Taking Science to the Marketplace

Examples of Science Service's Presentation of Chemistry during the 1930s

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Abstract: During the 1930s, Science Service, a not-for-profit independent news organization, promulgated an approach to popularizing science which favored audience preferences over scientific agendas and attended to industry as well as academic research interests. Stories about chemistry and chemists harmonized well with Science Service's emphasis on research utility and relevance. This article describes examples from syndicated news reports, radio broadcasts, a newspaper series called 'Fabrics of the Future', and a department store exhibit on chemistry that traveled through the United States in 1939-40.

Keywords: *popularization of chemistry, 20th century, Science Service*.

1. Introduction

In 1936, science journalist Frank Thone declared to members of the American Association for Adult Education that their fellow citizens were "as eager as St. Paul's Athenians to hear some new thing" about science but they preferred flexibility to pontification.[1] His explication foreshadowed today's world of ubiquitous, portable communications devices:

> Their Agora is the daily newspaper. It may be a less sociable institution than the Athenian market-place or the Victorian lecture-hall, but it is a much more flexible one. You can roll up a whole company of heralds, messengers, and gossips, stick them in your pocket, select the ones you want to listen to, and hear their stories whenever you please.[2]

Thone's employer, a not-for-profit news organization called Science Service, had been delivering just such 'company' since 1921. Through newspaper articles, books, and radio programs, it sought to promote discussion of science in ways that were acceptable to scientists yet profitable to publishers. By the mid-1930s, Science Service had helped to increase news coverage of science,

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enlarged the worldwide network of science communicators, and whetted the public's interest in knowing what scientists were accomplishing. As an organization, it had achieved respectability and modest financial stability, even if its embrace of the values of popular culture occasionally unnerved otherwise loyal supporters within the research community.

With one foot in the scientific establishment and the other in a commercially driven media marketplace, Science Service played a cautious game. Organized as a sanctioned intermediary between the scientists and the rest of the press, yet compelled to sell its news products in order to survive financially, the group became skilled at occupying the middle ground. Scientists complained about inaccuracy and sensationalism. Editors shouted, 'give me something my subscribers will like!' Science Service reacted by constantly assessing the quality of its news stories and responding to all reasonable criticism, while continually adjusting its products to fit the newspapers' demands.

The challenges that Science Service faced during its early years are, in fact, representative of larger debates at the time about whose interests popularization should serve. When the first director, chemist E.E. Slosson, died in 1929, the organization experienced a wrenching fight for control which emphasized the competing ideals for popularization. Following three years of interim management, the appointment of Watson Davis, an engineer and journalist who had been working for the organization since its beginning, signaled a compromise that placed public interest and marketplace appeal first among the criteria for topic selection, increased attention to applied science and technological innovation, yet attended to scientists' concerns about accuracy and the timing of research announcements. The organization became skilled in the art of compromise, at straddling the middle ground. The images and ideas chosen by its writers during the 1930s thus reflect well what the marketplace – Thone's 'Agora' – was buying.

This article summarizes conclusions from my on-going research on the news values promoted and adopted by Science Service from the 1920s through the 1940s, and how negotiation of those values influenced print and broadcast images of science.[3] After a brief summary of the organization's founding, I discuss its initial approach to how (and by whom) science news should be constructed. With emphasis on images of chemistry, I then describe three representative examples of content from the 1930s – *Daily Mail Report* news stories, 'Adventures in Science' radio programs, and a 1939-40 project called 'Fabrics for the Future' in which a traveling department store window display was coordinated with local newspaper publication of articles about synthetic textiles.

Research on the history of Science Service has, to some extent, confirmed my previous conclusions about popular science, although the editorial files have also revealed new aspects of the cultural negotiations affecting it. The news stories and radio broadcasts of Science Service during the 1930s echoed patterns of assimilation, celebration, and pragmatic appraisal found in other popularization venues (LaFollette 1990). Science Service defined 'science news' broadly to include medicine, engineering, economics, and invention, an inclusiveness typical of the time. The messages promoted science's practicality and usefulness, or outlined how research was contributing to economic recovery during the Great Depression; the writers promised a brighter future through research and then borrowed images of alchemy and magic from popular fiction and motion pictures. Stories focused more on conveying factual information, with little attention to controversy or conflict among scientists. Toward the decade's end, Science Service gave increased attention to textile and pharmaceutical products and to chemistry's contributions to national self-sufficiency, and the editorial staff cooperated with the chemical industry to portray chemistry as an essential and positive contributor to American life. By agreeing to broadcasters' demands for increased attention to scientists' personalities, the radio series also helped to extend to science the 'cult of celebrity' emerging during the 1930s.

