Elsa Rassbach," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.
[526] "Ben Shedd," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.
[527] "Betsy Anderson," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.
[528] Ibid.
[529] "Case Study: NOVA, WGBH," January 1978, from Michael Ambrosino's personal papers.27.
[530] Ambrosino, "The Science Program Group for Public Television in the United States," 20.

Education and Research at MIT, Everett Mendelsohn, director of the Harvard History of Science Department, Charles Walcott, a professor at Harvard University, and William Nierenberg, director at the Scripps Institution of Oceanography. But, when Ambrosino approached the well-respected scientists, they strongly advised him against forming a committee. Jacob Bronowski, the writer behind the highly acclaimed BBC series *The Ascent of Man* (1973), told him:

> I like [the proposal]. But you've been to the BBC. What do all these advisors mean? An advisory committee on a television production never works. You are an honest man. You will do an honest job.[531]

Philip Morrison, a professor of physics at MIT, echoed Bronowski's criticism. Morrison and his colleagues already felt overwhelmed by their university's service requirements; the last thing they wanted to do was to join another 'monthly' committee. Instead, Morrison and others volunteered their time on an as-needed basis.[532] Ambrosino simply called them up and talked out any of the questions he had about science.

Still, Ambrosino decided he wanted a science editor for the series. His best option was Graham Chedd, a consultant for the AAAS's Public Understanding of Science initiative. Chedd had a degree in chemistry from Cambridge, with a focus in geology.[533] After he graduated, he worked as a journalist for *New Scientist,* a popular science periodical, and then briefly for *Horizon*. In 1970, the same year Ambrosino traveled to

[531] "Case Study: NOVA, WGBH," January 1978, from Michael Ambrosino's personal papers.10.
[532] Michael Ambrosino to David Ives, Oct. 2, 1973, "NOVA- Misc, 1971-1988 (2 of 2)," WGBH Archives.
[533] The information in the following paragraph is taken from an interview with Graham Chedd, September 13, 2016.

the BBC, Chedd was on a fellowship in the United States making films, sponsored by GlaxoSmithKline. Shortly after that, AAAS hired Chedd as their grants manager for the Public Understanding of Science initiative. When Ambrosino approached him to consult for *NOVA*, Chedd eagerly accepted. Like the other Brits, he was looking for an opportunity to work in the United States. As the science editor, he was in charge of the imported films from the BBC and redubbing them with American narration.

By early December 1973, the production team was fully-underway. They were producing three films in the United States and choosing which films to import from the U.K. Ambrosino wrote the team, "It is a time of activity and excitement pointing toward our premiere in March and the return of science to American television."[534] One of the most important parts of the project was still yet to be decided: the name of the science series. Everyone seemed eager to contribute a suggestion. Ben Shedd remembered, "Ambrosino's entire office door [was] covered with colored 3" by 5" cards with lots of potential names for the series."[535] "Everyone on the project was encouraged to scribble title suggestions," Campbell-Jones recalled, " it just didn't work."[536] Aubrey Singer, the founder of *Horizon*, thought that "The Boston Meridian" would be a fine title. (Teasingly, he told Michael that the BBC's Science Features Group would accept either bottle of Chateau La Tour 1959 or Haut Marbouzet 1964 as payment.)[537] WGBH management had

[534] Michael Ambrosino to WGBH Science Program Group, December 18, 1973, from Michael Ambrosino's personal papers.
[535] "Ben Shedd," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.
[536] "Simon Campbell-Jones," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.
[537] Aubrey Singer to Michael Ambrosino, November 1, 1973, "NOVA, 1971-1976 (1 of 2)," WGBH Archives.

their own ideas: "Science Riddles," "Science Seen," "Science Mystery Theater."[538] Rice was especially proud of his suggestion: "Eureka! " "[It is] used express triumph on a discovery," he explained.[539] Rice argued that the word's Greek roots would lend the title something "intriguing, more dashing."[540] Ambrosino was aghast. "Eureka was the bane of science and scientists," he later recalled:

> because it spawned the myth that science worked by instant enlightenment, in the bath or not… Modern science is not and has never been "Eureaka" [sic]. [541]

Ambrosino believed that *NOVA* needed to showcase the gradual, tenuous nature of scientific research. Science, he explained to Rice and others, occurred in tiny steps and could take years. Scientific research involved an entire community of researchers who wrote reports, scrutinized results, duplicated experiments, and questioned their own work. It was only after years of diligent research that the scientific community produced theories that formed the basis of scientific knowledge.

Meanwhile, Ambrosino came up with his own title: "NOVA." Abbreviated from the astronomical term for an exploding star ("supernova"), *NOVA* was short, yet punchy. Ambrosino explained to Rice, "*NOVA* carries the sense of being new and bright,

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[538] Sylvia Davis to Michael Ambrosino, December 19, 1973, "NOVA, 1971-1976 (1 of 2)," WGBH Archives.
[539] Michael Rice to Michael Ambrosino, September 17, 1973, "NOVA, 1971-1976 (1 of 2)," WGBH Archives.
[540] Ibid.
[541] "Michael Ambrosino," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.

scientific in content and slightly mysterious in character."[542] He thought it would catch the attention of viewers without being bogged down in explanatory jargon.

Ambrosino's suggestion of *NOVA* was also an ironic comment on the tenuous nature of public television funding. "Just like the celestial nova," he later recalled, "many series, after their brilliant introduction and display, floundered because of lack of funds, faded, fizzled, and disappeared from view."[543] Ambrosino had secured funding for two years, but he wasn't hopeful for the future of public broadcasting.[544] He didn't know whether *NOVA* could ever be as popular as *Masterpiece Theater*.

During the funding process, Ambrosino considered ways to talk about science. In a letter to the chairman of the Corporation for Public Broadcasting, he divided "science" into three categories: 1. Pure Science, 2. Science's impact on society, 3. Public policy issues rooted in science and technology.[545] But, once the *NOVA* team came together, Ambrosino largely gave Campbell-Jones, Angier, and Gladstone free reign. He felt that it was important to give his staff the freedom to do his or her best work.[546] Michael recalled:

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[542] Michael Ambrosino to David Ives, Michael Rice, and Sylvia Davis, November 9, 1973, "NOVA, 1971-1976 (1 of 2)," WGBH Archives.
[543] "Michael Ambrosino," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.
[544] Michael Ambrosino to Clarence Ohlke, July 7, 1972, "NOVA, 1971-1976 (1 of 2)," WGBH Archives.
[545] Michael Ambrosino to Frank Pace, Jr., March 17, 1972, "NOVA, 1971-1976 (1 of 2)," WGBH Archives.
[546] "Michael Ambrosino," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.

> We never sat down together and said, "We need ten shows, Let us together do these, let's you produce these, and we'll produce these others. People come up with ideas, the best shows made, because they have a great interest in doing them.[547]

It was a freeing approach for the directors. Campbell-Jones remembered, "An idea had been buzzing around my head based on the surprising fact that the Colorado River did not reach the sea."[548] Could he and his team research that? Michael gave them the go-ahead. Meanwhile, Angier's team looked into the origins of human life; Cary Lu suggested interviewing Carl Sagan, who had been his doctoral advisor at Cornell.[549] Francis decided to try his hand at a drama, the discovery of drugs that made anesthesia possible.[550] For the next three years, the intelligent, thoughtful programs would enable *NOVA* to establish its foothold in public broadcasting.

A Star is Born

Ambrosino served as *NOVA's* Executive Producer from 1974 until 1976. During that time, the series nationally broadcast fifty episodes.[551] *NOVA* production teams made nineteen of these films, and co-produced and commissioned the rest. As part of a national

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[547] "Case Study: NOVA, WGBH," January 1978, from Michael Ambrosino's personal papers, 17.
[548] "Simon Campbell-Jones," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.
[549] John Angier, Interview with author, July 29, 2016. Sagan was also part of Ambrosino's advisory team. See Michael Ambrosino to David Ives, October 2, 1973, (2211)
[550] Francis Gladstone, Interview with author, December 7, 2018.
[551] This included 22 acquisitions (from *Horizon* and independent producers) and 9 co-productions with the BBC. Michael Ambrosino and John Angier, August 2, 1976, "NOVA- Misc, 1971-1988 (2 of 2)," WGBH Archives.

'package' of PBS television programs, *NOVA* aired weekly on all PBS stations.[552] The first three seasons featured episodes on medicine, archeology, anthropology, biology, and physical sciences. American viewers learned about the ecology of the San Francisco Bay, the dangers of overfishing and deforestation, and the intelligence of young chimpanzees. (See Fig. 5). The *NOVA* series couldn't be defined thematically. Indeed, as Ambrosino explained in a CPB report, episodes of *NOVA* weren't meant to build upon each other; each episode really stood alone. He ruminated:

> If you compare a third season's show with a first show and asked, "What's the difference?," you'd have to say, "Gee not much." If you looked a little deeper, perhaps you'd have been able to see that we were dealing with issues that were a little more complicated.[553]

Interestingly, *NOVA*'s wide variety of topics was a major asset. If a viewer didn't care for one topic, she could still tune in the following week and watch a program that she liked. As one journalist put it, "settle down in front of the TV and see what *NOVA* has for you this time."[554] Again, this episodic approach mimicked *Horizon*'s successful formulation. Episodes of *NOVA* differed week to week, but the series was tied together by a continuity of visual, tonal, and rhetorical style.

Ambrosino's BBC-trained producers utilized lush cinematography that would also become characteristic of *NOVA*. Angier later recalled, "We brought broadcasting with us

[552] John Angier, Interview with author, July 29, 2016.
[553] Case Study: NOVA, WGBH," January 1978, 19, The Corporation for Public Broadcasting, from Michael Ambrosino's personal papers.
[554] "Settle down…," *Mosaic,* National Science Foundation, March-April 1975.

from the UK. The way that we started making programs was how it was done there – not how it was done here."[555] Compared to American television programs at the time, the BBC programs were visually rich. For instance, in the first episode of *NOVA*, "Where did the Colorado Go?" (1974), Simon Campbell-Jones whisked his crew away for a shoot in the American West. The film told the story of the demise of the Colorado River, a once-strong waterway that had become a mere trickle due to mismanagement. Gladstone later commented, "It's a good ecological documentary that is not science with a capital S at all, but, rather, shows the dark side of water engineering."[556] The film was especially noteworthy for its spectacular cinematography. "We left Boston for 43 days on location," Shedd later recalled, "from the top of the Colorado River in the Rockies to where it runs dry in the Mexican desert."[557] The result was a resplendent view of the American southwest. To achieve a bird's-eye view of the Grand Canyon, they strapped a cameraman into a small aircraft and flew him low over the conifers of northern Arizona. The plane suddenly dropped into the Grand Canyon and the cameraman filmed beautiful shots of the shallow green river flowing against the red rock walls. One of the more spectacular shots was used in the opening. In Mexico, Campbell-Jones remembered, "we finally landed in the middle of the desert, in the remains of a port. The wooden piers and skeletons of large boats were clearly visible. If ever one picture told the story of the Colorado, that was it."[558] The image of the abandoned port visually supported Campbell-Jones' message, that engineers had underestimated how dams impacted the Colorado

[555] John Angier, Interview with author, July 29, 2016.
[556] Francis Gladstone, Interview with author, December 7, 2018.
[557] "Ben Shedd," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.
[558] Ibid.

River. *NOVA* also used animation to provide imaginative visualizations. They hired local animator Sal Raciti to help the producers illustrate establishing concepts, dream sequences, visual examinations of systems, maps, and "[anything] that couldn't be captured with a live camera."[559] Raciti would illustrate nuclear reactors, eroding mountains, and molecules of DNA. Powerful images bolstered the film's rhetorical message.

The BBC-trained producers also valued the importance of an authentic soundtrack. Each production of *NOVA* featured music tempered to the mood of the production and varying throughout each episode. A short segment on 18th century philosophy featured a tinny harpsichord and trumpets ("The Search for DNA," 1976), while somber bugles underscored the tragedy of the coal miners in West Virginia ("What Price Coal," 1977). *NOVA* also had dedicated sound effects team. For "Will the Fishing Have to Stop?" (1975), folio artist Mary Jo Wheately resorted to slapping real fish fillets against a wooden board to replicate the noise of jumping fish. " It worked beautifully," she recalled, "but in hindsight, it was probably not my brightest idea. The narration booth was a bit aromatic for a few days."[560] The *NOVA* productions were crafted for audio and visual enjoyment; the producers paid close attention to these individual elements of storytelling.

[559] "Sal Raciti," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.
[560] "Mary Jo Wheately," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.

The dramatic music and stunning visuals highlighted the most crucial element of *NOVA*: hard-hitting science reporting. *NOVA* episodes don't simply offer viewers an explanation of science. Instead, as Gladstone later put it, "they *were* films critical of consequences or effects of science."[561] Ambrosino thought it was this journalistic approach that set *NOVA* apart from other American films.[562] The objective, hard-hitting journalism that was common on television in the United Kingdom was viewed as rudely offensive in the United States.[563] But as *Horizon's* Robert Reid wrote to Ambrosino, "A successful series … will not have to be afraid of taking an unpopular view, provided that that view can be substantiated by rational argument."[564] The producers of the BBC were unrelenting in their pursuit of a story, but they also offered viewers a balanced, objective look. In this way, the first episodes of *NOVA* were reminiscent of CBS's *See It Now*.

Even here, there was a crucial difference between *NOVA* and *See It Now – NOVA* lacked Edward Murrow's suave persona. As mentioned earlier, Rice and Ambrosino weighed the possibilities of pairing *NOVA* with an affable host. Ultimately, a series without a host afforded more flexibility to the *NOVA* staff (i.e. they didn't have to pay a personality to fly out to different locations). Reid also suggested to Michael that more discerning viewers would be skeptical of a host. "[A host]," he wrote, "undoubtedly alienates the more sophisticated viewer, who knows only too well that [he] cannot be the

[561] Francis Gladstone, Electronic mail with the author, August 31, 2016.
[562] "Michael Ambrosino," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.
[563] John Angier, Interview with author, July 29, 2016.
[564] Robert Reid, "Some Comments for a Proposal on a Science Programme Group," 6, 1973, "NOVA, 1971-1976 (2 of 2)," WGBH Archives.

polymathematic character his scripts make him appear to be."[565] Indeed, a regular host might have made *NOVA* seem too slick and commercial. Without a host, the viewer was thrown directly into the action of a *NOVA* episode.

Instead, individual scientists themselves served as the personalities of *NOVA*. Unlike *See It Now*, which interviewed high-profile scientists like Edward Teller, *NOVA* showcased relatively unknown scientists, from government employees to college professors. Most had never been on camera. Angier remembered, "In the early days, scientists hadn't seen anything like [*NOVA*] on television. . . People didn't have preconceived ideas on how they should behave and how they should talk."[566] This lack of self-awareness translated to a fresher performance on screen. In fact, Angier found as the series progressed, more scientists fussed about their on-screen appearance. The early episodes of *NOVA* captured a cross-section of scientific life in the early 1970s. Graham Chedd found that, compared to British scientists, Americans were very eager to work with television crews.[567] Unintentionally, the production crews recorded the diversity of college laboratories. *NOVA* crews interviewed men and women, emeritus professors in tweed jackets and young graduate students with perms. As historian Steven Shapin has noted, by the 1970s, popular culture was no longer so enamored with the special 'moral' quality of the scientific vocation.[568] Being a scientist was just like being anyone else. In "Where Did the Colorado Go?," the crew filmed a tanned hydrologist taking sediment

[565] Ibid., 7.
[566] John Angier, Interview with author, July 29, 2016.
[567] Graham Chedd, Interview with author, September 13, 2016.
[568] Stephen Shapin, *The Scientific Life: The Moral History of a Late Modern Profession*, (Chicago: University of Chicago Press, 2008). 290.

samples from the sands of Lake Powell.[569] Stripped down to his striped speedo, the scientist was nonchalant. *NOVA* afforded viewers a glimpse of the scientist in the wild.

The Plutonium Connection

NOVA's staff took great pride in pursuing topics, untethered by commercial or political obligations. In an episode from the second season, "War from the Air," (January 5, 1975) Francis Gladstone combined footage of bombed cities with grisly statistics. He argued that aerial bombing only strengthened military resolve, while killing hundreds of thousands of civilians.[570] Surprisingly, this episode didn't provoke much outcry. Instead, one of the most controversial episodes of *NOVA* ran later that spring: "The Plutonium Connection" (March 9, 1975). Director John Angier asked American viewers an unsettling question, "Could a smart college student build a bomb?"

"The Plutonium Connection" touched upon a popular concern: too much information about nuclear weapons had been declassified. Starting with President Eisenhower's Atoms for Peace campaign in 1953, the Atomic Energy Commission had started to share information about nuclear reactor construction with scientists in other countries. By 1971, the AEC's "declassification drive" was in full swing.[571] Proponents of governmental transparency were pleased; others were less certain. Ted Taylor, a

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[569] "The Plutonium Connection," John Angier, March, 9, 1975. *NOVA*, Boston, WGBH.
[570] "War from the Air" was an episode that resonated strongly with the older members of the *NOVA* team, who still had memories of World War II. As Michael Ambrosino explained, the episode was a response to the despair of the Vietnam War.
[571] Alex Wellerstein, "Atoms for peace, atoms for terror: Debating secrecy and safeguards, 1970-1978." from Alex Wellerstein, *Knowledge and the Bomb*, 388.

consultant to the AEC, was especially worried. A former member of the Manhattan Project, Taylor was concerned that the agency had declassified too many files regarding the construction of nuclear weapons. What if a terrorist stole fissionable plutonium and then used declassified plans to build a bomb? Together with *The New Yorker's* John McPhee, Taylor wrote *The Curve of Binding Energy*, a tome about the perils of possible plutonium bombs.[572] Another scientist and a colleague of Taylor's, Amory Lovins was similarly worried. Like Taylor, Lovins fretted about the safety of nuclear reactors (potential targets for domestic terrorism).[573] He reached out to John Angier.

After some discussion, Angier was inspired to produce a film about the dangers of atomic accessibility. An early draft, titled "The Element of Danger," focused primarily on the hazards of plutonium itself. [574] At the core of the plutonium production, Angier noted, would be the consequences of the AEC's breeder program, Ted Taylor, and the toxicity of plutonium. The outline also noted an internal AEC report wherein "young physics graduates had produced a bomb only using published information."[575] By early September 1973, Angier drafted a script of the program. He played with several possibilities for openers. In one scenario, the episode would start with a mock-announcement of a nuclear blackmail threat (à la *War of the Worlds*). Angier decided,

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[572] Ibid., 389.
[573] Amory Lovins is a Harvard educated energy consultant. At the time, he ran a group called "Friends of the Earth" in the United Kingdom. Angier met him when researching an episode for Horizon on Wales' Snowonia Park. John Angier, Interview with author, July 29, 2016.
[574] Loose leaf notes (undated), "The Plutonium Connection," WGBH Archives.
[575] This note probably referred to a 1964 experiment at Lawrence Livermore Laboratory, where staff members challenged three postdocs to build their own nuclear weapon using public resources. The AEC subsequently published an internal report on the postdoc's findings (Wellerstein, *Knowledge and the Bomb,* 392).

instead, to frame the story through the eyes of an undergraduate student. He commissioned an MIT undergraduate, majoring in chemistry, to research and design a bomb in five weeks.[576] Angier sent the completed designs to Jan Prawitz, a science adviser for the Swedish government for evaluation.[577] He also mailed a copy to the Atomic Energy Commission.[578] All other copies of the plans were destroyed. Ambrosino and Angier, meanwhile, decided that the program needed an exceptional narrator. Angier decided to approach high-profile actor Robert Redford, knowing that the actor had a serious interest in issues of science, the environment and nuclear proliferation. "[We] chose Redford," Ambrosino recalled, "because we were short of funds for publicity and knew that all the newspaper critics would review the program."[579] Redford agreed to narrate because he thought the subject was shocking, but pertinent.[580]

The completed episode showcased the threat of declassified information.[581] As envisioned, Angier started by following the "student" around MIT.[582] With shaggy brown hair and a leather jacket, the white, male student seemed unimposing. His dorm room was messily strewn with books and titillating pinups. But as Angier noticed, there was one crucial difference between him and the average MIT undergrad: this student had

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[576] Michael Rice to David Ives, September 24, 1974, "NOVA, 1971-1976 (1 of 2), D02710," WGBH Archives.
[577] John Angier to David Ives, September 5, 1975, "NOVA- Misc, 1971-1988 (2of2)," WGBH Archives.
[578] John Angier to John Harris, January 2, 1975, "NOVA- Misc, 1971-1988 (2of2)," WGBH Archives. The Atomic Energy Commission dissolved on January 19, 1975. Subsequently, it was reorganized into two agencies, the Nuclear Regulatory Commission and the Energy Research and Development Administration. https://www.nrc.gov/about-nrc/history.html
[579] See notes on an earlier version of this chapter by Ambrosino. Held by the author.
[580] John Carmody, "The do-it yourself A-Bomb" Washington Post, March 8, 1975.
[581] "The Plutonium Connection," John Angier, March, 9, 1975. *NOVA*, Boston, WGBH.
[582] For privacy reasons, Angier hired an actor to portray the student. All records of the student's identity have been destroyed.

succeeded in designing a bomb. Prawitz, the Swedish expert, confirmed that the undergraduate's plans were feasible for a small explosion. During the next hour, Angier interviewed Ted Taylor, Ralph Nader, members of the International Atomic Energy Agency, and other scientific experts. The film also argued that plutonium-processing plants needed enhanced security safeguards. To prove this point, the *NOVA* crew met with security teams at the Oak Ridge National Laboratory. Here, they learned that the laboratory's only protection came from armed guards sitting in rickety lookouts. It seemed hardly enough protection for a savvy spy. Gary Molen, a manager of one plutonium production facility, told Angier, " We are not in a position to nor do we plan to be in a position to actually prevent or stop a significant armed attack." The crew also visited another plutonium production facility in Cimarron City, Oklahoma, run by the Kerr-McGhee Corporation. Angier later remembered, with disgust, that facility was poorly regulated. The company, without much thought, let the crew film every part of the laboratory, even the plutonium vault. "We could've been terrorists," Angier remarked, "It would've been the perfect cover."[583] Additionally, Angier discovered that detailed plans for the construction of all civilian nuclear plans were freely available at the AEC's offices in Washington, D.C.[584]

Through his research, Angier proved that a student could build a feasible bomb from knowledge gleaned from public records. He demonstrated that it was possible for plutonium products to be smuggled out of civilian production facilities. To visually

[583] John Angier, Interview with author, July 29, 2016.
[584] Ibid.

underscore the implications, Angier showed footage of collapsing buildings, clouds of dust, and people walking through rubble. "This could be New York, London, Belfast, Tel Aviv, or any big city," Robert Redford's concerned voice intoned, "It seems unthinkable that just five weeks of a student's time could come up with this potential. Why is the information he needed so freely available?"

Angier's documentary caused a stir even before its PBS's debut (See Fig. 6). On February 28th, the film was screened in the U.S Senate. The documentary's actual premiere was covered by American papers and picked up by international papers as well.[585] Public opinion was split. The writers of the *Boston Globe* and *Newsweek* praised the program for its in depth reporting.[586] *The New York Times* however delivered a stinging rebuke. "At what point does a detailed warning become a primer in the very subject it is supposedly warning against?" wondered columnist John O'Connor.[587] *TV Guide's* editors cautioned, "The public broadcasting service either performed an outstanding public service or a misguided and potentially tragic disservice."[588] Some fretted that by exposing just how easy it was to build a bomb, *NOVA* had primed potential terrorists. (Several months later, a viewer filed an unsuccessful suit against PBS to

[585] "Do it yourself A-Bomb on TV," *The Jerusalem Post,* March 5, 1975, 5. ; Joyce Egginton, "TV shows how to make a backwards A-Bomb," *The Observer,* March 9, 1975, 1; "Diese Woche: Die Bombe von Boston," *Stern #12,* March 13, 1975.
[586] Percy Shain, "NOVA takes a look at N-bomb blackmail," *Boston Globe,* March 7, 1975.; "A do it yourself A-Bomb," *Newsweek,* March 10, 1975.
[587] John O'Connor, "Plutonium Connection Prove A Dud," *The New York Times*, March 9, 1975. Michael Ambrosino wrote a letter to the editor, unpublished, which voiced his support of the film. "In his review of last week's…" "NOVA, 1971-1976 (1 of 2)," D02710, WGBH Archives.
[588] "As we see it," *TV Guide,* March 1975.

prevent future broadcasts of "The Plutonium Connection.")[589] Angier defended himself, stating, "If you genuinely think there are risks, you have to tell people."[590] Sen. Abraham Ribicoff, a congressman from Connecticut, was particularly impressed by the documentary.[591] At his request, the entirety of the documentary was read into the Senate Congressional Record.[592] Similarly, the public seemed largely taken by Angier's approach. Did the documentary tap into cultural anxieties about the dangers of technology?[593] Did reports of international acts of terrorism, like the 1972 Munich Olympics, seem too close to home? Whatever the reason, "The Plutonium Connection" was one of the most repeated episodes of NOVA's second season.[594]

The documentary greatly upset the National Science Foundation. The criticism of the Atomic Energy Commission itself was not isolated. By 1974, so many citizens had complained about the AEC's regulatory processes that Congress voted to reorganize the agency.[595] But several former members of the AEC worked at the NSF. These scientists were furious with the less-than-ideal depiction of the AEC on national television. After the episode aired, NSF officials summoned Ambrosino to Washington to explain

[589] "Bomb-Show Halt Denied by Kellam," *The Virginia Pilot*, August 27, 1975, B1, "Misc, 1971-1988 (2 of 2)," WGBH Archives.
[590] "Do it yourself A-Bomb on TV," *The Jerusalem Post*, Marc 5, 1975, 5.
[591] Sen. Ribicoff sponsored several bills related to nuclear non-proliferation and radiation health safety. He chaired the Senate Committee the helped the AEC transform in the Nuclear Regulatory Commission and Energy Research and Development Authority. Benjamin Sovacool and Scott Victor Valentine, *The National Politics of Nuclear Power: Economics, Security, and Politics.* (New York: Routledge, 2012), 75.
[592] U.S. Congress, Senate, "The Plutonium Connection," March 11, 1975. S3617. "NOVA, 1971-1976 (1 of 2)," D02710, WGBH Archives.
[593] Wellerstein, *Knowledge and the Bomb*, 391.
[594] "PBS Report, 1974-1975" DO1820, WGBH Archive.
[595] "NRC History" last modified August 4, 2016, https://www.nrc.gov/about-nrc/history.html.

himself.[596] Ambrosino defended Angier's program. He pointed out that critical voices in the program had, in fact, come from within the nuclear energy establishment itself. Frustrated, NSF officials threatened to withdraw all funding for *NOVA* unless Ambrosino created an official, NSF-approved advisory committee that would oversee all future *NOVA* episodes. Ambrosino replied that if NSF made such demands, he'd refuse any sort of funding from them. Furthermore, he'd also inform national journalists about the NSF's attempts at coercion. In the end, the NSF backed down and *NOVA* producers continued to make documentaries on their own terms.

"The Plutonium Connection" encapsulated the political fervor of its early seasons. Angier captured a snapshot of the debates over the regulation of nuclear energy, while offering his own perspective. Viewers learned that scientists didn't always agree with each other. Films like "The Plutonium Connection" confirmed that contention could exist within the scientific community. In order to understand science, *NOVA* suggested that viewers needed to understand the politics that surrounded scientific activities. In future episodes, like *The "*Incident at Brown's Ferry" (1977) and "Linus Pauling: Crusading Scientist" (1977), *NOVA* explained how activists contributed to scientific conversations. Although they didn't explicitly promote activism, *NOVA* producers encouraged their viewers to be interested consumers of scientific information.

The Race for the Double Helix

[596] The following information is from Ambrosino's recollections. "Michael Ambrosino," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.

In his proposal to the American Association for the Advancement of Science*,* Ambrosino suggested that *NOVA* spotlight the history of the DNA. James Watson, an American geneticist, had written a popular account of 'the race' at Cambridge, *The Double Helix* (1968). Comparing the story of the discovery to "a complex jigsaw puzzle," Ambrosino believed it could showcase "the sociology of an international community of scientists."[597] *Horizon's* Robert Reid was a little more skeptical. He told Ambrosino, "Nobody can deny that *The Genetic Code* is a wonderful subject, but in this country at least it is a well worn theme."[598] He suggested that, if Ambrosino was interested in pursuing the topic, that he consider it from the perspective of another member of the team, Rosalind Franklin.[599]

Reid's idea was shelved until 1975, after the publication of Anne Sayre's biography *Rosalind Franklin and DNA*. Graham Chedd approached Ambrosino with the idea of directing an episode of *NOVA* about the 'race' for the double helix. During his time as a science journalist, Chedd had spent a week interviewing Francis Crick, James Watson, and Maurice Wilkin at Cambridge for two educational films, including an episode of *Horizon*. "This was the first and only time they [had] compared notes extensively on those days," he late recalled, "and it was a fascinating encounter."[600] Chedd suggested that *NOVA* reuse and edit this footage for a "DNA" episode. After

[597] Michael Ambrosino, "The Science Program Group for Public Television in the United States," American Association for the Advancement of Science, March 1973. 11, WGBH Archives.
[598] Robert Reid, "Some Comments for a Proposal on a Science Programme Group," 6, 1973, "NOVA, 1971-1976 (2 of 2)," WGBH Archives.
[599] Ibid.
[600] Graham Chedd to Isaac Asimov, July 22, 1975, "The Double Helix," WGBH Archives.

reviewing the footage, he told Michael, that the BBC film provided a 'personal' look into the story of DNA, but it ultimately lacked context: "The viewer has no idea why finding the structure of DNA is so all-fired important."[601] Two things would strengthen the film's American broadcast. First, *NOVA* could animate several sequences to explain the function of DNA. Secondly, the film needed a "Mr. X" to guide viewers through the tale. Chedd daringly suggested, "What about Asimov?"[602]

Isaac Asimov was a prolific American writer of the mid-20th century. He earned his fame writing short science fiction stories in the 1950s and 1960s, although he also dabbled in writing popular science books. With his trademark bushy sideburns and square glasses, Asimov was also a recognizable icon. He appeared as a frequent guest on talk shows in the late 1960s, like *The Dick Cavett Show*. As a professor of biochemistry at nearby Boston University, Asimov was also a local. Chedd wrote a polite letter to Asimov suggesting the possible collaboration. Asimov, he suggested, could appear to audiences as another 'Jacob Bronowski.'[603] A week later, Asimov wrote back, expressing tepid interest, but concerned that he wouldn't have time.[604] Chedd promptly replied, "I think your association with the film would bring a lot of viewers to their screens."[605] He implored, "Imagine Jim Watson, Linus Pauling, and Isaac Asimov all on one *NOVA*!"[606]

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[601] Graham Chedd to Michael Ambrosino, undated, "The Double Helix," WGBH Archives.
[602] Asimov had already written an op-ed for NOVA in TV Guide. Ibid. Also see Isaac Asimov, "Chimpanzees," *TV Guide,* May 4, 1974. 33-34
[603] Graham Chedd to Isaac Asimov, July 22, 1975, "The Double Helix," WGBH Archives.
[604] Isaac Asimov to Graham Chedd, July 26, 1975, "The Double Helix," WGBH Archives.
[605] Graham Chedd to Isaac Asimov, July 28, 1975, "Folder #5," Box 299, from the Isaac Asimov Collection, Howard Gotlieb Archival Research Center at Boston University.
[606] Ibid.

Asimov was swayed. Although reluctant, he told Chedd, "I recognize the importance of the program and my wife is all for it, so I'll try to do it."[607]

With Asimov's assent, the production swung underway. Several weeks later, Chedd and Asimov met, watched the previous film, and talked through the revised script. Asimov found himself swept up in the excitement of television production. He told Graham that he had read Sayre's biography on Franklin. "Though I intended to skim, I found myself reading every word," Asimov gushed "I thought it very good and found it, in fact, a healthy counterweight to 'The Double Helix.' " Asimov characterized Franklin as, "A brilliant woman trying to make a place for herself in a strongly masculine environment."[608] Overall, he said that Sayre's book that made him aware that Franklin "did not quite get her just credit." Meanwhile, Chedd decided to film the 'pick-up scenes' (Asimov's narration) at Cold Springs Harbor.[609] The crew filmed Asimov on a chilly afternoon in October 1975.

"The Race for the Double Helix" premiered on February 22, 1976.[610] In the opening shot, grandfatherly Asimov ambled along the green lawns of Cold Spring Harbor. From here, the film darted back and forth between shots of Crick, Watson, Pauling, and Wilkins chatting with each other in stately Cambridge offices at the Cavendish Laboratory. The episode was meant to teach viewers about the function of

[607] Isaac Asimov to Graham Chedd, August 9, 1975, "The Double Helix, WGBH Archives.
[608] Isaac Asimov to Graham Chedd, August 23, 1975, "The Double Helix, WGBH Archives.
[609] Graham Chedd to William Udry, August 12, 1975, "The Double Helix, WGBH Archives.
[610] "The Race for the Double Helix," Graham Chedd, March, 9, 1975. *NOVA*, Boston, WGBH.

DNA in the human body. But viewers were also supposed to walk away understanding "the role interpersonal relations play in the sharing of 'hot' scientific information."[611] Watson and Crick each discussed their compatibility as scientists and as friends. As each man talked, they interrupted each other, eager to finish each other's sentences. Crick and Watson explained how casual conversations with their other friends, chemists and physicists, had helped them formulate possible models of DNA. Science was a process of collaboration. "You're not supposed to sit on data for years," Crick commented, "Because the essence of science is communication." But Rosalind Franklin, Crick explained, had "wanted to take over the problem and do it all herself." The episode confronted Crick, Watson, and Wilkins about their treatment of Franklin. Watson protested claims that he had worked against Franklin. Instead, he countered, that shortly before the discovery, he had approached Franklin, wanting to share the latest report on a proposed structure of DNA. Franklin found Watson so irritating that, Watson claimed, as he pushed it into her face, "she came toward me, I thought she was going to hit me." He reported that she hit Wilkins too (Wilkins, in the next scene, explained that he had no memory of this.) Asimov was careful to interject that other colleagues had found Franklin "delightful." But, as Asimov pointed out, because Wilkins and Franklin refused to work together, Crick and Watson gained the upper hand in their research. The documentary ended with Crick and Watson sitting in a cozy English pub. As they drowned their pints, each marveled just how fortunate they'd been to work together.

[611] "A Teacher's Guide to NOVA, Fall 1977," WGBH Archives.

The episode was favorably received on both sides of the Atlantic. Although J.W. Anderson, of *The Washington Post*, criticized the lack of action in the episode, he called it "a highly rewarding program."[612] Nancy Banks-Smith, of *The Guardian*, remarked, "Rosalind Franklin is the tragic shadow of the story."[613] Of the Cambridge trio, only Francis Crick contacted Asimov following the episode's premiere. He praised the film, particularly Asimov's narration. The film, he thought, was a good balance to Watson's book. He only had some criticisms, mainly about the film's focus on Roslind Franklin.[614] Asimov sidestepped this comment in his returning letter. He politely replied that he couldn't take credit for the wonderful program and expressed his pleasure at having been included.[615]

NOVA gave Asimov an opportunity to weave himself into the narrative of the double helix. More importantly, the production recovered the image of Rosalind Franklin. By presenting a sympathetic portrait of Franklin on national television, Chedd provided a heavy counterweight to Watson's account. But the film also prompted viewers to think critically about the process of scientific discovery. PBS viewers learned that Nobel-winning scientists aren't any nobler than non-scientists. They could let petty feelings get in the way of basic research. Again, as in "The Plutonium Connection," the production reinforced the objectivity of science by highlighting the political nature of scientists. Phil

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[612] J.W Anderson, "A Rerun for the Race for DNA," *The Washington Post,* February 21, 1976.
[613] Nancy Banks-Smith, "World in Action on Television," *The Guardian,"* July 9, 1974. Banks-Smith commented on Horizon's version of the episode, without Asimov.
[614] Francis Crick to Isaac Asimov, Sept. 27, 1976, from the Isaac Asimov Collection, Howard Gotlieb Archival Research Center at Boston University.
[615] Isaac Asimov to Francis Crick, Sept. 30 1976, from the Isaac Asimov Collection, Howard Gotlieb Archival Research Center at Boston University.

Morrison commented that the episode allowed viewers to check Watson's story, first hand, by listening to the personal accounts of all the other actors.[616] Viewers could learn how to weigh competing stories of science. *NOVA*'s sociological account revealed that scientific narratives were just another creation of the laboratory.

Conclusion

All the way along, Ambrosino kept a master schedule of *NOVA*'s timeline on cascading sheets of graph paper. Taped neatly at the top was Ambrosino's business card, with the blue and green WGBH logo beaming. The left column was marked in fine blue pen: June 3, June 10, June 17, and so on. Each cube marked a week in the production. The other four columns were dived into Team I, Team II, Team III, and Team IV, for each of the different production units. Using purple pen, Ambrosino charted out how long each group would have to research, film, and edit a production. At the far right side, alternating in red and green pen, Ambrosino marked the airdates for each film, checking them off week by week. By the end of 1976, this *NOVA* schedule stretched over five feet long. His master schedule was strictly functional, yet it was also sentimental. Much like a parent could track the growth of a child, Ambrosino used the schedule to measure the progress of the series. It's the one physical document that aligned all the separate strands of his production. Although simple, the busy lines on the paper demonstrate the fervor of the first three years of NOVA.

[616] "A Teacher's Guide to NOVA, Fall 1977," WGBH Archives. 3.

By March 1976, *NOVA* found its footing among PBS's national line up. According Nielsen, *NOVA* ranked just behind *Masterpiece Theater* in popularity. Ambrosino was excited. After all, as he explained, compared to *Masterpiece Theater, NOVA* was carried by 8 fewer stations, received 25% fewer broadcasts, and had a much smaller advertising budget.[617]

Later on that year, Ambrosino sent 75 PBS stations a questionnaire, asking them what they thought about *NOVA*. Almost all stations wrote back glowing reviews. California's KVIE reported that their viewer "were hungry for this kind of programming."[618] Florida's WPBT commended WGBH's work: "*NOVA* is A-Plus above all the animal adventure programming and network's occasional science documentary."[619] In Mississippi, the program manager of WMAA praised *NOVA*'s "balanced and beautifully executed" reporting. He said, "As the only regularly scheduled science series for curious adults on American television, we all consider *NOVA* a valuable tool."[620] The BBC's style of scientific storytelling had impressed American viewers.

Many stations noted that college professors and high school teachers had written in, asking for transcripts and copies of films. *NOVA* was a popular choice for assigned viewing in several districts. Responding to this interest, *NOVA*'s staff released their first

[617] "Case Study: NOVA, WGBH," January 1978, 18, from Michael Ambrosino's personal papers.
[618] "PBS Report, 1974-1975" DO1820, WGBH Archives.
[619] Ibid.
[620] Ibid.

teaching guide in 1976. "The topics discussed in *NOVA* and their manner of presentation," they explained in the introduction, "make the *NOVA* series a rich resource for the classroom."[621] *NOVA*'s classroom guide usually contained a summary of the program, a list of important vocabulary and concepts, a list of additional resources, and suggested group activities. *NOVA* wasn't just aimed at science teachers. The classroom guide suggested that social studies teachers could use the episodes to talk about the interactions between public policy and science; English teachers could use the episodes to find inspiration for analytic and creative writing.[622] The suggested group activities were especially creative. For "The Overworked Miracle" (1976), an episode on antibiotic resistance, *NOVA* suggested that young scientists and artists collaborate together on an 'antibiotic mural.'[623]

Still, some scientists at American universities took issue with *NOVA*'s focus on controversial issues. Prior to *NOVA*, science television series had always been categorized as 'educational.' Most, like *Watch Mr. Wizard,* focused on teaching scientific fundamentals to American viewers. But, even after a few years of production, WGBH's British producers still insisted that *NOVA* was an *informational* television program. As discussed earlier, many producers of the BBC's Science and Features production unit viewed educational programs as too didactic. Instead, their films sought to entertain viewers, not to teach them. Ambrosino agreed with this vision. As he often said, ""I hate

[621] "NOVA: Classroom Guide, 1976" PrimeTime School Television, WGBH Archives. 1.
[622] Ibid.
[623] Later, when VHS tapes become popular, *NOVA* would print shorter versions of these guides directly onto VHS boxes. Ibid, 4.

to be taught, but I love to learn."[624] Most importantly, Ambrosino believed that viewers learned through their own curiosity about the natural world. The most important thing was to create thoughtful stories about science that piqued this natural human interest.