Science Service should not, however, be assumed to have been either a tool of the scientific elite or a public relations outfit for science and industry or a science education organization.[4] During its first two decades, Science Service acted foremost as a news broker that sought to generate a demand for science among mainstream newspapers, to facilitate scientists' cooperation in the popularization process, and to provide *useful* scientific information to 'the masses, not the classes'. The organization played this role at a critical moment in history, when both science and the mass media were changing dramatically. By the late 1930s, the scientific community was evolving into the complex and large-scale international research system existing today; science had earned front-page attention and would soon grab even more. Advertisers and publishers were transforming consumer expectations for communication style and content. Radio was becoming overwhelmingly commercialized and dominated by drama and entertainment; the telegraphic, visual approaches of Hollywood and magazines like *Time*, *Life*, and *Readers' Digest* were pushing the old style of 'literary' popular science to the margins of public desire. Science Service adjusted its own products to the changing context, and gradually convinced its scientific supporters to participate in this new marketplace for popular science.

2. Origins: a new institution for a changing market

Science Service's financial structure as a not-for-profit business corporation consistently influenced its content selections. Its limited endowment helped to cushion tough economic times and occasional project failures, but it was compelled to sell its news products in order to survive. Established by a wealthy newspaper publisher, and with advisors drawn from the nation's scientific elite, Science Service derived a substantial portion of its income from syndicating news stories to newspapers and periodical publishers. Organizational sustainability depended upon positive audience reaction and thus continually shaped the decision-making.

This section outlines aspects of the organization's naissance and original direction which are relevant to understanding how it operated during the 1930s. No comprehensive history of Science Service yet exists; this discussion relies therefore on new archival research as well as on work by David Rhees and other historians whose research has focused on the group's early years.[5]

The idea for the organization developed during an era when the scientific establishment had considerable concern about its public image but few practical ideas for how to polish it. The plans of various eminent scientists for establishing popular magazines had been hindered by their lack of real-world experience in the publishing business (see Burnham 1987, Kevles 1978, Tobey 1971). In 1903, millionaire newspaper publisher E.W. Scripps (1854-1926) became intrigued with the holistic and humanistic approach to science embraced by a University of California zoologist, William E. Ritter (1856-1944). With his sister Ellen, Scripps endowed a new oceanographic institute, and Ritter became its first director and a close friend of Scripps (Thone & Bailey 1927). By 1919, the two men had begun to imagine a new entity to foster public communication of science, discussing it with scientists around the United States. Within a year, they were actively designing what would eventually be called 'Science Service'.

A paramount consideration in these discussions was whose interests the organization should serve – science or society? Scripps and Ritter took a liberal democratic approach that differed from the patrician, elitist attitudes of most senior scientists. Scripps saw that science had extraordinary power to affect modern life and therefore citizens deserved better information about it. As his son Robert P. Scripps later explained, the millionaire knew that "for the masses as well as the classes, knowledge is power" (Scripps 1932, p. 156). The elder Scripps had, after all, made his fortune by delivering news and entertainment to those very masses. First consideration in the new group's decision-making should be given, he believed, to the potential audience's practical needs and interests rather than the scientific establishment's agendas.