Jerome Wiesner, the President of MIT at the time, disapproved of the program's aims. After *NOVA* had been on for several seasons, he visited WGBH's offices to complain.[625] He was concerned that *NOVA* was not aiding science education. Instead, it spent too much time engaging in "politics with a science tinge."[626] He didn't believe it was appropriate for a science educational series to discuss current affairs. *NOVA*'s producers politely listened to him. At the end of the day, however, they maintained their position. As Philip Morrison, one of *NOVA*'s science advisors, put it:

> Television, especially the questing, traveling, serious, honest cameras of *NOVA* take us to the people who do the work. We see them and hear them often disagreeing, often plainly-half wrong and half-right…Even a rerun brings us closer to a scientist in his or her lab, [more] than most books can ever hope to do.[627]

NOVA's staff believed that they introduced viewers to dynamic issues in the pursuit of science. They didn't want viewers to simply learn the basics of science; they wanted to

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[624] Michael Ambrosino, Interview with author, August 2, 2016.
[625] MIT professors were a central force behind a national reform of physics education. John Rudolph, *Scientists in the Classroom: The Cold War Reconstruction of American Science*, (New York: Palgrave Macmillan, 2002), 109.
[626] John Angier, Interview with author, July 29, 2016.
[627] "A Teacher's Guide to NOVA, Fall 1977," WGBH Archives. 3.

show them science in action. They believed that scientific knowledge, delivered in a real-world context, empowered their viewers.

By the time of Wiesner's visit, *NOVA* had experienced a transition in leadership. On the heels of the program's success, in 1976 Ambrosino had also agreed to help Jacob Bronowski prepare *The Ascent of Man* for its American debut. But Ambrosino was exhausted. As the executive producer of *NOVA*, he was always on-call. Ambrosino had worked on *NOVA* since 1971; he needed a break. At a WGBH meeting, he asked David Ives if he could have a paid leave of absence. "My pitch," Ambrosino later recalled, "was that folks who created projects, raised money, hired staff, asserted editorial control of each and every film, would soon find themselves in a state of exhaustion and that some method of refreshment was necessary."[628] When Ives dismissed Ambrosino's request, Ambrosino decided to leave *NOVA.*[629] He chose Angier as his successor.[630]

Angier's former Assistant Producer, Paula Apsell still serves as the current Executive Producer of *NOVA.* After the first decade of production, WGBH developed their own team of home-grown producers. One of its longer legacies was that it helped to create a network of science broadcasters. John Angier and Graham Chedd left WGBH to in 1979 to form their own production company. Together, they produced *Scientific*

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[628] "Michael Ambrosino," *Memories of NOVA,* March 2014, from Michael Ambrosino's personal papers.
[629] After *NOVA*, Ambrosino would continue to produce series for PBS including *Odyssey* (1980), *The Ring of Truth* (1987), *Eyes on the Prize* (1987), and *Journey to the Occupied Lands* (1993). These later films looked at the anthropology, science, race, and social science.
[630] John Angier, Interview with author, July 29, 2016. Graham Chedd, Interview with author, September 13, 2016.

American Frontiers, hosted by actor Alan Alda. Alda was so inspired by his involvement on the program that he and Chedd decided to found a science communication program at Stonybrook University. Similarly, producers from *NOVA*, like Ben Shedd and Cary Lu, would become involved in other programs, like *Cosmos*. Over time, the show's producers have developed *NOVA* into a science educational program, although they still examine controversial news, like water contamination in Flint, Michigan. ("Poisoned Waters," May 31, 2017). By positioning itself as a science show about current affairs, *NOVA* has continued to remain relevant. The production team has expanded to include digital media, like the web series *Gross Science.* Michael Ambrosino believes *NOVA* continues to be successful because it is about storytelling, not science. He explained that a film about the crab nebula, in itself, would not be understood. But, if a filmmaker told the story of the astronomers who studied the nebula, viewers would be intrigued. "We conceived of *NOVA* as a series that would explore and explain the way the world worked," Ambrosino wrote, "We [use] science as a tool, but we primarily think of ourselves as journalists looking for the stories of science."[631]

Unlike earlier television series, like *The Johns Hopkins Science Review and Watch Mr. Wizard*, *NOVA* didn't advertise whiz-bang science to its viewers. The producers of the program saw themselves looking for stories that explored the relationships between science and society. *The Johns Hopkins Science Review* looked at

[631]Sheila Curran Bernard, *Documentary Storytelling: Making Stronger and More Dramatic Nonfiction Films,* (New York: Focus Press, 2007) accessed on February 20, 2018 from Proquest, http://proquest.safaribooksonline.com.ezproxy.princeton.edu/book/video/9780240808758/4dot-approach/science_films?uicode=Incommon-member@princeton.edu.

the sunny side of science; *Watch Mr. Wizard* promoted a warm, fuzzy ideal of the scientist. But, by the 1970s, American viewers were no longer so trusting of traditional pillars of authority. Their television sets reflected nightly images of conflict: anti-war protests, civil rights rallies, and skirmishes happening in other countries. In this moment, an average viewer might have wondered: were scientists as trustworthy as they might have believed? The creators of *NOVA*, through their programs, exposed the complexities that existed within laboratories and governmental organizations. Simultaneously, another group of scientific storytellers believed that they knew another way to affect change in the dynamics between science and society. These actors, educators, and researchers decided to directly collaborate with scientists (and puppets) on a new program: *3-2-1 Contact.*

ILLUSTRATIONS

All images removed due to copyright concern

Fig. 1. David Ives and Michael Rice, the President of WGBH and the Program Manager, respectively. "What makes WGBH crackle with creativity?" *The New York Times,* August 15, 1976.

Fig. 2. The proposed structure of NOVA. Memo from Michael Ambrosino to his production team. February 3, 1973. With permission from the WGBH Archives.

Fig 3. (from left to right) Michael Chalvfour, Michael Ambrosino (center), Simon Campbell-Jones, Ben Shedd, and Terry Rockefeller. With permission from the WGBH Archives.

Fig. 4. Two NOVA camera people wade into the San Francisco Bay to film footage for "Inside the Golden Gate" (1974). Featured in the first NOVA clipbook. With permission from the WGBH Archives.

Fig. 5. An advertisement for "The Plutonium Connection," *Boston Sunday Globe*, March 9, 1975, 17.

CHAPTER FOUR

The Ideal Workshop: 3-2-1 Contact, 1977-1980

On a sweltering summer day in 1972, a young television producer named Joan Ganz Cooney implored a group of men and women at YWCA to understand the power of television. 1972 was a year of political upheaval in the United States. A group of feminists, led by Gloria Steinem, had just established *Ms. Magazine*.[632] Cesar Chavez, a Chicano labor leader, organized pickets in Californian farm fields.[633] In Washington, Congress passed the Equal Employment Opportunities Act of 1972, aimed at preventing the discrimination against women and minorities in the workplace at the time.[634] Joan Ganz Cooney, one of the few women in the United States to lead a major television production company, was sympathetic to these progressive struggles. Throughout 1972, Cooney voiced her frustrations that stereotypes seen on television "cast us in roles that somebody wishes us to play."[635] Now, at the YWCA's Conference on Racial Justice, she argued that it was important for television producers to recognize the power they wielded over determining societal norms. "Our mission, to experiment with the pervasive medium

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[632]Abigail Pogrebin, "How Do You Spell Ms.," *New York Magazine*, October 30, 2011.
[633] Norman Pearlstein, "The Cesar Chavez issue in California," *Wall Street Journal, Nov. 6, 1972.* Retrieved from ezproxy.princeton.edu/docview/133724482?accountid=13314
[634] The EEOC, 'The Law," https://www.eeoc.gov/eeoc/history/35th/thelaw/index.html.
[635] Joan Ganz Cooney, Lecture, American Women in Radio and Television, Luncheon, Hilton Hotel, New York City, New York. February 23, 1972. Box 32, Folder 17, Children's Television Workshop Papers, Special Collections, University of Maryland Libraries, College Park. (Hereafter the Children's Television Workshop Papers).

of television," Cooney declared, "places us squarely in the task of extending that education to all children."[636] She urged her audience to support educational programming that pushed past cultural expectations of race and gender.

Cooney earned her reputation in the television industry creating experimental, groundbreaking programs through her television production company, the Children's Television Workshop. She and a handful of other producers founded the Children's Television Workshop in 1968 to create educational programs for low-income families. Their first television series was *Sesame Street,* a program about a group of colorful puppets and humans living together in a New York City neighborhood. The daily program taught these young children about letters, numbers, and good social manners. By 1972, children across America had fallen in love with these characters; the Workshop, as it was affectionately known, was deluged with fan mail from toddlers who wanted to meet their television friends.[637] The Nielsen Company estimated 80% of all preschoolers in the United States watched *Sesame Street* in the early 1970s.[638] The Workshop followed upon the success of *Sesame Street* with a show called *The Electric Company*, which taught its eight-year-old audience reading fundamentals. Like *Sesame Street*, *The Electric Company* featured a cast of ethnically diverse actors, including future film star Morgan Freeman and Broadway legend Rita Moreno. Joan Ganz Cooney broke new ground by

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[636] Joan Ganz Cooney, "Quality Education for All," YWCA National Convocation on Racial Justice, Americana Hotel, New York City, New York, June 15, 1972. Box 32, Folder 17. Children's Television Workshop Papers.

[637] When the program went into a summer recess, children and adults noticed. One New York Times writer reported that his household was thrown into temporary panic. Robert Berkvist, No 'sesame' was no joke. *New York Times.* June 11, 1972.

[638] Fred Bruning, 'Sesame Street' on the same route.' *Newsday.* 1A. October 23, 1972.

playing with new formats and types of programming. The Workshop mixed cartoons with live-action; entertainment and education. But Cooney also established a new focus on race and gender of her audience. Through ongoing characters like *Sesame Street's* Gordon and Maria, young African American and Hispanic boys and girls saw actors that looked like them on the television screen.

The popularity of *Sesame Street* and *The Electric Company* established the Workshop's reputation as a creator of high-quality, education programs. Ambitiously, the leaders of the Workshop sought to become one of the nation's leading producers of educational television programming. Along with WGBH, the Workshop emerged as one of the key players of the public television renaissance of the 1970s.[639] But, unlike WGBH, the Workshop was a corporation that produced specialized content. As a company, it could focus on a few shows at a time and build a large permanent staff of hundreds. In its first decade, the Workshop, located across the street from New York City's Lincoln Center, became a nurturing environment for writers and children's media specialists.

In 1972, Joan Ganz Cooney sought new avenues of creative expansion, pushing beyond an audience of small toddlers. At the YWCA meeting, she mentioned that the Workshop was interested in helping all children succeed in a "highly technological society." "In a manner of speaking," she remarked, " we consider our efforts – the

[639] For more about the early history of the Children's Television Workshop, read Michael Davis' *Street Gang: The Complete History of Sesame Street,* (Viking, 2008).

production of *Sesame Street* and *The Electric Company* – as experiments in using technology for educational needs."[640] Privately, Cooney and others were starting to discuss creating a show centered on the concept of 'curiosity,' which would help children understand a technological world.[641] Over the next four years, several producers for the Workshop brainstormed ideas for a 'Curiosity Show' with graduate students at Harvard University's School of Education (See Fig. 1).[642] These ideas, carried back from Boston to New York, became the seeds of a new science series. Between 1977 and 1980, the staff of the Workshop diligently assembled a science television series for elementary school children.

3-2-1 Contact, the resulting series, aired in the afternoons on PBS stations nationwide from 1980 to 1988. The program was the first national science series since *Watch Mr. Wizard* to be specifically aimed at young children. Not surprisingly, some of the creators of *3-2-1 Contact* were former fans of *Mr. Wizard*. Both series were about the wonders of science, but the tone and approaches of the shows were really quite different. On screen, a team of older teenagers, not adults, led *3-2-1 Contact*. The series' protagonists visited volcanoes, laboratories, and oceans to interview scientists. Unlike

[640] Barbara Myerson Katz, Interview with author, May 5, 2017.
[641] Keith Mielke and Milton Chen, "Children, Television and Science: An Overview of the Formative Research for 3-2-1 Contact",1981, 5, Box 106, Folder 28, Children's Television Workshop Papers.
[642] The Harvard Graduate Seminars, held during the 1975 and 1976 fall semesters, marked the Workshop's first steps in the creation of a science show. Sam Gibbon, Gerald Lesser, and David Connell used the seminar as an incubator to think through the idea of a science series. A staffer for the Workshop later wrote, "What emerged [from these seminars] was a series which might directly focus on science but which would necessarily include curiosity and inquiry, those attitudes and skills with which the pursuit of scientific information is inextricably bound up." The graduate students' investigation already mimicked the process of the Workshop itself: they generated ideas about proposed content and then tested these ideas among themselves. It was a miniaturized version of the Workshop model.

Mr. Wizard, 3-2-1 Contact featured varied dynamic content. Episodes were interspersed with goofy animated shorts, sketches, and even an on-going mystery serial, "The Bloodhound Gang."

Like the shows discussed in previous chapters of this dissertation, *3-2-1 Contact* provides historians with a glimpse into the creation of a television program. However, unlike the programs discussed earlier, *3-2-1 Contact* was not created by a single individual (*The Johns Hopkins Science Review*) or even a handful of people (*Watch Mr. Wizard* and *NOVA*), but by a company of hundreds. There were three teams within the Workshop: Research, Content, and Production. Each team was responsible for a particular facet of development: the Research Department assessed the show's intended audience, the Content Department designed the program and wrote the scripts, and the Production Department filmed the episodes. The series was not the idea of a single person, but many individuals. On one hand, the Workshop described the company's physical office space in New York City, but the phrase also connoted an mélange of younger and older professionals working together on new television concepts. The idea of the "author" was conceived of collaboratively, or rather, institutionally. When official reports were written, credit was typically given to the department, not to the individual. Each departmental team would think, act, and collaborate as part of the Workshop.

The papers of the Children's Television Workshop tell a textured story of creation. A uniquely bureaucratic infrastructure left behind a wealth of materials to

recreate conversations and debates about *3-2-1 Contact*. (The materials from other science television collections are rarely so descriptive.) Additionally, the materials provide insight into the relationship between the Workshop's staff and outside advisors (educational, creative) who were recruited to help them create a program. Many studies of scientific celebrity have helped us bring the lives of individual science communicators into focus; it is much more rare that historians are able to look closely at the ways that production companies have constructed their own expertise.[643] *3-2-1 Contact* suggests that the Workshop cultivated alliances with scientific experts, invested resources into creating new knowledge about expertise, and sought validation from the scientific community itself. This chapter investigates three years of pre-production by looking into four distinct moments in production. Each part of the chapter encapsulates an instance where a different set of professionals demonstrated their particular expertise.

The first episode analyzes the Workshop's inaugural meeting about its future program, a three-day workshop at an opulent Long Island mansion, in April 1977. Bringing together educators, academics, writers, and television producers for an open-brainstorming session, they shared a common expertise: years spent studying science education and science communication. All were invited to share their insights; however established academics still dominated the conversation. But at this early stage of development, almost every idea was entertained. Yet, even in the beginning, the

[643] Historians of communication frequently write books about the history of television and movie production studios, such as MGM, Warner Brothers. Nicholas Sammond's *Babes in Tomorrowland* explores how Disney branded his corporation as leaders in child-development and education. Similarly, David Kirby's *Scientists in Hollywood* describes the role of science advisors for various major film projects, like *2001: A Space Odyssey*.

Workshop (represented by Cooney and others) maintained ultimate veto power to reject ideas that ran counter to their identity as a production company.

The second moment occurs in the middle of the Workshop's unique production process. Leaping ahead to April of 1978, a year after the conference, the Research Department created a comprehensive survey of children's television viewing habits. This was a groundbreaking study. At the time, no other science television production company had attempted to interact and understand their viewers before a broadcast. The Workshop learned how young children conceptualized scientists. The researchers of the Workshop contributed their own expertise to the project: an understanding of the child's perspective. The Research Department's work deepened the Workshop's credibility as a science communicator.

The third moment happens in the swirling conversations of the writer's room. The Research Department's experts told the Workshop what audiences wanted to see. The Content Department transformed statistics into actual scripts. During the summer of 1978, the writers of the Workshop drafted the premise of the series. Their collective notes demonstrate an unquantifiable type of expertise: artistic creativity. A glimpse at the letters and memos circulated by the members of the Content Department demonstrates how professional writers dream up a science series.

The conclusion of the chapter occurs in a conference room on December 16, 1979, one month before the premiere of the series. Once again, a group of academic experts met with members of the Workshop. This time, they shared expertise with the Workshop staff. With the premiere of *3-2-1 Contact,* the Workshop was poised to be the experts on a new type of children's programming. Newspaper reviews for the program hailed the success of the science series. Their science advisers approved and validated their work. The Workshop had gained recognition as a generator of science communication.

The Glen Cove Conference, April 1977

In February of 1977, the Workshop started to ask sponsors to fund a nine-month feasibility study for a science series. By this point, they decided that their ideal viewer was a child between the ages of eight and twelve.[644] It was around this age, they reasoned, that the child began to formulate assumptions about role models and the world around them. "Television, the non-threatening teacher, can help break down some of the cultural stereotypes about science," they claimed.[645] It was the perfect age for educators to shape children's ideas about science. Although the Workshop hadn't fully conceptualized the format, style, or content of the series, they decided that they wanted daily, half-hour programs.[646] They hoped it would be broadcast in classrooms.[647]

[644] "Towards a Daily Science Series for Children," February 1977, 5, Box 102, Folder 1, Children's Television Workshop Papers.
[645] Ibid.
[646] Ibid, 7.
[647] Ibid.

As part of the feasibility study, Joan Ganz Cooney assembled a group of educators, scientists, writers, academics and Workshop producers to brainstorm content for a science series for children. The first meeting was held at a three-day retreat in early April of 1977.[648] The workshop was held at an old mansion in picturesque Glen Cove, New York.[649] During the 'seminar,' participants debated the best techniques for a science show. Cooney called for their science show to be experimental and edgy.[650] One of the subjects of debate was just 'what sort of science' the show would talk about. Clark Gesner, best known as the writer of Broadway's hit show *You're a Good Man, Charlie Brown* wondered if the show would present a serious look at science, or just the usual 'gee-whiz' material.[651] Robert Jahn, Dean of the Engineering School at Princeton University, pondered whether a television show should push kids to pursue scientific careers.[652] Judah Schwartz, a professor of Education at Harvard University, suggested, "it was important to exhibit the unsolved problems [of science]."[653] Janet Browne, the head of the American Association for the Advancement of Science's Office of Opportunities in Science, stressed that the show should emphasize the utility of science because she felt that it would attract people who thought science was dull.[654]

[648] Cooney had learned about the value of conducting workshops of experts during her first television series. Sesame Street, similarly, arose after a series of seminars held at Harvard University. Davis, *Street Gang,* 139.
[649] Report on Science Series Curriculum Conference, April 1-3, 1977, 43, Box 102, Folder 2, Children's Television Workshop Papers.
[650] Ibid, 2.
[651] Ibid, 5.
[652] Ibid. 6.
[653] Ibid, 8.
[654] Ibid, 9.

The importance in presenting 'everyday' science was echoed by Phil and Phyllis Morrison, a scientific couple in attendance. Phil Morrison was a physicist at MIT and as one of J. Robert Oppenheimer's former graduate students, who had been a key player in the Manhattan Project before denouncing nuclear weapons and becoming a vocal disarmament activist. He also became a well-known popularizer of science in the 1970s through his regular book review column in *Scientific American*.[655] A personal friend of Michael Ambrosino, Phil served as an adviser on *NOVA*.[656] Phyllis was a science teacher and had helped run studies on science education for elementary students in New Jersey.[657] They were a team.[658] A Workshop memo noted that Phil would only work on the science series if Phyllis was invited.[659] In Boston, Massachusetts, where they lived, the Morrisons handed out children's books every year at Halloween.[660] Phyllis advised the seminar participants to avoid the use of the phrase 'science literacy,' emphasizing the importance of 'everyday science' in a science serial. Literacy was too limiting a word and excluded a child's visual and spatial understanding of science. "Science is two different things," she suggested, "making mud pies and reading the science section in *TIME*."[661] Phyllis proposed that the program needed to include real

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[655] Dennis Overbye, "Philip Morrison, 89, Builder of Atom Bomb, dies," *The New York Times*, April 26, http://www.nytimes.com/2005/04/26/science/philip-morrison-89-builder-of-first-atom-bomb-dies.html.
[656] Michael Ambrosino, Interview with author, August 1, 2016.
[657] Charles Walcott, Interview with author, April 14, 2017.
[658] The Morrisons' papers are held at the Massachusetts Institute of Technology Institute Archives and Special Collections.
[659] Gerald Lesser to Joan Cooney et al., "Recommendations for Members of Science show Board of Advisors," October 2, 1978, Box 102, Folder 20, Report on Science Series Curriculum Conference, April 1-3, 1977, 43, Box 102, Folder 2, Children's Television Workshop Papers.
[660] Michael Ambrosino, Interview with author, August 1, 2016.
[661] Report on Science Series Curriculum Conference, April 1-3, 1977, 5, Box 102, Folder 2, Children's Television Workshop Papers.

examples of problem solving.[662] She also recommended that the program "sing the praises of being wrong" and urge children not give up when solving experiments. "If the show can get across the importance of being courageous about being wrong," Phyllis explained, "it will affect the child's life in all spheres."[663]

Phil Morrison additionally suggested that the series needed to stress that science was a dynamic discipline. Ideally, the show would prompt students to ask, "What kind of knowledge am I talking about? How can I find out about it?" He believed, too, that the show should include some discussion of the social implications of science. Morrison wryly observed that while, "Superman never has to confront the scientific problems that his super powers entail, scientists do."[664] Morrison believed that the series should not separate science and technology. Instead, it should present "the tissue of science as a whole."[665] Morrison thought that many austere scientific texts offered students colorless accounts of science. In an article on science pedagogy, Morrison wrote, "The books and journals of science are more serious, more ponderous, than are the living men and women in their real laboratories.[666] The Morrisons urged the Workshop to craft a lively, engaging television series that would be welcoming to children, regardless of their personal interest in science.

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[662] Ibid., 9.
[663] Ibid.,14.
[664] Ibid.
[665] This quote was used in the official proposal and it's from an article written by Morrison. See "A Children's Television Series about Science and Technology" October 15, 1977, 7, Box 102, Folder 3, Children's Television Workshop Papers.
[666] Ibid., 9.

Just as influential as the Morrisons, Sheldon White, a professor of Psychology at Harvard University, offered the Workshop staff his own opinion on the ideal science series. As a development psychologist specializing in childhood, White believed that eight year olds were just beginning to be interested in science. He suggested that a science show could try to help young children understand patterns in science:

> The child begins to dimensionalize at around age four. He is interested in extremes ("opposites"). A little later he begins to realize that in order to be "opposite" things have to have something in common.[667]

White suggested a topical approach that separated scientific subjects into simple binaries ("Hot"/"Cold", "Big/"Little"). Arthur Livermore, of Princeton University, disagreed with this approach. He believed it was important for the show to be as miscellaneous as possible in order to teach students to build their own connections.[668] But, over the ensuing days of the workshop, White's approach gained traction. A topical approach, seemingly, would directly connect children to the science within their world. This, in turn, would demystify the world of scientists.

Additionally, the writers, producers, and science advisers on the program struggled to come to terms with the show's intended genre. In the opening address of the conference, Joan Ganz Cooney suggested the importance of incorporating science fiction into the program. She told participants that they should be able to plug into kids' interest

[667] Report on Science Series Curriculum Conference, April 1-3, 1977, 7, Box 102, Folder 2, Children's Television Workshop Papers.
[668] Ibid., 9.

in science fiction, bionics, the occult, and so on and still deal honestly with science.[669] Yet, as Carol Hantman, the official transcriber of the conference noted, Cooney's reassurances couldn't quell the uneasiness of the Workshop's producers. Gingerly, they noted that many children were interested in 'the occult.'[670] As the Research Deparment's studies would later confirm, many young children enjoyed watching documentaries that blurred the lines between real and non-real, like Alan Landsburg's *In Search Of* and *Ancient Astronauts.* Perhaps fiction could be used, if it was clearly demarcated as such. Some experts argued that it was important to include 'para-science' in the show. As Carol Hantman noted in her transcription:

> If the primary object of the series is to teach the child to question the basis of his belief, why not allow him to exercise his skepticism and in fact, urge him to do so by presenting these subjects in such a way that belief without evidence is made very difficult? [671]

Although writers and scientists agreed that paranormal science should be portrayed negatively, they couldn't comes to agreement about what they thought of science fiction.

Long before *3-2-1 Contact* was even a glimmer in Cooney's eye, the Workshop had been committed to ending educational inequality for all children. Cooney started *Sesame Street* to provide a preschool-like atmosphere for children whose parents couldn't afford preschool.[672] Cooney understood that children without access to education would

[669] Ibid., 5.
[670] Ibid., 36.
[671] Ibid., 39.
[672] Davis, *Street Gang*, 65.

doubt their own self worth.[673] Non-white children were especially left behind. As Cooney remarked at a luncheon in 1972, "We know that the so-called disadvantaged child, in particular, needs help. This is the child of the inner city, or the Appalachian Mountains, the child of the Chicano and Puerto Rican barrios, or the Indian reservation…"[674] The Workshop was especially sensitive to being an inclusive environment and explicitly recruited staff members from minority groups.[675] Many members of the staff fervently believed in the importance of supporting historically under-represented populations. Gerald Lesser, a Harvard professor at the School of Education and the Chairman of the Workshop's Advisory Committee, contextualized the Workshop's ethos. He commented in a recollection of the early years, "Most of us who lived through the late 1960s in the United States remember it as a time of pain and disruption."[676] Some were even directly involved in the struggles of the Civil Rights Movement. Joan Ganz Cooney's husband was part of a New York-based advocacy group to end discriminatory hiring practices.[677] The producers and writers of the Workshop felt they had a moral prerogative to help support children from poor, underrepresented communities. Edward Palmer, a director of *Sesame Street*'s Research Department later recalled, "In specific and palpably human terms, we [wanted to] measurably enhance the

[673] Joan Ganz Cooney, Lecture, Matrix Table Dinner, Philadelphia Professional Chapter of Theta Sigma Phi, Philadelphia, Pennsylvania. March, 23, 1972, Box 32, Folder 17, Children's Television Workshop Papers.
[674] Ibid.
[675] A 1979 memo worried that they weren't compiling with the spirit of equal opportunity; only 38% of their permanent staff could be classified as minority, but most of the positions were filled. 18% of the Science Staff identified with being minorities. Keith Mielke to Dave Connell. Memo, November 26, 1979, Box 102, Folder 24, Children's Television Workshop Papers.
[676] Shalom M. Fisch, ed., *"G" is for Growing: Thirty Years of Research on Children and Sesame Street, Mahwah,* NJ: Lawrence Erlbaum Associates, 2001), 26.
[677] Michael Davis, *Street Gang: The Complete History of Sesame Street,* (Viking, 2008) 137.

life chances of millions of educationally deprived youngsters."[678] Many members of the Workshop believed that *Sesame Street* and *The Electric Company* had improved the quality of education for poor, inner-city children.

So, from the beginning, the creators of *3-2-1 Contact* wanted to create a science series that would appeal to children from a variety of ethnic and socioeconomic backgrounds. As they noted in that very first conference, "It has already been stated that the pre-dominant stereotype of the scientist is a white male; unfortunately this has been largely borne out by fact."[679] According to a 1974 study by the National Science Foundation, only 2.6% of all scientists in the United States were either Black or Hispanic.[680] Most of the Workshop was eager to address this problem directly in the series. Some suggested the television program should directly address why the scientific community had discriminated against certain groups.[681] As a writer in the Production Department noted,

> The use of role models is not enough. You can't make Galileo or Newton a woman. You can't dress Einstein in a skirt….There is an entire socialization process involved and it is this which has to be revealed and attacked.[682]

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[678] Fisch, *G is for Growing,* 4
[679] Report on Science Series Curriculum Conference, April 1-3, 1977, 41, Box 102, Folder 2, Children's Television Workshop Papers.
[680] "A Children's Television Series about Science and Technology," October 15, 1977, 4, Box 102, Folder 3, Children's Television Workshop Papers.
[681] "A Children's Television Series about Science and Technology," October 15, 1977, 41, Box 102, Folder 3, Children's Television Workshop Papers.
[682] Unknown to Sam Gibbon, "When I walked into that roomful of people…", undated, 3, Box 103, File 33, Children's Television Workshop Papers, Special Collections, University of Maryland Libraries, College Park.

Some writers at the Workshop believed that it was important to discuss how women and minorities had been actively blocked from 'assuming a powerful role' in science.[683] To support their efforts, the Workshop actively recruited Black, Hispanic, and Asian scientists for the show's advisory committee.[684] They even organized a Bilingual Committee to understand how Spanish might be incorporated into the program.[685]

Ironically, while the Workshop was committed to the idea of ultimate inclusion, some of the scientists present at Glen Cove were concerned about the effects of such a series.[686] An over-eager university system had produced too many physicists in the 1960s and 1970s. There weren't enough jobs for a new generation of young physicists. 1,053 physicists competed for just 63 non-academic openings in 1971.[687] If children watched the program, would they all want to become scientists? At the end of the Glen Cove workshop, the official transcriber noted that some were worried whether it was irresponsible to encourage children to become scientists, given "the scarcity of jobs in the area."[688] They fretted about encouraging students to pursue a field with no opportunities. Even after the Glen Cove conference, they debated with writers about the ethics of falsely encouraging children (including some, they contended, who would have no aptitude) into

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[683] Ibid.
[684] Keith Mielke to David Connell, "October-November Management Report, 3-2-1 Contact," 4 November 26, 1979, Box 102, Folder 5, Management Meetings and Reports, January 1979-December 1982, Children's Television Workshop Papers.
[685] Ibid., 5.
[686] Ben Shen, a professor in astronomy at the University of Pennsylvania is identified with this view. Still many scientists, like Content Director Charlie Walcott, believed in the importance of scientific inclusion.
[687] David Kaiser, "Cold War requisitions, scientific manpower, and the production of American physicists after World War II," *HSPS* 33 (2002): 151.
[688] Report on Science Series Curriculum Conference, April 1-3, 1977, 42, Box 102, Folder 2, Children's Television Workshop Papers.

a scientific career.[689] "The show should by all means try to get attention of women and minorities," one scientist said:

> but keep in mind the scarcity of jobs in science. Give them information that they can use immediately (i.e. nutritional and medical information, things of particular interest to disadvantaged kids and their families).[690]

Presumably, women and minorities might have been interested in science, but they would never be able to join a scientific institution, these science advisers reasoned. It would be more immediately helpful if they redirected their focus to helping out their families. While such a comment was not directly racist or misogynistic, it comes across as elitist. As they helped the Workshop draft their official proposal in the fall of 1977, some science advisers urged them to tone down the career focus. Indeed, one draft of the proposal suggested, "The show is not career oriented and does not intend to influence children to take up science as a life-work."[691] Ostensibly, scientists were concerned about encouraging students to join the already hyper-competitive professional field, but, in my opinion, their concerns also read as paternalistic.

Still, the producers and writers pushed back. The Workshop's intentions were clear: *3-2-1 Contact* sought to inspire future scientists. As Kathy Mendoza, the series' executive producer later said:

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[689] "Proposal: A Children's TV Series About Science and Technology" with attached notes," October 15, 1977, 15, Box 102, File 15, Children's Television Workshop Papers.
[690] Report on Science Series Curriculum Conference, April 1-3, 1977, 13-14, Box 102, Folder 2, Children's Television Workshop Papers.
[691] "Become a perceptive observer…", no date, 35, Box 102, Folder 15, Children's Television Workshop Papers.

> We wanted to show [our viewers] people they might like to grow up to be. If you're a girl and see a woman on camera – a laser physicist and she's intelligent and competent and enjoys her work – then you might entertain that as a possible option. We wanted to show that there are many different kinds of jobs you can be doing when you grow up. [692]

The creators of *3-2-1 Contact* wanted their show to inspire students to become active participants of professional science, not just passive consumers of technology. They reassured their scientific consultants that not all students would want to become scientists. (One writer remarked that religious conviction hadn't created too many priests).[693] Optimistically, the writers reminded their scientific colleagues that today's children would come of age in the 1990s, which would be a time of better economic fortune than the mid-1970s.[694] Additionally, while individual professors worried about the fates of their future graduate students, national professional organizations encouraged the Workshop. The National Science Foundation (NSF), a main sponsor of the series, wanted more students to go into science. One of the primary objectives of the NSF's Public Understanding of Science Program was to encourage women and minorities to become professional scientists.[695] As the director of the American Association for the Advancement of Science's Office of Opportunities in Science, Janet Browne sent the Workshop staff articles and materials to help them brainstorm ways to help connect to

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[692] "Interview: The Research Behind the Scenes of 3-2-1 Contact" *CTW International Research Notes*. Box 102, Folder 7, Children's Television Workshop Papers.
[693] Loose notes, undated, Box 102, Folder 17, Children's Television Workshop Papers.
[694] Report on Science Series Curriculum Conference, April 1-3, 1977, 42, Box 102, Folder 2, Children's Television Workshop Papers.
[695] George Tressel to Ms. Marjorie Bell Chambers, Feb 27, 1979, Box 102, Folder 19, Children's Television Workshop Papers.

different communities.[696] Members of the Workshop's executive committee understood the vital nature of a pre-collegiate science series. They knew that a science series, aimed at young children, was important because it allowed students to be tracked into higher level science course in middle school, allowing them to jump into a scientific career.[697]

Interestingly, the Workshop's decision to emphasize career readiness in a television program set it apart from previous science series productions. As discussed in previous chapters, shows like *The Johns Hopkins Science Review* and *Watch Mr. Wizard* championed the importance of everyday science and encouraged viewers to investigate the science that happened in their homes. Science communicators in the 1950s believed that viewers who understood everyday science would become good citizens. They thought that educated viewers would become strong consumers of new technological products.

But where *The Johns Hopkins Science Review* and *Watch Mr. Wizard* promoted science as a fun hobby and scientists as valued professionals, science communicators of the 1970s pushed children to become scientists. The charming rhetoric of everyday science had worn thin. University professors like MIT's Gerald Zacharias found the

[696] Newspaper clippings, "Minorities in Science," June 1976 – August 1978, Box 103, Folder 3, Children's Television Workshop Papers.
[697] Edward L. Palmer, *Television and America's Children: A Crisis of Neglect*, (New York: Oxford University Press, 1988) 14.

pedagogy of everyday science banal.[698] Additionally, laboratories were no longer envisioned as isolated centers of knowledge. *NOVA* broke this new ground, in part, by showing viewers 'behind-the-scenes' episodes of industrial and university research laboratories that portrayed them realistically (cramped spaces, under funded). They were not imagined islands of pure science. *NOVA'*s producers introduced viewers to the idea that science was a political enterprise. By interviewing graduate students and postdocs, in a casual atmosphere, *NOVA*'s producers highlighted that scientists were normal humans. Additionally, a new wave of physics and biological textbooks in the 1960s had deemphasized the importance of understanding the practical applications of science. National educational reforms, pushed forward by university professors of physics, replaced discussions of everyday science in the high school classroom with more introductions of theoretical physics concepts.[699] In earlier generations, everyday science was conceived as the ideal way to introduce children to scientific basics. But, by the 1970s, science educators and television producers were in agreement. In order to get ahead in science, young children needed to understand the professional structures of scientific thought. It was no longer enough for a child to be amused at the buoyant blobs of oil in a water glass. Instead, it was more important for that child to learn about the fundamental properties of oil and water. Mr. Wizard, the friendly actor-turned-scientist, wasn't qualified to teach science to his young audience. Instead, children needed to see an actual scientist at work in a laboratory. Science communicators believed that children

[698] John Rudolph, *Scientists in the Classroom: The Cold War Reconstruction of American Science Education*, (Palgrave, 2002), 116.
[699] Ibid., 182.

didn't want to become scientists because they were entertained by scientific antics. Children became scientists because real scientists inspired them.

By the end of the Glen Cove conference, the visionaries of the Workshop had started to conceptualize what a new program could look like. Their television program would serve three main goals. First, it promised that it would inspire children to enjoy scientific exploration. Secondly, it would familiarize students with new styles of scientific thinking. Finally, and perhaps most importantly, it would help children, especially from ethnic and racial minorities, to "recognize science and technology as a cooperative human endeavor open to their participation."[700] The conference had brought together a group of well-regarded science educators and communicators. While experts like the Morrisons hadn't dominated the conversation, their concerns and ideas had greatly shaped the Workshop's vision. The inclusion of these experts early in the production process was two-fold. Clearly, the Workshop benefitted from expert advice and the Glen Cove attendees enjoyed their new association with an esteemed television production company. Additionally, by hosting the conference, the Workshop established itself as a player in the science education community. At this moment in the production of *3-2-1 Contact,* the Workshop began to position itself as a new type of authority about media and science for all children.

The Research Department's Evaluations, Spring 1978

[700] "Proposal: A Children's TV Series About Science and Technology," with attached notes, October 15, 1977, 2, Box 102, File 15, Children's Television Workshop Papers.

A key component of the Workshop's educational programing was its capacity to conduct ongoing independent research. As an official history of the Workshop explained, "CTW researchers work with the production staff and outside experts to determine program elements that will combine appeal and educational effectiveness."[701] The Workshop was the first media corporation to house an onsite research staff. Joan Ganz Cooney later remembered that her established colleagues in the industry ridiculed her for creating an in-house research department. "Researchers helping producers design a show? You must be kidding!", she was told from "practically everyone in TV willing to give an honest opinion."[702]

In the 1970s, established television dogma held that a successful show depended on the intuition of an experienced staff, not the facts and figures of audience surveys. But the 1970s also marked a flurry of new sociological studies about children and television. Following their British colleagues, American sociologists were conducting new studies that conceptualized television as just one of many socializing agencies.[703] For the first time, social scientists started to observe children in classrooms, not laboratories. They paid attention to variables like a subject's race, gender, and socioeconomic class. Following a wave of new academic research, they started to ask questions to understand how television viewing impacted African American children.[704] Similarly, sociologists

[701] "Towards a Daily Science Series for Children," February 1977, 5, Box 102, Folder 1, Children's Television Workshop Papers.
[702] Fisch, *"G" is for Growing,* xi.
[703] Carmen Luke, *Constructing the Child Viewer: A History of the American Discourse on Television and Children, 1950-1980*, (New York: Praeger, 1990), 173.
[704] Ibid., 180.

finally asked questions about gender and television. The first group of studies about depictions of women in the mass media appeared in 1974.[705] Researchers discovered most Saturday morning cartoons showed women as nagging housewives and "dumb blondes." Many parents worried how those negative images would affect children. For educators and sociologists, *Sesame Street* stood out as a 'pro-social' program that encouraged good behavior. [706] These educational professionals also respected *Sesame Street*'s unique, research-based style of television production.