To implement this approach, Science Service was incorporated independent from any single scientific organization or discipline. To gain respect from skeptical newspaper editors, Scripps argued, the organization must be perceived as an objective and reliable presenter of facts. It should not be a publicity machine for science or engage in advocacy or 'propaganda'.[6] It should "tell the millions outside the laboratories and the lecture halls what was going on inside" (Scripps 1932, p. 156) and do so accurately. Both Scripps and Ritter were convinced that mediocre presentation fed public 'indifference' to science. The new organization's products must be readable, accessible, and interesting as well as accurate and timely. Ritter reinforced this message when he wrote to Scripps in 1921: "Unquestionably there are aspects of science that appeal strongly to popular interest; there is much that is curiosity-satisfying, much that is practically useful, much that is dramatic; and were Science Service to 'play up' these aspects to the extent that it might, [then] it could soon reach a self-supporting basis, and could go on and largely increase its funds."[7] Ritter served as first president of the board of trustees and remained 'honorary president' and an influential advisor until his death in 1944.

Partial self-sufficiency – in both content and finances – became a key to success. This model of popularization differs from that advocated by many scientists, then and now, for it emphasizes reactivity to audience preferences. Although incorporated as a not-for-profit entity, the organization was never wholly funded by Scripps. He espoused a liberal vision of the free flow of ideas but his philanthropy was rooted firmly in capitalism. If Science Service charged a fair price for its products, then the clients would value its news more; and if forced to sell those products, the organization would be more sensitive to the clients' needs and professional standards. If no newspaper or magazine wanted to buy the stories, then the organization should not survive. Science Service, its first director explained, "is sufficiently endowed to be independent and yet it is intended to be self-supporting although prohibited by its charter from making profits."[8] Or, as one trustee wrote:

> It is a non-profit-making institution, and if it charges enough for the production of its service to keep going, *then assuredly the fact is patent that it is not subsidized; and, moreover, enjoying a real income, it can afford to actually produce not only well-written copy, but copy that has first been verified–that is authentic and UP-TO-DATE.* Constant improvement – or death – is assured by the necessity to charge rates commensurate with the service rendered.[9]

Only the news products ever really met these financial goals during the first decades; most other projects were subsidized by the news sales or endowment income.

Scripps donated $30,000 per year (supplemented by other occasional gifts) from 1921 until his death in 1926. His family trust continued the same annual payment for the next thirty years. By late 1924, endowment income and product sales contributed about equally to support operations, and the managing editor predicted that they might “eventually increase the income from the sale of the product to such an extent that the endowment income can be used to exploit possibilities which are not on the face of them commercially attractive.”[10] Within a relatively short time, such risks were indeed possible, enabling them to experiment with popular radio broadcasting, for example.

The board of trustees included ex officio such prestigious scientists as the presidents of the National Academy of Sciences and American Association for the Advancement of Science and the head of the Smithsonian Institution. Prominent trustees during the 1920s and 1930s included psychologist James McKeen Cattell (editor of *Science* and *Scientific Monthly*), astronomer Harlow Shapley, and such notables as A.A. Noyes, Vernon Kellogg, and John C. Merriam. Science Service advertised the location of its editorial offices within the new National Academy of Sciences building to imply legitimacy and status (Figure 1), even though the staff operated independent of it or any other scientific association.

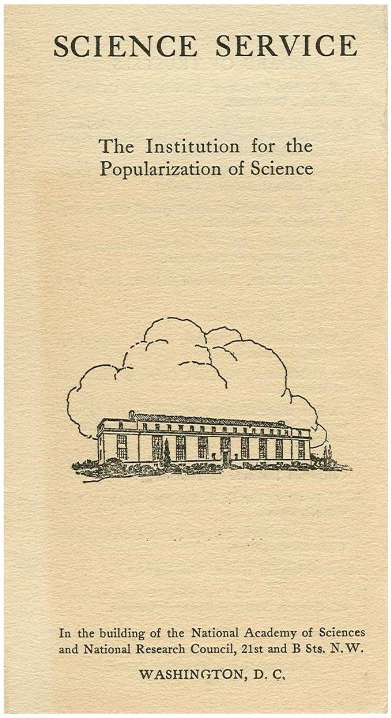

Figure 1. Cover of Science Service promotion brochure, 1924, showing the National Academy of Sciences building in Washington, D.C. (Smithsonian Institution Archives, Accession 90-105, Box 20, Folder 19). Courtesy of Smithsonian Institution Archives.