The Workshop's approach was based on an informed feedback loop between writers, researchers, and directors. As Gerald Lesser, the chairman of the program's Advisory Board, explained, "Where the ultimate purpose of basic research is typically to expand our understanding of mental or physical processes, the ultimate purpose of formative research is to inform the creation or revision of a product."[707] As the media was produced, it would be tested in actual classrooms for appeal and comprehension using a system of interviews and questionnaires. If children disliked a particular character, for instance, that would be reported back to the Workshop staff. The character might be rewritten or recast. Then, the episode would be rescreened in the classroom. If this version met an audience's approval, it would be aired on national television. As Cooney put it, "We were suggesting a kind of informed luck, or at the very least, that luck's role be lessened by something more akin to science."[708]

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[705] Ibid., 197.
[706] Ibid., 276.
[707] Fisch, *"G" is for Growing,* 41
[708] Ibid., mxii.

Four individuals comprised the Workshop's Research Department. A former professor of communications at Indiana University, Keith Mielke served as the Executive Director of *3-2-1 Contact* and he was in charge of the research staff. [709] All three of his associates were professionals: Milton Chen, Hylda Clarke, and Barbara Myerson Katz (See Fig. 2a and 2b).[710] Chen and Myerson Katz had met earlier at Harvard, while Myerson Katz was a graduate student and Chen was an undergraduate. The three young researchers got along very well. Officially, they worked on the third floor of the Children's Television Workshop office building, but they spent a lot of time on the road, traveling to different elementary school classrooms, YMCAs, and community centers in the New York area. As a diverse trio (Chen was Asian-American, Myerson Katz was Jewish, and Clarke was African-American), they quickly dubbed themselves 'the Mod Squad of research.'[711] It was a playful reference to a then-popular television show called The Mod Squad, which featured a multi-ethnic trio of police officers. A former university professor, Mielke proved a generous mentor for the young researchers. Myerson Katz remembered:

> It was almost like being in another graduate program. And that's kind of how Milton and Hylda and I were with Keith, because he was the professor, and it was almost like we were his graduate students.[712]

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[709] Joan Ganz Cooney to All CTW Staff, November 6, 1978, Box 102, Folder 19, "Towards a Daily Science Series for Children," February 1977, 5, Box 102, Folder 1, Children's Television Workshop Papers.
[710] Barbara Myerson Katz, Interview with author, May 5, 2017.
[711] Ibid.
[712] Ibid.

The Workshop was an exciting place for a young creative professional in the 1970s. Frequently, a researcher or a writer would be hired on a temporary basis and then become a permanent staff member when a position opened up. Although each show (*Sesame Stree*t and *The Electric Company*) had a separate research team, they frequently met for lunch and strolled together through Central Park. The Research staff spent long nights together tabulating data and graphing assessments by hand. Women were valued as equal participants and co-creators. Myerson Katz was impressed that she never felt like 'the only woman' in the room. The Workshop, she remembered, "practiced the principles that they infused into their programs."[713] Additionally, many people on the staff were young parents; they felt honored to be able to create another high-caliber series like *Sesame Street.*

After the science series was officially proposed, Cooney assigned the Research Department to investigate existing science programs which could provide insights into what the target audience found appealing and comprehensible in order to inform development of the Workshop's planned series. In the summer of 1977, the Research Department began to design studies to assess children's preexisting attitudes about science; especially concerning science films and TV shows. That summer, a new movie captivated their core audience: *Star Wars.* Myerson Katz remembered the first time that she heard about *Star Wars.*[714] She, Mielke, and Chen were walking down Broadway, around 72nd street. They spotted a giant billboard advertising the movie; it was striking.

[713] Ibid.
[714] Ibid.

She recalled, "Keith pointed to the sign and said, 'That's what we're competing against. We have to get the attention of an audience that's going to see that in the movies." The movie, which premiered weeks later, featured then state-of-the art cinematic special effects, like talking robots and fast-moving spaceships. With a fraction of the budget, the Workshop wanted to convince eight to twelve year olds that real science could be just as cool as the Force.

In one study, conducted in early 1978, the team looked for qualitative data measuring children's bias towards scientists. They surveyed 200 children, grades 4 to 6, in an elementary school in western New York.[715] 200 children were asked to write essays about science – they could either describe the reasons why they might want to be a scientist or imagine the average day in the life of a scientist. In a later report, the Research team reported that, "Many children respected scientists for their contributions to humanity, especially for finding new cures for disease and inventing new things."[716] But, overwhelmingly, students believed that science was an intellectually exhausting, dangerous, and demanding career. One boy wrote, "I would not like to be a scientist because I would not like to do what they do. They get up early in the morning."[717] Students only expressed some interest in learning about the human body. Researchers noted that gender didn't seem to matter; neither boys nor girls were particularly interested

[715] "Research Report #14 Analysis of Essays written by Target Audience Students in Western New York," April 28, 1978, 2, File 18, Box 106, Children's Television Workshop Papers.
[716] Keith Mielke and Milton Chen, "Children, Television and Science: an overview of the formative research for 3-2-1 contact," 12. Box 106, Folder 27, Children's Television Workshop Papers.
[717] Ibid., 73.

by science.[718] Discouragingly, most students saw scientists as "very narrow human beings who spend their lives in labs and have little social interaction."[719] They described scientists as older men wearing white lab coats, hunched over their laboratory equipment.[720] For the Research Department, these results emphasized that most children didn't feel comfortable imagining themselves as future scientists.

The Research Department decided they wanted to hone their understanding of children's affinities by creating a questionnaire to assess popular children's television programs. This information would also allow researchers to learn about their audience's viewing habits. Their magnum opus was "The Television Interest Survey."[721] For "The Television Interest Survey," researchers chose twenty then-popular television programs, selecting shows with a variety of formats, genres, and intended audiences. These included: *Wild Kingdom, NOVA, Jacques Cousteau, The Six Million Dollar Man, Star Trek, Donnie and Marie, Saturday Night Live, The Muppet Show,* and *ZOOM!.* The Television Interest Survey was sent out to classrooms in Massachusetts, Mississippi, Virginia, Illinois, and California; 4,148 children completed the questionnaires.[722] Researchers hoped the selection of states would encompass not only geographic but also ethnic and economic diversity. About half of the black children in the study came from

[718] "Research Report #14 Analysis of Essays written by Target Audience Students in Western New York," April 28, 1978, page 2, Box 106, Folder 18, Children's Television Workshop Papers.
[719] "Children's Science Series Project: Background Report on Project Activities, January-October 1978", December 1978, 12, Box 102, Folder 4, Children's Television Workshop Papers.
[720] Milton Chen, *A Review of Research on the Educational Potential of 3-2-1 Contact: A Children's TV Series on Science and Technology*, January 1984, 14.
[721]Keith Mielke and Milton Chen, "Children, Television and Science: an overview of the formative research for 3-2-1 Contact," 57. Box 106, Folder 27, Children's Television Workshop Papers.
[722] Keith Mielke, Milton Chen, Barbara Myerson Katz, Hylda Clarke, "Survey of Television Viewing Interests Among Eight-To-Twelve Year Olds, October," 1978, 15, Children's Television Workshop Papers.

Jackson, Mississippi; Most of the Latino viewers were from Chicago.[723] Each questionnaire came complete with a picture from each of the series and pictorial stick figures to identify response options. Students could either say that they had never heard of the show, chose to ignore it, or chose to watch it (See Fig. 3). This way, the team hoped, their results would not be obscured by the literacy of their subjects. The Research team designed the test to be completed in just 20 minutes. By May 1978, the results were in.[724] For simplicity's sake, I've recreated just two of the many charts included in the reports.

Popular Television Programs for All Children

Top Programs for Girls (51% of the Sample) [725]	Top Programs for Boys (49% of the Sample) [726]
Little House on the Prairie	*Spiderman*
Eight is Enough	*Star Trek*
I Love Lucy	*Black Sheep Squadron*

One of the first things that the Research Department learned was that girls and boys seemed to be interested in different types of programs, skewed by gender preferences. According to the results, many more boys than girls watched science and

[723] Ibid., 11.
[724] Children's Television Workshop: A Progress Report and Proposal for Production and Delivery of a New Children's Television Series about Science and Technology, March 1, 1979, 7, Box 102, Folder 4, Children's Television Workshop Papers.
[725] Keith Mielke and Milton Chen, "Children Television and Science: an overview of the formative research for 3-2-1 Contact", September 1981, 58, Box 106, Folder 28, Children's Television Workshop Papers.
[726] Ibid., 59.

science fiction shows.[727] Girls favored programs centered on human relationships and strong female leads.[728] Surprisingly, girls quite enjoyed *Charlie's Angels.* This surprised the researchers, because *Charlie's Angels* was an action show. Furthermore, the series, which starred three, attractive women as private investigators, was aimed at teenage boys. As Myerson Katz observed:

> Girls at the time would tell us that they really liked those characters because they knew how to defend themselves and could figure things out. These young girls recognized confidence. They didn't see it as sexist. What they saw was women doing cool stuff.[729]

Clearly, the researchers observed, these young girls were looking for role models on television. Boys watched shows with action, competition, and physical endurance.[730] The questionnaire also kept track of race.[731] Black viewers liked watching comedies featuring black families.[732] Besides that, kids mostly watched the same things, regardless of race. Age was also a factor; third and fourth graders liked *The Brady Bunch;* their companions in fifth and sixth grade preferred *Three's Company* (a situation comedy aimed at adults).

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[727] Ibid., 30.
[728] According to a separate CTW survey, they cited *Dallas*, *Love Boat*, and *Baby I'm Back* as favorites. "Formative Research Report #13: Studio See," April 11, 1978, Box 106, Folder 18. Also "Children Television and Science: an overview of the formative research for 3-2-1 contact, 63.
[729]Keith Mielke and Milton Chen, "Children Television and Science: an overview of the formative research for 3-2-1 Contact", September 1981, 127, Box 106, Folder 28, Children's Television Workshop Papers.
[730] Keith Mielke, Milton Chen, Barbara Myerson Katz, Hylda Clarke, "Survey of Television Viewing Interests Among Eight-To-Twelve Year Olds," October, 1978, 63, Box 106, Folder 15, Children's Television Workshop Papers.
[731] 11% of the children were black and 14% were Latino.
[732] Ibid., 101.

Overall, everyone's favorite show was *Happy Days* (a family oriented situation comedy set in the 1950s).[733]

Awareness of Science Programming, Boys vs. Girls, Percent Responding, "I have never heard of this show"

Show	Boys	Girls
Wild Kingdom	11%	15%
Animals, Animals, Animals	19	22
In Search of	36	49
Jacques Cousteau	57	72
NOVA	72	78

The bad news: kids didn't like watching science on television. Most of the kids surveyed had never heard of the four science shows placed on the list (*Jacques Cousteau*, *Wild Kingdom*, *Animals, Animals, Animals*, and *NOVA*).[734] Of these*, Wild Kingdom* was the most popular science show; *NOVA* was at the bottom of the list.[735] Even *In Search Of*, a show that seriously considered UFOs and was hosted by *Star Trek* actor Leonard Nimoy, was more popular than *NOVA*.

[733] Ibid., 43.
[734] Keith Mielke and Milton Chen, "Children Television and Science: an overview of the formative research for 3-2-1 Contact", September 1981, 61, Box 106, Folder 28, Children's Television Workshop Papers.
[735] Ibid,. 65.

The research staff took several insights away from these studies. The fact that science-related shows were much more popular among boys than girls, Chen, Clarke, Myerson Katz, and Mielke wrote, reaffirmed the importance of creating an inclusive science program for all. Additional, separate studies conducted by the team confirmed that boys and girls seemed to like shows with dramatic narratives.[736] Two studies established that documentaries with strong visuals and clear narration could hold children's attention.[737]

Researchers also used the surveys to imagine ideal characters for a science show. Noting that Latino and Black viewers seemed to like watching shows featuring same-ethnic group actors, the Research Department suggested the potential appeal of same-ethnic group cast members as role models.[738] Most studies suggested that children seemed to 'root for' younger characters.[739] They also loved characters like *Happy Day'*s Fonzie and *Mork and Mindy*'s Mork, who were funny without seeming 'corny.'[740] They liked conventionally attractive leads, but preferred characters that seemed kind.[741] Children preferred strong, three-dimensional characters to flat characters. They enjoyed

[736] Formative Research Report, #35, September 25, 1978. 3, Box 106, Folder 19, Keith Mielke and Milton Chen, "Children Television and Science: an overview of the formative research for 3-2-1 Contact", September 1981, 58, Box 106, Folder 28, Children's Television Workshop Papers.
[737] Formative Research Report, #35, September 25, 1978, 2, Box 106, Folder 19.
[738] "Children's Science Series Project: Background Report on Project Activities, January-October 1978," December 1978, 9, Box 102, Folder 4, Children's Television Workshop Papers.
[739] "Formative Research Report #18: Viewing Frequencies of Four Magazine/Variety Shows among 8-12 year olds, May 26, 1978, Box 106, Folder 18, Children's Television Workshop Papers.
[740] "Research Report #38: Impressions of TV Character Preferences Among Target Audience," October 31, 1978, Box 106, Folder 19, Children's Television Workshop Papers.
[741] Ibid.

watching characters develop new skills.[742] Seemingly, the Workshop's young audience wanted to see realistic characters in realistic situations. Popular shows (*Happy Days, Charlie's Angels*) featured characters in the 'real world.'

Surprisingly, science fiction serials hadn't fared well in classroom tests. "While *Star Wars* was extremely popular," the Research Department noticed, "the phony appearance of a space station and its cast in another program was rejected by kids."[743] These results were later used to justify framing the show around a realistic, not fictional premise. Children were a fickle audience; they were eager for new material, but picky about production quality. Mielke's correctly predicted *Star Wars'* imminent cultural impact upon children. As the Research Department summarized, "This audience is quite sophisticated in their television viewing and relatively unsophisticated in their scientific knowledge, which is what makes them a fascinating and challenging audience for this series."[744]

The Research Department's surveys served several functions. The data from the surveys, once published, would become part of a larger sociological picture of television in the 1970s. The act of creating these studies themselves emphasized the Workshop's credibility as a research institution. Additionally, the data collected gave insight into the

[742] Formative Research Report, #35, September 25, 1978. 3, Box 106, Folder 19, Children's Television Workshop Papers.
[743] Formative Research Report, #43, November 21, 1978, Page 1, Box 106, Folder 19, Children's Television Workshop Papers.
[744] Formative Research Report, #43, November 21, 1978, 2, Box 106, Folder 19, Children's Television Workshop Papers.

field of science communication. The Workshop passed this data along to other academics and other educational broadcasters.[745] "We feel an obligation," they wrote, "to share methods and progress with the research community generally."[746] When the Research Department staff showed up at educational conferences, their presentations were packed with colleagues from other organizations eager to learn about their methods and findings.[747] The Workshop's researchers, thus, gained expertise in the growing field of science communication. A year earlier, at Glen Cove, the Workshop had solicited the advice of expert science educators. Now, after a year's worth of research, the Workshop began to build its own expertise and reputation.

The Content Department's Meetings, Summer and Fall 1978

By May 1978, the Content Department began to seriously talk about ideas for the program. The Content Department and the Research Department worked in tandem, but had separate responsibilities. As Kathy Mendoza, the executive producer for the first season of *3-2-1 Contact* explained in an interview, each department had slightly different perspectives on the same subject matter. "Research was constantly focusing us on how the audience would perceive the information," she clarified, "Content was asking if the

[745] Reports published: Chen, M., Clarke, H., and Myerson Katz, B. 3-2-1 Contact, a TV series on science and technology for children 8-12: test show evaluation. New York: Children's Television Workshop, 1979. Mielke, K., Chen, M., Clarke, H., and Myerson Katz, B. Survey of television viewing interests among eight to twelve year olds; Myerson Katz, B. CTW's new science series: the role of formative research. Televisions 7 (1980): 24-31.
[746] "Children's Science Series Project: Background Report on Project Activities, January-October 1978," December 1978, 35, Box 102, Folder 4, Children's Television Workshop Papers.
[747] Barbara Myerson Katz, Interview with author, May 5, 2017.

information was correct."[748] Research provided a glimpse into the whims of nine-year-old viewers and Content utilized this information to create an engaging television program.

The Content Department's official purpose was to write (and fact-check) the scripts of *3-2-1 Contact*. They made sure everything presented was scientifically accurate. Located on the second floor of the Children's Television Workshop, the Content Department defined the show's thirteen themes and brainstormed scientific principles to infuse into thirteen weeks of programming.[749] In an interview, Kathy Mendoza compared the creative atmosphere of the Workshop's Content Department to an "idea factory."[750] However it's difficult to identify everyone who worked within this "idea factory." (No complete staff list exists for the department.) However, one of the most valued members of the department was Charles Walcott, a Harvard-trained biologist who served as the Content Director.

Charles Walcott had been involved with television productions since the mid 1950s. He had worked on Mary Lela Grimes' *Discovery,* advised Michael Ambrosino's *10-inch Classroom*, and written treatments for *NOVA*.[751] Because of his interest in

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[748] "Interview: Behind the Scenes of 3-2-1 Contact", Issue No 3. , Spring 1980, CTW International Research Notes, 6 , Box 102, Folder 7, Children's Science Series Project: Background Report on Project Activities, January-October 1978," December 1978, 9, Box 102, Folder 4, Children's Television Workshop Papers.
[749] Ibid, 8.
[750] "On 3-2-1 Contact, the Sun's a Basketball" *Detroit News,* Jan 27, 1980, Section E.
[751] In 1956, Walcott served as an assistant on *Discovery,* the WGBH show about science written and produced by Mary Lela Grimes. Walcott also worked on Michael Ambrosino's *The 21 Inch Classroom.* Briefly, he became involved in Jerold Zacharias' project to redevelop American high school's science

science communication, Walcott briefly considered pursuing a career in television. Seeking advice, he visited Don Herbert ("Mr. Wizard") in New York City in the early 1960s. The size of Herbert's headquarters, which encompassed a three-story townhouse in an outer borough, greatly impressed Walcott. Herbert warmly received the young professor and showed him around. He told Walcott, "You know, there are lots of ways of doing science on television and I really encourage you."[752] Walcott caught the eye of the Workshop. At the time, Walcott was working as the director of an elementary science study and as a professor of biology at SUNY-Stonybrook. [753] After attending a few meetings, Walcott quickly signed onto the project, believing that it had great potential.

As the Content Director, Walcott oversaw the collaborations of writers and scientists. The Workshop employed scientists from an array of fields; including two physicists, a biophysicist, a biologist, and an astronomer.[754] Briefly, the Workshop also considered working with a list of potential creative consultants, including Isaac Asimov, Theodore Sturgeon, Gene Roddenberry, Arthur C. Clarke, Ray Bradbury, Judy-Lynn and Lester del Rey, Kurt Vonnegut, Tom Lehrer, Stan Lee, Buckminister Fuller, Lorne Michaels, and Mel Brooks.[755] Ultimately, while some of these individuals were contacted (such as George Lucas) and expressed their support, the main visionaries of the project

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curriculums. (Zacharias, Walcott recalled, believed that young children were unable to grasp scientific concepts). While at Harvard, Walcott caught wind of another WGBH Production, *NOVA*. Ambrosino asked Walcott to write a treatment (a rough script) for an episode about birds. The episode turned into one of the first episode of *NOVA*, "Why do Birds Sing." Charles Walcott, Interview with author, April 14, 2017.

[752] Charles Walcott, Interview with author, April 14, 2017.

[753] Charles Walcott, Interview with author, April 14, 2017.

[754] "Proposal for Season II," August 6, 1980. 12, Box 102, Folder 8, Children's Television Workshop Papers.