Trustees also included executives in the Scripps-Howard newspaper empire and such well-known editors as William Allen White and Marlen Pew, and the historian Mark Sullivan. These latter advisors shared invaluable practical advice on how to compete in the news business, and they proved to be the critical element in the fight over appointment of a new director and in preserving what Scripps and Ritter had envisioned.

3. Staffing, credentials, and a fight for control

During Science Service's first forty years, two men in particular – one trained as a chemist, the other as an engineer – implemented the Scripps-Ritter vision of an all-inclusive, market-oriented popular science. They shared many common perspectives, not the least being a broad definition of 'science news' which included attention to medicine, engineering and mining technologies, transportation, and parapsychology, as well as such predictable topics as relativity and evolution. The differences in the men reflected the twin impulses of popularization in the twentieth century. The chemist advocated an approach that was more academic and literary, that emphasized science's theoretical foundations and romanticized its practical implementation. The engineer advocated journalistic techniques and values, favored content tied to invention and innovation, courted friendly relations with advertising and public relations representatives, and frequently adopted the language and images of stage and screen rather than the literary *salon*.

The first director, Edwin Emery Slosson (1865-1929), possessed an unusual combination of skills and experience, and had been handpicked by Scripps, Ritter, and their advisors (Rhees 1979).[11] A native of Kansas with sturdy liberal values and a distinctive flair to his writing, Slosson had completed a Ph.D. in chemistry at the University of Chicago in 1902 while teaching at the University of Wyoming. The next year, he moved to New York to become literary editor of *The Independent*, where he worked until moving to Washington, D.C., in January 1921 to head Science Service. With three degrees in chemistry, Slosson had respectable credentials as a scientist, but, as he confessed to another chemist, he much preferred writing to laboratory work:

> I too like you am classed as a 'renegade from natural science' since I have never done any research work in chemistry after having taken my doctorate at the University of Chicago in that science. But I have like you retained my interest in science and have done what I could to spread a knowledge of scientific achievements among the reading public.[12]

In New York, Slosson built a reputation as one of the premier science popularizers, combining a reverence for technical accuracy with literary flourishes. He regarded dramatization as essential in attracting readers, and so he immediately began 'hunting' for writers who could 'sense the dramatic elements' in basic scientific principles. "Dehydrated potatoes are convenient for conveyance but they have to be soaked up before they are palatable," he wrote (Slosson 1922, p. 482).

Slosson's interests and expertise lay more in the creative than managerial side of the news business. His first employees were a managing editor and a part-time news writer. When the managing editor quit, Slosson took the title of Director, promoted the part-time writer to full-time manager, and returned to making money by writing books and articles and delivering lectures around the country.[13]

That first writer hired by Slosson in 1921, Watson Davis (1896-1967), effectively ran the organization for the next 45 years. A native of Washington, D.C., Davis had earned a civil engineering degree at George Washington University and worked on the research staff at the National Bureau of Standards from 1917-21. He also began contributing science articles to a local newspaper. Although his literary skills paled in comparison to Slosson's, Davis had the instincts of a journalist and an engineer's ability to organize tasks. He could ferret out news and glean the essence from dull research reports, and proved to be a skilled manager.

When Slosson died in October 1929, he was not replaced for over three and one-half years, even though Davis was the logical successor. The struggle over that appointment emphasized differences in how scientists and journalists were still perceiving popularization. To scientists, the best popularizer was always another scientist; no journalist or other professional could ever be an adequate substitute. To those who embraced a vision of scientific popularization as free expression in a free society, it was the quality of the product that mattered rather than the writer's academic training. Was a story accurate? Did it serve the audience's needs and satisfy their curiosity? Was the information useful? Davis had been running the organization since Slosson's illness in January, had earned the trustees' respect, and had many powerful supporters. He lobbied hard for the position. His allegiances had always leaned toward the journalists, however. As chemist W.H. Howell, chairman of the trustees' executive committee, wrote to Davis, "In spite of your protests I reckon you as a newspaper person, because invariably you take that point of view when debatable matters come up".[14] To the scientist-trustees, selection of an eminent researcher to replace Slosson would enhance the organization's reputation among the scientific community. To the newspaper executives, a director who understood the marketplace would assure survival.