[755] Chris Cerf to Paul Firstenberg, August 22, 1978, Box 102, Folder 35, Children's Television Workshop Papers.

were the Workshop's in-house writers.[756] Myerson Katz remembered that even the Workshop's administrative assistants contributed ideas for the series.[757]

By May 1978, the Content Department began to seriously talk about ideas for the program. The Workshop staff had previously decided they wanted to have a show like *Sesame Street*, which utilized a magazine presentation style. A magazine style presented a variety of short vignettes together (animated segments, documentary pieces) like a series of articles in a magazine. It had also been decided that each episode would be half an hour long. Following Sheldon White's earlier suggestion, the Workshop liked the idea that each week, the program would focus on a different binary set of ideas. As Carol Hantman, one of the writers, explained to her colleagues, "Themes are a way of marshaling the huge amount of material which makes up the work of scientists."[758] She believed that themes provided viewers with conceptual anchors. Some ideas included themes like Light/Dark, Big/Little, and Hot/Cold. A wide, liberally interpreted theme could allow for writers to cover a variety of topics in different scientific areas. Over the course of a week, a show about Hot/Cold could cover how early humans made fires, how space suits protected astronauts against the temperature of space, and how desert animals cool themselves down. Additionally, this approach provided viewers with opportunities to make interdisciplinary connections between the sciences and human society. Hantman

[756] Walcott remembers how his scientific team enjoyed a unique position in the Workshop. He had the opportunity to watch several tapings of Sesame *Street* and to meet the actor who played Big Bird. Charles Walcott, Interview with author, April 14, 2017.

[757] Barbara Myerson Katz, Interview with author, May 5, 2017.

[758] Carol Hantman, Memo: "Themes for the Science Show," May 3, 1978, Box 103, Folder 32, Children's Television Workshop Papers.

explained that themes allowed the writers to create short, interesting vignettes that would appeal to the greatest number of viewers. If a segment about space bored a viewer, for instance, the following documentary short might interest her. [759]

By watching the television program, viewers could learn how to sift and sort information themselves. *3-2-1 Contact* wouldn't be the type of 'Gee Whiz' science that Mr. Wizard presented in the 1950s. Instead, Hantman and Walcott both hoped their program would teach viewers how to think like a scientist. "Children of every age," Walcott rationalized to his colleagues, "are fascinated by the world around them and want to understand and feel a mastery over it. This sense of curiosity is really the basis of science."[760] As an educator, Walcott especially wanted to encourage the natural curiosity of young students. His viewers would feel like they could be participants in the scientific process, too. Learning about science would allow young viewers to become informed citizens. "At time when the public is faced with important choices on issues with substantial scientific and technological basis, such as nuclear energy, chemical additives, or toxic waste disposal," Walcott later explained, "it is crucial to understand the process of how scientific conclusions are reached."[761]

By the summer of 1978, a month after the Research Department had delivered the results from the Television Survey, the Content Department began to earnestly draft ideas

[759] Carol Hantman to Sam Gibbon, Keith Mielke, and Dana Zoran. Box 103, File 32, Children's Television Workshop Papers.
[760] "Interview: Behind the Scenes of 3-2-1 Contact," Issue No 3. , Spring 1980, CTW International Research Notes, 6 , Box 102, folder 7, Children's Television Workshop Papers.
[761] Ibid.

for the overarching premise of the show. A flurry of letters and memos were sent to Sam Gibbon. Gibbon, the creator of *The Electric Company,* was officially the senior consultant of the program, but his main function seemed to be as a facilitator for conversations about *3-2-1 Contact* in the Workshop.[762] At first, every opportunity was on the table. Milton Chen, inspired by an article about a Victorian gallery of science, wondered whether they could create a modern space to explore technology.[763] Another writer had a unique proposal for a series' frame. "Could we use some of the Greenpeace encounters as the basis for drama?" she queried. She argued that the program would really appeal to young viewers. "This organization, the Greenpeace Foundation," she remarked, "has a lot of built-in appeal for our target audience: the membership is young and international: they're dedicated to non-violent action to save life, both human and non-human."[764] Don Fouser, a former WBGH producer, suggested a soap-opera. Writing to Gibbon, he mused:

> Could we try and structure a science series within the confines of a research institute, but make it as personally interesting as *Dr. Welby* [a series about a family doctor and his circle of patients] – a laboratory peopled with a younger staff, dealing with the world outside while solving personal dilemmas – love, caring – the gut concerns of life for us all and especially for the young.[765]

Fouser believed that focusing on the laboratory of a hospital would allow for a variety of fresh storylines and characters. Perhaps in one episode, they could focus on a young

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[762] Gibbon would go onto create another PBS program about science*, The Voyage of the Mimi* (1984).
[763] Milton Chen, "Notes for a format idea," July 13, 1978, Box 103, Folder 32, Children's Television Workshop Papers.
[764] Ibid.
[765] Don Fouser to Sam Gibbon, July 31, 1978, Box 103, Folder 32, Children's Television Workshop Papers.

laboratory technician and her baby. Another would take place in the lecture hall. It offered, he believed, "an honest dealing of our subject."[766]

Others suggested setting the program at a science fair, in a magical submarine, or even a laboratory ("Nobody seems to like that idea," one writer mentioned, "but it should be included on the list.")[767] Even Stonehenge was suggested ("This isn't a joke. I mean something incorporating the feeling, the awesomeness, the mystery of the two vertical slabs of *2001: A Space Odyssey*.")[768] Clark Gesner suggested that the show could be set in a large laboratory/television studio and include a small, floating cube-like companion that whistled.[769] For a while, the writers considered setting all the action in something called "The Tunnel."[770] Together, Gesner, John Glines, and Hantman generated the most abstract idea:

> There should be a multitude of optical and electronic effects: lavish use of close-ups and wipes and many unusual wipes—glass shattering, leaf falling, jigsaw puzzle wipes….there should be a minimal use of words and then matched with appropriate visuals…there should be ample use of sounds, music, and aural effects….The facts exist, let us add the phosphorescence. [771]

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[766] Ibid.
[767] Hurley to Sam Gibbon, "The People," Sept. 6, 1978, Box 103, Folder 34, Children's Television Workshop Papers.
[768] Ibid.
[769] Clark Gesner, "Suggestion for the Science Show Format," 5, Box 103, Folder 33, Children's Television Workshop Papers.
[770] "Science Curriculum Format Meeting, 3/3/1977, Milton Chen and Dana Zoran to Dave Connell, Sam Gibbon, et all." March 9, 1977, Box 102, Folder 17, Children's Television Workshop Papers.
[771] John Glines to Sam Gibbon, Sept. 25, 1978, Box 103, Folder 35, Children's Television Workshop Papers.

This far-out impression failed to gain much traction.

By the end of September 1978, the writers were starting to decide they wanted the show to be based firmly in reality. Science fiction, they concluded, was passé. " I wonder also if movie and TV viewers are quickly reaching a saturation point in space entertainment," one writer commented after reviewing a potential treatment. The Research Department's studies led them to believe that children had grown tired of space operas. The most popular television programs for children were realistic dramas like *Little House on the Prairie* or comedies like *Happy Days.* Milton Chen, who was also involved in the Content discussions, encouraged his colleagues to support a realistic program. He argued that the Workshop didn't need to copy the style of science fantasy shows like *Battlestar Galactica.* Chen suggested:

> While it is true that *Hulk* and *Wonder Woman* and *Star Wars* are the biggest hits among our audience, in my view they feed only one, albeit one large appetite of kids.

Instead, Chen urged the Workshop staff to write a show for the kids who wanted to be taken seriously.[772] His colleagues agreed. "Why burden ourselves or the audience with fiction," Carol Hantman argued, "when the material is so compelling when served straight up with no olive?"[773]

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[772] Milton Chen to Science Show Production and Research, "Strategy and Guesses Leading to Format Idea Stressing Viewer Participation Strategy," Sept. 8, 1978, Box 103, Folder 34, Children's Television Workshop Papers.

[773] Carol Hantman to Science Show Production and Research, "Format idea: A fictional premise for a department-based show" Sept. 13, 1978, Box 103, Folder 34, Children's Television Workshop Papers.

Developing an earlier idea from Gesner, Chen suggested that the program have two settings: A TV studio home-base and "a roving remote unit" that would tie-in the program's daily documentary pieces.[774] He then pitched an idea for the featured cast. Suggesting that they hire actors around 20 and 30 years old, Chen imagined these cast members would be like the 'explainers' found in science museums:

> Their main purpose is to make everything on the show as clear as possible to viewers...They are not professional scientists but are intensely curious and serve as role models. For now, imagine them as Lindsay Wagner [*The Bionic Woman],* Clifton Davis [*That's My Mama*], or Ron McNair [NASA's first black astronaut][775]

Young viewers wanted to see youthful, hip students, the Workshop concluded, not space warriors or cutesy Muppets. A realistic science show would stand apart from television programming aimed at younger viewers.

Gradually, the content of *3-2-1 Contact* took shape. The final premise was two-fold: First, there would be a 'clubhouse', where three young adults (supposedly high school students) hung-out after school. These hip teenagers were Marc, a young black man, Lisa, a white woman, and Trini, a Latina woman. These teenagers would talk about science in their daily lives. Often, they'd perform experiments using existing household items. They'd also travel to remote locations, like laboratories, volcanoes, and the ocean

[774] Milton Chen to Science Show Production and Research, "Strategy and Guesses Leading to Format Idea Stressing Viewer Participation Strategy and Guesses," Sept. 8, 1978, Box 103, Folder 34, Children's Television Workshop Papers.
[775] Ibid.

in order to learn about science that surrounded them. The clubhouse setting was intended to provide the connective tissue of the show, "relating the segments to one another as to their scientific message, stating the headline of the day simply and clearly."[776]

As the content for the show developed, some of the consultants and writers for the Workshop wondered about other ways that they could make a science series 'cool.' With the popularity of the then-new TV series *Mork and Mindy* and its zany star in mind, they idealized finding a host who was a 'Robin Williams' type.[777] Perhaps a teen idol likes Shaun Cassidy?[778] Consultant Don Fouser suggested they cast a "neat" host – someone like Alan Alda who at the time was the star of the popular TV series, *M.A.S.H.*"[779] For a while, they joked about approaching 'the Fonz.'[780] But the Research Department had conducted studies and concluded that children were bored by 'talking heads.'[781] "Janet Welsh Brown, from the AAAS, had another suggestion: Find athletes who had had backgrounds in science. As she wrote to her colleagues at the Workshop, "It's what one of our former colleagues called 'Jocks for Science.'[782] Brown noted that the AAAS was already collecting a list of 'famous,' brainy athletes. So far, they had found several who just happened to also be track stars, sports car racers, tennis, and football players. Even

[776] From Milton Chen to all, "Comments from Jerry Lesser on First Five Weeks' Scripts," November 7, 1979, Box 102, Folder 20, Children's Television Workshop Papers.
[777] "Proposal for a Network Special," Sept. 1979, 2, Box 2, Folder 6, Children's Television Workshop Papers.
[778] Ibd.
[779] Don Fouser to Sam Gibbon, July 31, 1978, Box 103, Folder 32, Children's Television Workshop Papers.
[780] Janet Welsh Brown, to Joan Ganz Ganz Cooney et al., April 4, 1977, Box 102, Folder 17, Children's Television Workshop Papers.
[781] Barbara Myerson Katz, Interview with author, May 5, 2017.
[782] Ibid.

better, many of these athletes were women and minorities and could potentially serve as role models. She thought the combination of sports and science could inspire kids who liked sports to consider science as well.

The Workshop liked Brown's suggestion because it emphasized multi-faceted scientific role models. Instead of hiring one main celebrity, they decided to sprinkle cameos throughout the first season.[783] LeVar Burton, fresh off his popular mini-series *Roots*, was featured in one episode. Tennis pro Arthur Ashe appeared in another segment. Dizzy Gillespie and the members of KISS were featured in episodes about sounds. Most of the guests of *3-2-1 Contact's* first season, however, were plucked from everyday life. Many graduate students and university professors were featured. Some of the more unusual guests included a surfer, a racecar driver, and the owner of Vinnie's Pizza, home to the World's Largest Pizza, according to the *Guinness Book of World Records*. By using a combination of famous and 'normal' guests for *3-2-1 Contact,* the Workshop emphasized the idea that everybody could be a scientist.

Interestingly, the 'children' on *3-2-1 Contact* were not actually high-school students. They were actors; most were in their early and mid twenties. Nan Lynn Nelson, who starred as Vikki, the spunky, sixteen-year old actor of "The Bloodhound Gang" serial, was married at the time.[784] This was a departure from *Watch Mr. Wizard*, where

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[783] "Appendix 6, Index to Season Documentary & Studio Guests," August 6, 1980, Box 102, File 8, Children's Television Workshop Papers.
[784] Marc Tyler Nobleman, "The Bloodhound Gang ("3-2-1 Contact) cast interviews, 1 of 4," June 21, 2013, accessed from http://noblemania.blogspot.com/2013/06/the-bloodhound-gang-3-2-1-contact-cast.html

Don Herbert had recruited actual school-age children to appear on the program. In the 1950s, an actor like Don Herbert could play a scientist, but it was important for on-screen child actors to be authentic.

Over the course of the summer and fall of 1978, the Workshop staff celebrated another feat. At Glen Cove, they had gathered expert advice from science educators and communicators. Next, from their own Research Department, they generated information about children's intrinsically held scientific beliefs. Now, as children's media professionals, the Workshop staff translated their data into scripts. They tried to understand that children would respond to different types of genre and certain kinds of characters. They figured out storytelling techniques that internalized positive scientific messages. By listening to experts and their audience, the Workshop created its own method of science communication. They hoped to spin dry statistics into television gold. In doing so, the Workshop was creating its own reputation as a professional institution for science education and communication.

Science Advisory Council's Meeting, December 19, 1979

After the fall of 1978, the Content Department and the Production Department jumped into high gear. The Research Department continued to conduct studies, based off the writers' ideas. By April 1979, 45 studies had been completed.[785] Once the writers and scientists settled upon a narrative for the show, they began to draft scripts for the

[785] "Progress Reports, Development, January 1978-April 1979." March 1, 1979, Box 102, Folder 4, Children's Television Workshop Papers.

episodes. Five pilot episodes were written from February to April. Charles Walcott jokingly remembered to what length it took to get the scripts written:

> The producers would say, "Oh! I have a concept," and describe it. And the scientists would say, "Hm, interesting, but not science." And the producers would say, "What do you think we ought to do?" And the scientists would come out with this airy-fairy suggestion – and the producers would say, "Yes, but that's not television and nobody will understand it." We discovered the secret to success was to lock them up in a room, and not let them out for lunch until they had come to some kind of an agreement.[786]

Neither the writers nor the scientists could push their agenda during a writing session. Even during production, expertise was a constantly negotiated subject. The Workshop would occasionally solicit advice from outside scientists, either through interviews or correspondence.[787] However, during the production phase, scientists were not allowed to be a dominating presence within the Workshop. When, for instance, several scientists commented that they didn't like the idea of weekly 'themes', the writers listened to their concerns, but politely ignored them.[788]

The staff of the Workshop even enjoyed autonomy from their sponsors. The sole corporate sponsor of the program, United Technologies, had no involvement with the

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[786] Charles Walcott, Interview with author, April 14, 2017.
[787] Dana Zoran to Science Series Production and Research Staff, "D'Arcy Thompson, On Growth and Form," August 1, 1978, Box 103, Folder 32, Children's Television Workshop Papers.
[788] From Carol Hantman to Sam Gibbon, Keith Mielke, and Dana Zoran, "Themes for the Science Show," May 3, 1978, Box 103, Folder 32, Children's Television Workshop Papers.

production of the series.[789] Even the National Science Foundation (NSF), which was a major public funder of the program, stayed away from any creative involvement. (Perhaps they had learned from their earlier scuffle with *NOVA*.) As George Tressel, the liaison between the Workshop and the NSF, explained to a concerned television activist:

> It is our policy to not interfere with the content of projects in any way, both in order to provide creative independence and more important to avoid the problems of a "1984" government information environment.[790]

The Workshop enjoyed total creative control of their programs. Still, it kept its funders up to date by sending out quarterly progress reports. The NSF was invited to make several site visits to the Workshop's headquarters. True to its creed, the Workshop listened to the feedback of its young viewers and its experts.

From the onset of the production, executives at the Workshop wanted to create an official 'Advisory Committee' of scientific experts. Paul Firstenberg, the executive vice President of the Workshop, suggested reaching out to the faculty of a nearby educational institution, Princeton University. Several of the Workshop, including Sam Gibbon, were Princeton alums and professors in the engineering departments at the university had expressed interest in collaborating with the Workshop.[791] But perhaps, Firstenberg argued, they needed more than a 'scientific expert' like Carl Sagan (who had politely

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[789] This holds from interviews with Barbara Myerson Katz, Charles Walcott, and Sam Gibbon.
[790] "Outline, General Presentation, NSF-OE site visit," January 31, 1979. Box 102, Folder 16, Children's Television Workshop Papers.
[791] Paul B. Firstenberg to Evelyn Davis, January 5, 1977, Box 102, Folder 34, Children's Television Workshop Papers.

turned down an invitation). Maybe they needed a historian of science. As Firstenberg rationalized:

> [Historians of science] explain to non-scientists the development of scientific thinking and concepts and explain the political and social importance of scientific discoveries, all of which sound to me to be close to the directions in which you are moving the show.

Historians of scientists, Firstenberg reasoned, were ideally suited to bridge the divide between the scientist and the non-scientist. After visiting Princeton, Firstenberg had two suggestions: Thomas Kuhn ("an eminent, innovative thinker and articulate but also easy-going") and Michael Mahoney ("energetic and one of the University's most popular teachers.") [792] Kuhn was approached but declined the invitation to participate.[793] In the end, no historians of science served on the advisory committee.

The members of the Workshop worked diligently to recruit scientists from across industrial and academic institutions. They especially strove to find scientists representative of all minority groups.[794] By the end of March 1979, the Workshop had finally compiled a suitable list of sixteen advisers. Five were women. There were also

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[792] Paul B. Firstenberg to Joan Ganz Cooney, July 13, 1977, Box 103, Folder 1, Children's Television Workshop Papers.

[793] Paul B. Firstenberg to Thomas Kuhn, July 29, 1977, Box 102, File 34, Children's Television Workshop Papers.

[794] The production notes reveal two examples of CTW's dedication to find scientists from ethnic communities to appear on the program. Davidson to Keith Mielke et al. talks about the "the search for the female, black scientist," January 25, 1979, Box 102, Folder 19; From Keith Mielke to Joan Ganz Cooney, et al., "October-November Management Report, 3-2-1 CONTACT," "Considerable special recruiting efforts have been expended by the Content group. One example of the disappointing outcomes is seen in the search of an nutritionist. Seven Hispanic women were contacted. In each case, they were either too busy to talk with us, or , at the last minute, called in too sick to keep their appointment. " November 26, 1979, Box 102, Folder 25, Children's Television Workshop Papers.

representations of scientist from black, Hispanic, and Asian-American communities. Additionally, these science advisers came from across the entire United States.[795] There were biologists, chemists, science educators, and teachers. Officially, the advisory committee was supposed to consult with the staff on all facets of production. More practically, the Workshop asked them to attend three screenings of the pilot episodes; they served as the Workshop's test 'adult' audience.

In the final months of production, in the winter of 1979, the Workshop focused generating buzz on about the program.[796] Filming of the series lasted until November 1979, which gave the Workshop's production team only a month to make final edits. By late December, the *3-2-1 Contact* publicity campaign was in full swing. Joan Ganz Cooney appeared on *Good Morning America* to preview clips from the unseen episode. 200,000 *Teachers Guides* for the series were printed and distributed to classrooms around the country.[797] The first *3-2-1 Contact* magazine, was published in November 1979, created by the Workshop's Publications Department to support the main messages of the television series. In the first issue, children learned how some of their favorite science fiction television series (i.e., *Mork and Mindy*) didn't actually portray real science. For their work on the series, the science advisors received complimentary magazine

[795] "Final Report: Development and Testing Phase, May 1, 1978-June 30, 1979." 21, Box 102, file 5, Children's Television Workshop Papers.
[796] It's worth noting that the production staff for the program was only hired in July 1979. See letter from Keith Mielke to CTW Staff, "Production Personnel, 3-2-1 CONTACT," July 1979, Box 102, Folder 19, Children's Television Workshop Papers.
[797] "Progress Report: November, December, 1979, January 1980," 4, Box 102, File 7, Children's Television Workshop Papers.

subscriptions.[798] As part of the pre-show push, the Workshop's marketing team wrote small biographies of the science advisors to be placed in a science advisers' local newspaper.[799] Additionally, some science advisers advertised the program themselves; contacting local presses and pitching articles about their work on the series.[800] All these articles strengthened the scientific credibility of the fledgling television production.

On December 16, 1979, the Science Advisory Committee was called together for their third and final screening.[801] Meeting over the course of two days, the Committee watched three full episodes ("Monday-Noisy/Quiet," "Monday- Forces," "Friday-Forces") and a thirty-minute reel sampling the highlights of the documentary shorts included in the season. Overall, the Workshop noted, the sixteen scientists and educators generally gave their approval. One noted, "I feel that the strength of the show is the very examples of phenomena brought together under the umbrella of a topic." There were some criticisms. One scientist thought the dramatic situations were too unrealistic. Judah Schwarz, present at the Glen Cove meeting, bleakly remarked that they shouldn't "expect the show to do magic that the entire educational system has not been able to do." But his voice was in the minority; most of the scientists in the room were excited by the footage

[798] Keith Mielke to Content, Research, Production, CES, Public Information, "Summary Notes on the Third and Final Meeting of the Advisory Committee, 3-2-1 CONTACT, December 16-7, 1979," December 19, 1979, Box 102, Folder 20, Children's Television Workshop Papers.
[799] "Progress Report: November, December, 1979, January 1980," 6, Box 102, Folder 7, page 6; Also "Top Scientists and Educators Named to Advise New CTW Science Series." Box 108, Folder 12, Children's Television Workshop Papers, Special Collections, University of Maryland Libraries, College Park.
[800] Mary Alice Schumacher, "Shaping the Future of kids' TV shows," *The Record* (Cedar Falls, Iowa), January 25, 1978.; Fran Kaufman to Bob Hatch, Feb. 28th, 1978, Box 108, Folder 12, Children's Television Workshop Papers.
[801] All the quotes in the passage are drawn from that meeting. Keith Mielke to Content, Research, Production, CES, Public Information, "Summary Notes on the Third and Final Meeting of the Advisory Committee, 3-2-1 CONTACT, December 16-7, 1979," December 19, 1979 Box 102, Folder 20, Children's Television Workshop Papers.

they saw. Two women thought there should be more information included about how to pursue a career in science. Steven Jay Gould, a prominent paleontologist and celebrity scientist, was one of the more vocal (and well-known) participants. As was noted, his guiding philosophy as a science communicator was, "that we cannot be held responsible for not including all the facts, but that we should under no circumstance plant seeds of error and misinformation." He liked that the Workshop had not cluttered the script with scientific jargon. Gould's only real complaint was that he didn't like the theme song. "But," as the report noted, "he recognized that the music was not designed to be attractive to the advisory committee." The Science Advisory Committee also agreed to be interviewed by news outlets in advance of the show's premiere. As experts in their fields, they could proudly endorse the Workshop's finished product. Their support of *3-2-1 Contact* validated the Workshop's creative process. The Workshop itself noted in an internal report that the Committee "strengthened the acceptance of the series with the scientific and educational communities."[802] With the Science Advisory Committee's approval, the Workshop emerged as a reputable science communication institution.

Diverse. Inclusive. Dynamic. *3-2-1 Contact* was ready to launch onto television screens. January 14, 1980, the week that the series aired, articles about the show appeared in national periodicals: *TIME*, *TV Guide, Newsweek*, and *The New York Times.* Many of them were accompanied with whimsical pen and ink sketches of the cast. The Workshop had hired Jack Davis, well-known for his illustrations in *MAD Magazine,* to draw up

[802] "Proposal For Season II, August 6, 1980," 13, Box 102, Folder 8, Children's Television Workshop Papers.

several cartoons of the series' crew. These illustrations depicted a smiling troop of the six protagonists: Marc, Lisa, and Trini were depicted in a variety of fun, science-y activities (playing tennis, scuba diving, and playing with animals), while the three members of the Bloodhound Gang searched for clues (See Fig. 4). These illustrations emphasized *3-2-1 Contact's* diverse cast; all actors were featured prominently, girls and boys. Davis drew with racial sensitivity: the African-American and Hispanic characters were portrayed non-stereotypically. Every character was the same size on the page; each character was equally interesting. All the characters were portrayed doing a different activity. Each of the characters was portrayed holding props related to his/her documentary shorts on the program. Marc, for instance, held a tennis racquet and a baseball bat. These were allusions to episodes where he had met tennis pro Arthur Ashe and visited a bat laboratory. Neither gender nor race limited the protagonists' possibilities in science. With a volcano erupting in the background and two airplanes flying in the foreground, the cartoon showcased the dynamic action of the series. *3-2-1 Contact* promised to take their viewers on exciting, scientific adventures.

Adult reviewers and children alike enjoyed the show. Rena Pederson of the *Dallas Morning News* called the show, "zippy, hip, and the kind of show that should interest adults as well as 8 to 12 year olds."[803] Academics liked the show as well. Television critic Martin Mayer, writing in *The Journal of the Film and Television Arts,* dubbed it the best "instructional series since *Sesame Street*." He remarked:

[803] Rena Pederson, "New PBS series attempts to make science simple," *Dallas Morning News,* January 13, 1980, in "Progress Report, February 29, 1980," Box 102, Folder 7, Children's Television Workshop Papers.

> As always with CTW, the show is pro-social as all get-out: Bill Moyers himself couldn't be more plain good and innocent and trusting. There are role models all over the place: the sanitary engineer in the sewer is a black woman scientist: a cartoon sequence tells of a little girl, who's [pictured] with wrench, who from infancy knew that she wanted to be a mechanic.[804]

The Workshop's welcoming message was clear to its intended audience: if a child wanted to become a scientist, she should! The articles stressed that the show had relied on expert counsel and incorporated the feedback of trusted teachers and scientists.[805] Journalists also communicated the Workshop's primary message: to get children excited about the science in their own world. "This is not elitist, detached, special-interest subject area," Kathy Mendoza remarked in one article, "This is part of your life today."[806] *3-2-1 Contact* made a positive impression on popular journalists and writers. Other professional organizations clamored to partner with the Workshop, including The Society for Applied Learning Technology, American Educational Research Association, Girl Scouts of the USA, and the National Science Teachers Association.[807] At the end of 1980, the Workshop received four Emmys for *3-2-1 Contact.*[808]

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[804] Martin Mayer, "Beyond Mr. Wizard," The Journal of the Film and Television Arts, 8 (1980): 10.
[805] "On '3-2-1 Contact,' the sun's a basketball*," Detroit News*, Box 102, Folder 7, Children's Television Workshop Papers.
[806] Ibid.
[807] "Progress Report," May 30, 1980, 6, Box 102, Folder 7, Children's Television Workshop Papers.
[808] "Proposal for Season II," Box 102, Folder 8, 1, August 6, 1980, Children's Television Workshop Papers.

It also successfully appealed to its core audience, children. The show aired on PBS stations on weekdays after school; it was also screened in classes.[809] In its first month, 2 million children watched *3-2-1 Contact* each day. Pleased, the Workshop reported, "This viewership is higher than last year's averages for any other PBS daytime program except *Sesame Street*."[810] *3-2-1 Contact* was watched with the same regularity as other PBS staples, like *ZOOM* and *The Electric Company.*[811] The Workshop reported in subsequent reports that teachers, parents, and children had written positive letters about *3-2-1 Contact.*[812] In a proposal for the second season, the Workshop noted that after the series' run in April, hundreds of parents phoned their local PBS affiliates asking for it to be rebroadcast.[813] The Workshop hired an outside researcher, Dr. Jerome Johnson at the University of Michigan, to evaluate the first season's reception by school children. Johnson surveyed 66 children in three Michigan classrooms. He observed that, "After viewing CONTACT, children believe that scientists are engaged in a rich variety of activities other than laboratory work; that there are women as well as men scientists; and that scientists are normal people just like other adults."[814] 85% of students who watched the show more than once a week subsequently went on to do some sort of science-linked activity (reading a book, looking at an animal, visiting a museum etc.)[815] *3-2-1 Contact*, seemingly, had changed the minds of its viewers and convinced them to positively view scientific culture. "I felt that was vindication," Charles Walcott recalled, "for a lot of

[809] "Progress Report: November, December, 1979, January 1980," 6, 10, Box 102, Folder 7, Children's Television Workshop Papers.
[810] Ibid., 12.
[811] Ibid.
[812] "Progress Report," May 30, 1980, 5, Box 102, Folder 7, Children's Television Workshop Papers.
[813] "Proposal for Season II," Box 102, Folder 8, August 6, 1980, Children's Television Workshop Papers.
[814] "Proposal for Season II," 5, Box 102, Folder 8, Children's Television Workshop Papers.
[815] Charles Walcott, Interview with author, February 5, 2018.

what we were trying to accomplish."[816] When the Research Department had interviewed students in 1977, they were wary of scientists; now they wanted to be like them.

The initial promise of the Glen Cove Conference had come to fruition. The Workshop had worked with science advisors from the beginning, from 1977 until the series' premiere in 1980. Trusted science communicators, like Phil Morrison, had offered the Workshop ideas about how to engage with the public. The Workshop offered science educators information about children's understanding of science by creating a series of comprehensive audience surveys. Together, science advisers work with the Workshop's writers and researchers to craft an appealing show about science that stressed an inclusive vision. This collaboration allowed the Workshop to become a trusted producer of materials promoting science education. The scientists involved in the production of the series also benefitted. *3-2-1 Contact* became a platform for real scientists to talk about their professions to a receptive audience.

The Workshop pushed their viewers to dream bigger. *3-2-1 Contact* proclaimed that every child could aspire to become scientist. All the elements of the program pushed this ideology. Documentary segments spotlighted the work of individual scientists. Friendly scientists visited the gang at their workshop and encouraged them to learn more science. For instance, in one episode, Marc was constructing a model of the Solar

[816] Charles Walcott, Interview with author, April 14, 2017.

System.[817] To learn more about the sun, he invited Dr. Joseph Martinez, a Mexican American physicist from the Department of Energy, to visit the clubhouse. Dr. Martinez, wearing a black turtleneck sweater and tan jacket, sat down with the gang on a beanbag chair. After asking Dr. Martinez about how he got his start in science, the teenagers asked him why there weren't very many Hispanic scientists. Dr. Martinez reasoned that Mexican American children didn't have enough role models. Further, he explained, he knew that some teachers didn't believe that their Spanish-speaking students could become scientists. The gang agreed that this is unfair. Trini remarked that it was too bad that most Hispanic students felt like they could only go into vocational schools. Lisa nodded, saying, that she believed that everyone could be a scientist because, "in the end, the moon is the moon and affects everyone, no matter what language you speak." This brief segment encapsulated the Workshop's commitment to promoting scientific careers. As Dr. Martinez recounted his own path, from a curious child to a seasoned physicist, viewers could imagine themselves becoming scientists. The ensuing conversation was sympathetic to viewers who struggled with monolingualism in American classrooms. Finally, Trini's slightly critical comment about vocational school underscored the show's support of academic careers. Every detail of the episode was constructed to encourage children to see themselves as scientists.

[817] "Light/Dark: The Sun (February 18, 1980)" 3-2-1 Contact. (1980: NYC, New York). Sesame Workshop, screened on June 23, 2017.

Some of those who watched the program did become scientists. Ainissa Ramirez, an engineer and science communicator, has fondly remembered the series. In *Science*, Ramirez recalled:

> I have wanted to be a scientist ever since I was a little girl. I got the idea from a television program called *3-2-1 Contact*, where I watched a young African-American girl solve problems. I saw my reflection in her and was transfixed.[818]

Just as the Workshop hoped, African American and Hispanic children saw themselves reflected in the characters of *3-2-1 Contact.* These diverse characters assured children that they too could become scientists. Ramirez was just one of many inspired viewers.[819] At Awesome Con 2017, a national American science fiction convention, historian Matthew Shindell mentioned that *3-2-1 Contact* had helped shaped his own image of 'real' science.[820] Just the mention of *3-2-1 Contact* prompted a rousing cheer from the audience. (Bemused, *Dr.Who* actor David Tennant quipped that the series was clearly in need of reboot.)

3-2-1 Contact marked a change in tone in for science series. In the 1950s, science series were informational and entertaining. Scientific storytellers focused on telling stories about 'everyday science' and exploring the applications of science. These series were usually positive, but apolitical. In the 1970s, these scientific storytellers had

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[818] Ainissa Ramirez, *The Making of a Science Evangelist*, Science, May 8, 2015, accessed June 25, 2017 from http://www.sciencemag.org/careers/2015/05/making-science-evangelist

[819] In a fitting moment, Milton Chen once found himself listening to Ramirez's recollections of *3-2-1 Contact* at a conference. Delighted, he introduced himself to her afterwards. Milton Chen, Interview with the author, March 29, 2017.

[820] "Awesome Con 2017 – David Tennant Q & A, June 17, 2012," last modified June 19, 2017, accessed from https://www.youtube.com/watch?v=lFwMm2JZUps

different aspirations. Following larger political and social trends, a new group of scientific storytellers created television shows focused on science and society. *NOVA's* episodes were hard-hitting; their producers took scientists to task for their involvement on controversial issues. *3-2-1 Contact,* on the other hand, sympathetically examined the role of scientists within communities. *NOVA'*s producer suggested that their viewers temper their blind trust of scientists with knowledge of current events. The producers of *3-2-1 Contact* proposed that a children's program, focused on instilling the importance of the scientific method, would help restore the public's trust in science. At the same time, another scientific storyteller believed that the storytellers should appeal to the emotional power of scientific storytelling. Carl Sagan's *Cosmos* asked the public to consider the wonder of the cosmos.

ILLUSTRATIONS

All images removed due to copyright concern

Fig. 1. The Harvard Graduate Seminar. The course was led by three of the Workshop's visionaries: Gerald Lesser, Sam Gibbon, and David Connell. (David Connell is wearing glasses, a black vest with a white collar. Gibbon stands next to him in white shirt. In the center, off to the left, is Gerald Lesser.) Some of the students in these course became directly involved in the creation of *3-2-1 Contact,* including Barbara Myerson-Katz (sitting center with long dark hair and white turtleneck). Carol Hantman, a graduate assistant for the course, is seen kneeling in the first row, second to the right. (Photo from the collection of Barbara Myerson Katz).

Fig. 2b. Hylda Clarke analyzing charts generated by in-class viewing, 1972. From Herman Land, "The Children's Television Workshop: How and Why It Works: Summary and Overview of the Final Report," Box 2, Folder 26. , Children's Television Workshop Papers, Special Collections, University of Maryland Libraries, College Park.

Fig 3. A sample question from the Television Interest Survey, 1978. Survey of Television Viewing Interests Among Eight-To-Twelve Year Olds," October, 1978, 63, Box 106, Folder 15, Children's Television Workshop Papers, Special Collections, University of Maryland Libraries, College Park.

Fig. 4. An illustration of *the 3-2-1 Contact* cast used widely in press-kits and newspaper article, 1979. From personal collection of the author.

CHAPTER FIVE

The Star Professor: Cosmos, 1968-1980

Carl Sagan stands on a craggy cliff between sandy rocks and green grass. He's a tall middle-aged man, wearing an orange windbreaker. Beneath him, turbulent blue waves roar from the Pacific Ocean. Sagan smiles into the camera, slightly squinting. Gentle gusts of wind caress his salt-pepper hair. He looks straight through the camera, toward us, his viewer. Slowly, the master storyteller begins his tale. He talks of worlds of ice and stars of diamond. Atoms as massive as suns. Universes smaller than atoms. He talks about Earth and its rich variety of plants and animals. And then, his face brightening, he explains this is also our story. How we achieved our present understanding of the cosmos. How the cosmos has shaped our evolution and our culture and what our fate may be. Sagan smiles into the camera and asks us to join him on this voyage. He holds a small puff of a dandelion seed aloft. Easily, he releases it. Thus the first episode of *Cosmos,* one of a thirteen part television series, begins.[821]

Cosmos: A Personal Voyage aired in 1980 on PBS and told the comprehensive story of the Universe from ancient astronomers to NASA satellites. Sagan, a planetary scientist from Cornell University, served as the host of the series. But Sagan was also its

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821 "The Shores of the Cosmic Ocean," *Cosmos: A Personal Voyage,* (1980, Los Angeles, CA; Cosmos Studios, Inc., 2013) 3:13 – 6:55.

primary writer and visionary. Surprisingly, in the first moments of *Cosmos'* first episode, Sagan never introduced himself to the viewer; he didn't even invoke his scientific credentials. By the time that *Cosmos* aired, Sagan was already well known from his appearances on popular television talk shows and educational specials. Many viewers tuned into the program specifically to watch him. *Cosmos* was the realization of the scientific storyteller's decades-long dream to design a new, inclusive approach to science education using the medium of television.

Sagan was just one of the scientists who embraced a new form of science outreach. Although Sagan was actually part of an older generation of scientists, he quickly adapted to the style of science communication popular in the 1970s. Sagan worked with a team of scientists, writers, and historians to produce *Cosmos*. *Cosmos* was one of the first television science series created by a scientist. Yet, *Cosmos* itself didn't make Sagan famous; Sagan's previously established reputation as a respected scientist made *Cosmos* a respected and memorable television series for American viewers. The creation of *Cosmos* is intertwined with Sagan himself. Even as he established a career as an admired scientist, Sagan had been interested in science communication throughout his life. His career as a public educator offers historians a focused study into the creation of a public science persona through television appearances.

"[A] visible scientist's way with words," sociologist Rae Goodell has noted, " is a result of talent and training."[822] In this chapter, I argue that Sagan's gradual development as a "visible scientist," a scientist who regularly taught through popular media, can be traced through his appearances on public television. The chapter, then, is divided into three parts. The first period in Sagan's development as a public figure (1960-1969) occurred on stage and in front of small audiences. Sagan started his career as a young professor at Harvard, lecturing in front of undergraduates. Occasionally, he made appearances on television as a guest speaker. His first major television program was the BBC's *The Violent Universe.* To journalists, he embodied the ideal image of the 1970's academic: a serious, sensitive man of science. As his exposure grew through newspaper articles, so too did his audience.

The second period of study (1970-1975) examines how Sagan, as an academic, refined the communication skills that would allow him flourish on television. In Sagan's case, he received a year's worth of exposure on one of America's most beloved talk shows, *The Tonight Show*. After seven appearances on Carson's *The Tonight Show,* Sagan showed audiences that he could mix humor and science together. His appearances on *The Tonight Show* dramatically raised Sagan's public profile. Sagan began to receive particular attention in the press for his charisma onscreen.

Finally, after learning how to reach audiences, Sagan's third and final period of growth as a scientist on television occurred: he created his own television series together

[822] Rae Goodell, *The Visible Scientists,* (Little, Brown, 1977), 30.

with creative partner Ann Druyan and many others (1975-1980). Throughout the 1970s, Sagan's own theories about science education developed. In *Cosmos,* Sagan encouraged his audience to reaffirm their trust in science by understanding how principles of science permeated history, art, and music.[823] He was interested in creating visual metaphors that took objects from everyday life and demonstrated a certain wholeness of science. It was somewhat reminiscent of the 'everyday science' of the 1950s, when educators taught their audience about the relationship between a person and the science of their physical environment (refrigerator, etc.) But Sagan's philosophy of science education encouraged his viewers to discover how science could be as expansive as the universe and as intimate as the self.

Although it might appear so in this chapter, I do not intend for Sagan's skills as a scientific storyteller to overtake the importance of his role as a scientist. For the sake of brevity, I do not focus on his achievements within the scientific community in this chapter, although these helped to ensure his popularity. This chapter does not offer readers a full biographical sketch of Sagan's rich, full life.

While the Sagan estate allows researchers to review materials held within his collection, they maintain strict guidelines on what is published. In order to review Sagan's papers, I waived my rights to quote materials from the collection without the permission

[823] This chapter does not give a detailed analysis of *Cosmos*' content. For information on this aspect, I would encourage a reading of Nasser Zakariya or Karen Sorensen's recent works. Nasser Zakariya, *A Final Story: Science, Myth, and Beginnings,* (Chicago, The University of Chicago Press, 2017).; Karen Sorensen, *Cosmos and the Rhetoric of Popular Science*, (Lexington Books, 2017).

of the Sagan estate. Unfortunately, they have specifically denied me permission to create an online version of this chapter. To quote an email that I received from a representative of the estate, "Our legal department will not be able to grant your request based on your requirement to submit your dissertation to ProQuest. While we share your appreciation and respect your admiration of Dr. Sagan and his work, we would not authorize your use of our copyrighted material."[824] Given this restraint, I am unable to share this chapter on the online version of this dissertation.

[824] Pam Abbey, correspondence with author, January 25, 2018.

CONCLUSION

The Voices of Tomorrow

Eight scientific storytellers sat on the stage under the spotlights. On March 30, 2013, three thousand fans had gathered in Tempe, Arizona to listen to them expound upon the nature of scientific storytelling. The group included Tracy Day and Brian Greene, a television broadcaster and her husband, a particle physicist; Ira Flatow, an NPR radio personality, Neil deGrasse Tyson, an astrophysicist, Richard Dawkins, an evolutionary biologist, Neal Stephenson, a science fiction writer, and Bill Nye, an engineer.[825]

Over three hours, this group mused upon the qualities of good scientific storytelling. They all agreed that many scientists have exciting stories to share with others. Day talked about organizing scientists to speak at the World Science Festival, which she had founded with Greene. "The key thing is, we wanted to put the scientist on the stage," she explained, "[Scientists] were great communicators and they often didn't get the chance to do that."[826] She was impressed by the number of methods available for scientists to tell their stories to a wider audience. Stories about science, about data and

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[825] Stephen Macknik, "The Storytelling of Science," *Scientific American,* April 22, 2013, Accessed from https://blogs.scientificamerican.com/illusion-chasers/storytelling-in-science/ on March 30, 2018.
[826] "The Great Debate: The Storytelling of Science," Arizona State University, March 30, 2013. Accessed from https://origins.asu.edu/events/great-debate-storytelling-science on March 30, 2018.

discovery, could be infused with empathy, art, and poetry. Flatow mentioned the importance of being so clear that even your mother could understand it even, he noted, if your mother was a particle physicist. Although these storytellers worked in different mediums, they shared something in common: all of them had created television programs. Greene, Nye, and Tyson had achieved stardom through their appearances on television. These former titans of science television harkened back to their former glory days. Nye kept winking at the audience and repeating his old catch phrases. ("We might, dare I say it, change the world!"). Tyson joked about his wardrobe – through his popular appearances, he had developed a reputation for wearing bedazzled vests. In one moment, Nye and Tyson playfully wrestled and hugged on stage to mock the seriousness of scientific debate. Their audience cheered. As a reporter at *Scientific American* described, "Perhaps the most amazing aspect of the event was the crowd. A rowdy rock'n'roll mosh pit that was there to cheer on their favorite public science personality. That was truly a sight to see."[827] To the audience, these three scientists were old friends. To see them together on stage was almost like witnessing a television reunion.

At one moment, Brian Greene thoughtfully addressed the crowd. "You are an unusual audience," he remarked:

> An unusual group that would come out in this enthusiastic way and support science. Most of the world doesn't see science as a story. Most of the world sees

[827] Macknik, "The Storytelling of Science."

> science as a collection of facts they were forced to learn some point in school …. And they were all too happy to leave it behind.[828]

But this audience, Brian Greene inferred, was different. They understood that science was a human activity. Stories about science were fascinating stories about other humans. With his words, Brian Greene acknowledged the other scientific storytellers in the room: the viewers of science television programs, who shared what they had seen and experienced with even wider audiences.

In 1952, Lynn Poole had called upon his viewers to acknowledge the existence of scientific storytellers, the presence of the people behind "television's mirror." In 2013, Greene urged his audience to recognize themselves as contributors to a culture that celebrates scientific storytelling. Although Poole was a showman and Greene was a scientist, the two of them shared a common goral: they wanted their viewers to be excited about science. Poole's television series, *The Johns Hopkins Science Review* (1948-1955) fostered the first collaborations between broadcasters, actors, and scientists, and educators. Decades later, Greene's series *The Elegant Universe* (2003) and *The Fabric of the Cosmos* (2011). Poole paved the way for the scientific storytelling of Greene, deGrasse Tyson, Nye, and other scientific storytellers. But, since the flicker of the *The Johns Hopkins Review* in 1948, the place of scientific storytelling within popular culture has changed. In 2018, seven decades later, scientific storytelling has become an accepted form of narrative. How did we become a culture in which three thousand people would fill an auditorium just to listen to scientists?

[828] "The Great Debate: The Storytelling of Science."

In my dissertation, I've argued that the creation of science television series created an important space of dialogue for scientists and non-scientists. When examined closely, science television episodes can be understood as artifacts of cultural attitudes toward science. Materials, like memos and correspondence, reveal that process of science television production is simultaneously a process of interdisciplinary collaboration. Additionally, fan correspondence and oral histories show that science television becomes integrated into individuals' personal identities. Over thirty years, the concepts, personas, and affects of science television have become incorporated into public memory.

Since the late 1940s, science television programs have served as a malleable medium of professionalization for scientists. The very first science television series, *The Johns Hopkins Science Review,* was created to impress non-scientific viewers with the usefulness of scientific knowledge. Scientists were depicted as important, albeit dull figures in American culture. *Watch Mr. Wizard* came next, helping teach young viewers to trust friendly scientists. In the mid 1970s, *NOVA* explored the potential pitfalls of the profession through critical programs like "The Plutonium Connection." The scientists depicted in *NOVA* were represented as normal men and women; science was just another profession. By 1980, *3-2-1 Contact* actively encouraged their young viewers to imagine science as diverse field. The scientists of tomorrow would be men and women of all races. *Cosmos* taught viewers to reconsider scientists as poetic writers and introspective

philosophers. Over thirty years, the televisual scientist had transformed from the staid scientific researcher to the dynamic scientific storyteller.

This dissertation also traced the ways that scientists became trusted as the creators of scientific programs. Early on, Lynn Poole specifically told his brethren that scientists were too stodgy to be good public presenters. In contrast, Don Herbert befriended university professors and sought out opportunities to collaborate. The producers of *NOVA* took the scientific establishment to task, yet they chose to spotlight younger, more progressive post-docs and assistant professors. By the 1970s, a younger generation of scientists had recognized the benefits of appearing on television and creating television programs. *3-2-1 Contact* presented scientists with their first full opportunity to be equal collaborators on- and off-camera. *Cosmos* presented a realization of this vision, where a scientist, Carl Sagan, dreamed up and produced his own television series. By the end of the series, scientists had replaced artists as trusted creators of science series.

The visions and methods of creating science on television also evolved over three decades. In the early 1950s, scientific programs were fashioned around a series of experiments. Lynn Poole and Don Herbert wrote programs that emphasized the "everyday science" philosophy, that is, they had decided that viewers wanted to learn scientific principles that were directly related to their daily activities (for instance, how does bleach clean clothes?). By the 1960s, educators changed their teaching philosophies. Additionally, audience tastes had changed. Viewers eagerly watched

programs like *Wild Kingdom*, which took science out of the laboratory and into the wild. Programs were in color and the scientists wore paisley pants, not white jackets. Additionally, television coverage increasingly focused on turbulent social events, like protests and wars. The next iteration of science television needed to be more than useful; it had to convince viewers of its relevancy in society. The succeeding wave of science television addressed these concerns. *NOVA*'s television programs were almost essays: the energetic young filmmakers intentionally made them political commentaries about the relationships between science and society. *3-2-1 Contact* emphasized the importance of recruiting young, diverse scientists for future scientific innovations. *Cosmos* advocated a humanistic vision of science that blended together science and philosophy. Thirty years later, scientific storytelling emphasized the importance of crafting a personal, scientific affect, not understanding the inner workings of a blender.

Another thirty years later, the young rebels of 1970s television have become the old guard. A new generation of science communicators, like Brian Greene, Neil deGrasse Tyson, and Bill Nye, started to appear in the 1990s and 2000s. They were imbued with the visions of science television they had experienced as children. Some of them remember the old shows. As a child, Neil deGrasse Tyson recalls, "I watched the words [Carl Sagan] chose, and the phrasings, and the clever references to pop culture references."[829] He explains that, "*Cosmos* is more than Carl Sagan. Our capacity to decode and interpret the cosmos is a gift of the method and tools of science. And that's

[829] Larry Getlen, "Neil deGrasse Tyson: Carl Sagan Altered My Trajectory," *Observer*, December 2, 2015, Accessed from http://observer.com/2015/12/neil-degrasse-tyson-carl-sagan-altered-my-trajectory/

what's being handed down from generation to generation."[830] These storytellers benefited from the path that their predecessors had forged a generation earlier. University professors actually started to encourage their students to develop their own science communication skills. The first generation of scientific storytellers had helped to normalize their own set of professional skills. In an obituary for Don Herbert, Bill Nye, recalled:

> Mr. Wizard sent us to the moon. He changed the world. If you think about it, your favorite and most influential teachers were performers. When they get up in front of the class, they've got something to say, and they present with style. As an informal (non-classroom) educator, I grew up loving Mr. Wizard and then later studying his moves. If any of you reading now have been surprised and happy to learn a few things about science watching "Bill Nye the Science Guy," keep in mind it all started with Don Herbert.[831]

Nye credited Herbert's friendly persona as one the reasons that he watched the program; he intentionally studied Herbert's performances to learn how to communicate to others. The first generation of visible scientific storytellers, who were also scientists, helped to inspire their ardent fans to become scientists and to communicate their love of science to others.

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[830] Joel Achenbach, "Why Carl Sagan is Truly Irreplaceable," *Smithsonian Magazine,* March 2014, accessed from https://www.smithsonianmag.com/science-nature/why-carl-sagan-truly-irreplaceable-180949818/#163ZVDXshSW6ojUl.99 on March 30, 2018.
[831] Bill Nye, "Teaching Science with a big 'poof!'," *The LA Times,* June 15, 2007. Accessed from http://articles.latimes.com/2007/jun/15/entertainment/et-wizard15.

Like the previous cohort of scientific storytellers, these new television educators develop their own philosophies of storytelling. Greene notes that he spends a lot of time working on the narratives behind his productions. He explains:

> I feel strongly that people get ideas if they are part of a seamless, coherent narrative. Whereas, if they're just approaching them as one idea after another, after another, without some overarching organization or coherence, it feels unnatural – it won't stick as much and they won't have a good time.[832]

Greene's awareness of storytelling emphasizes his belief in the relationship between entertainment and pedagogy. His audience will want to learn something, he reasons, if they're enjoying it – so it's up to scientists to foster a positive relationship between the viewer and the materials.

As a television presenter and former amateur actor himself, Greene explains a primary difference between live event and television: on television, you can get a retake; on stage, you must never miss a cue.[833] Hence, former dancers and actors, like Lynn Poole and Don Herbert, made fantastic early performers on television; their training ensured a smooth delivery in the days of live television broadcasts. By following their example, scientists like Carl Sagan practiced performing in front of a television audience. With the invention of cheaper film in the 1960s, scientists in studios could afford the luxury of a second take. Storytellers at *NOVA* and *3-2-1 Contact* could clip, trim, and present a particular story of science.

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[832] Brian Greene, Interview with author, February 21, 2018.
[833] Ibid.

What is old has become strangely new again: scientists want to develop their acting skills. Skim the web, and you'll find advertisements for live science events, like science stand-up nights and science theatrical plays. Alan Alda, a television actor, got his start on John Angier and Graham Chedd's *Scientific American Frontiers*. Inspired by his time on the series, he founded a school of science communication. Since 2009, the Alan Alda Center for Communicating Science claims to have trained 10,000 scientists and doctors teaches scientists improvisational acting skills.[834] One of the newest experimentation spaces in New York City is *Caveat,* a science bar and performing space. The creator of *Caveat,* Ben Lillie grew up watching *Cosmos, NOVA,* and *3-2-1 Contact*. (He also started *StoryCollider,* a radio program and podcast series that showcases personal stories about science). *Caveat* is a snug bar that is hidden away on the lower east side.[835] At the center of the space is a stark black stage; one side features a collection of leather chairs and a cozy library; the other features a sleek bar, with a row of bar stools. Lillie created the space as a playground for academics, scientists, writers, and actors to workshop different presentation styles. Lillie doesn't think of himself as a scientific storyteller, scientist, or a communicator. Like Greene (who also avoids labels), Lillie sees himself as simply as a person who likes to create interesting stories about science.[836] Lillie envisions *Caveat* as an incubator for future scientific storytellers of tomorrow. But, when I talked to Ben Lillie, he told me that many of his collaborators dream of something

[834] "About," Alda Communication Training, http://www.aldacommunicationtraining.com/about/ Accessed on April 2, 2018.
[835] Caveat, 21 A Clinton Street, New York, NY 10002. Visited on March 13, 2017.
[836] Ben Lillie, Interview with author, March 13, 2017; Brian Greene, Interview with author, February 21, 2018.

else: their own television programs. This surprised me – in the era of science vlogs, podcasts, and Facebook livestream, television seems almost quaint. What is it about appearing on a television program that still seems appealing, even to these voices of tomorrow?

Science television series were revolutionary because they successfully encouraged audiences to envision themselves as scientific storytellers. Certainly, science popularization in other mediums pre-dated television, like radio and books.[837] Yet science television series intentionally activated their viewers to become storytellers. In every episode of *The Johns Hopkins Science Review*, Lynn Poole looked directly into the camera and addressed his viewer. Mr. Wizard told his viewers to follow along with him at home. Each episode of *NOVA* told viewers that, even if they weren't scientists, they could follow current events in science. The producers of *3-2-1 Contact* urged viewers to become scientists of the future. In *Cosmos*, Carl Sagan smiled into the camera and asked his viewers to journey into the universe with him.

The television viewers were the unseen storytellers. In every science television series, viewers were encouraged to write in for free materials and form affective

[837] Bernard Lightman, *Victorian Popularizers of Science: Designing Nature for New Audiences (*Chicago: The University of Chicago Press, 2007); Peter Bowler, *Science for All: The Popularization of Science in Early Twentieth-Century Britain* (Chicago: The University of Chicago Press, 2009); Marcel LaFollette, *Science on the Air: Popularizers and Personalities on Radio and Early Television* (Chicago: University of Chicago Press, 2008); Marcel LaFollette, *Science on American Television: A History* (Chicago: University of Chicago Press, 2013).

connections with the on-screen storyteller.[838] Viewers positively responded these direct calls for communication; they wrote scores of fan mail to their favorite television hosts. These fans often thanked these scientific storytellers for a creating a television program that respected their intelligence. They explained that the program had inspired them to talk to their teachers, their friends, and their children about science. By witnessing science on television, viewers became co-creators of scientific narratives.

Since *Cosmos* aired in the 1980s, the boundaries between the scientific storyteller and the audience have completely collapsed. With the proliferation of video blogs in the 2000s, the channels of distribution have greatly changed. Everybody can become a scientific storyteller. This has allowed younger, ethnically diverse storytellers to start telling their own stories. Older science communicators are intentionally trying to create a move inclusive environment. Bill Nye's recent relaunch on Netflix *Bill Nye Saves the World* and Neil DeGrasse Tyson's webseries *Rising Stars* both intentionally showcase the work of science journalists and educators in their early 20s and 30s.[839] Some scientific storytellers are advocating for themselves. In 2016, *500 Women Scientists* was organized by a group of women scientists.[840] In addition to promoting science literacy and advocating for scientifically sound political movements, *500 Women Scientists* aims to

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[838] Katherine Pandora,"Knowledge Held in Common: Tales of Luther Burbank and Science in the American Vernacular," *Isis* 92 (2001): 498.

[839] Justin Maiman, "Watch our new show with Neil deGrasse Tyson called 'Rising Stars'," *Business Insider,* October 2, 2017, http://www.businessinsider.com/watch-facebook-show-neil-degrasse-tyson-rising-stars-easton-lachappelle-2017-10 accessed on April 2, 2018.
Hanh Nguyen, "'Bill Nye Saves the World' Review Teaching Scientific Literacy to Millennials Makes for a Fist-Bumpy Ride," *IndieWire,* April 21, 2017, http://www.indiewire.com/2017/04/bill-nye-saves-the-world-review-netflix-1201806140/ accessed on April 2, 2018.

[840] "Who We Are," 500 Women Scientists, https://500womenscientists.org/who-we-are/, accessed on April 2, 2008.

connect journalists to female scientist in every field. They seek to bypass the traditional television platform entirely.

Yet, despite the popularity of podcast, webseries, and Netflix, television still inspires storytellers.[841] In the autumn of 2015, two seventh graders from Houston, Texas contacted NOVA's senior series producer Melanie Wallace.[842] Tatyana McClain and Han Van had watched a NOVA documentary called "Forgotten Genius," which debuted in 2007. "Forgotten Genius" described the life and work of the African American chemist Percy Julian. At the turn of the 20th century, Julian had developed a process for synthesizing progesterone, estrogen, and testosterone from plants; among doctors, he was known for his pioneering work with the drug cortisone. In 2015, eight years after the documentary's original broadcast, these middle school students were inspired to learn more about the life of this little-known scientist. With the support of their teacher, Monica Blackshire, McClain and Van reached out to NOVA in search of additional resource materials in order to create a presentation for National History Day. Wallace, delighted and enthusiastic, went into the NOVA archives to find materials on Julian, which included some letters and papers written by him and not available to the general public. The students competed successfully at their school and in their district, winning the chance to compete at the state level against high school students from all over Texas.

[841] Much of this text is taken, almost verbatim, from email correspondence between Melanie Wallace and the author on April 2, 2018.
[842] Ralph Bouquet, "Exploring the Life and Legacy of Percy Julian," NOVA, December 14, 2016, http://www.pbs.org/wgbh/nova/blogs/education/2016/12/percy-julian/ accessed on April 2, 2018.

But in Austin, Texas, despite their best efforts, the students placed third, just missing out. "Yet," producer Wallace remembers:

> Their work was so impressive that their teacher, Ms. Blackshire and I hatched a surprise for them at their eighth grade graduation. Ms. Blackshire commissioned a special trophy–called *"The NOVA Achievement Award*" – and I flew to Houston for their graduation awards ceremony to make the presentation. Needless to say, the students and their families were completely surprised. It was an exciting day for Tatyana and Han who were thrilled to be recognized for their efforts in front of their peers.[843]

The children themselves were delighted to be recognized for their attempts to practice scientific storytelling. But there's something even more important about *NOVA's* trophy. In the 1950s, educators, broadcasters, and parents felt a need to push their children into scientific careers. Now, several generations of viewers later, many educators, broadcasters, and parents are acknowledging the intrinsic value of scientific storytelling itself.

Young students like McClain and Van understand the importance of learning strong communication skills. For guidance, they looked to television, the original crucible for scientific storytelling. Even in a world of ever-increasing digital platforms, television still remains relevant. NOVA producer Wallace thoughtfully notes, that:

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[843] Ibid.

> A story like this one speaks to the importance of science communication and creating resources and stories that can endure and do so in ways that as creators we have no idea what the life span of our work can be or how the recipients will use the material to enhance their life. [844]

70 years ago, the first scientific storytellers appeared on television. By producing television series, they created a space for narrative creativity. But, most importantly, these writers, scientists, and actors mentored successive generations of scientific storytellers. Those unseen storytellers guided the voices of tomorrow.

[844] Ibid.

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