Davis pointed out that being a scientist did not guarantee access to newspaper offices. What mattered was whether "editors are confident of the authoritativeness and the reliability of our product."[15] Nevertheless, the executive committee offered the position to a well-known zoologist who had little experience in publishing or popularization. When that scientist refused the job, Davis was kept in limbo for another eleven months, while trustees (led primarily by James McKeen Cattell) attempted to reorient the organization away from the Scripps's vision of democratic expression and toward becoming a publicity machine for science.[16] Finally, in 1933, in the depths of the Great Depression, Davis was appointed director.

Davis was an energetic and ambitious man, described as "exceptionally capable [...] enthusiastic, vigorous and very likeable."[17] He possessed a keen understanding of the dynamics of the relationship between scientists and popularization, tracing much of scientists' uneasiness to their discomfort with popular formats: "It is a distrust of 'sensational presentation', so called; because of the form rather than the quality of the presentation that lies behind the indefinite criticisms that are sometimes directed to our work."[18]

Avoiding the "careless and unintelligent simplification" that can distort meaning is the first line of defense against such criticism, Davis wrote, and so he routinely conducted internal assessments of the organization's performance, emphasizing accuracy as the foremost news value.[19] All external complaints by either readers or sources were "conscientiously recorded upon the filed copy of the [news] report."[20] The conclusion of one survey of Science Service's daily news reports in 1929-30 reflects pride in such vigilance: "in only 36 instances out of 1707 stories issued were any criticisms recorded. Over half of these were what might be called typographical errors and many of them were caught by our own staff rather than outsiders."[21]

During the 1920s, Davis had begun to shape the organization toward a more relaxed relationship with industry, corporate public relations sources, and advertising firms. As an engineer, he was comfortable, perhaps even enamored, with the new industrialists of science; he established cordial working relationships with corporate executives at Du Pont, General Electric, and similar companies. He became friends with public relations guru Edward L. Bernays and advertising executive Ivy Lee. Once director, Davis thus continued on a path he had already begun to blaze, accommodating popularization to the social, cultural, and economic realities of the time. This approach is evident in the content published in the 1930s. Cooperation with publicists and corporate interests seemed the right thing to do. After all, Davis and the rest of the staff perceived themselves as engaged in their own public relations campaign – to persuade both press and scientific community to join in a campaign to educate the masses about what was happening inside the laboratories.

That staff included many pioneers in science journalism, including some of the first female science journalists in the United States.[22] Many were among the founders of the National Association of Science Writers in 1934. Almost all Science Service writers had some type of technical training; a few, like Thone, had graduate training but had abandoned full-time research and teaching for a career in journalism.[23] These intermediaries were familiar with scientific organizations, universities, and science-based industries. They understood scientists' culture, respected the authority of their expertise, and were alert to concerns about accuracy and credit. They were also convinced that scientific knowledge was a social asset to be shared and that science's fortunes were irrevocably entwined with those of the 'masses'.

4. Constructing the Daily News about Chemistry

If large numbers of readers (and the newspapers serving them) did not express consistent interest in a particular scientific topic, then Science Service gave it less attention. Coverage of the disciplines was therefore quite uneven, reflecting shifting public interest rather than necessarily the intellectual vigor of a research area. Mathematicians complained constantly about the lack of attention to their work, for example, but theorems or proofs could rarely compete with the glamour of archeology or physics. Special features and syndicated columns during the 1920s concentrated more on astronomy (weekly 'Star Maps'), meteorology ('Why the Weather'), or natural history and botany ('Nature's Notebook'); news articles followed similar patterns. During the 1930s, chemistry attracted more attention, thanks in part to consumer interest in the development of new pharmaceuticals, fabrics, materials, fertilizers, and insecticides. In effect, the public became more interested in what chemists were producing, and journalists responded.

Between 1935 and 1939, coverage of chemistry in Science Service's main product – the 40-50 stories sold every week through a syndicated service called *Daily Mail Report* – increased steadily from approximately 2% of stories during sampled weeks in September 1935 to 7% in March 1936, 11% in December 1938, 11% in May 1939, and 17% in October 1939.[24] Attention probably increased because of the achievements of interdisciplinary research with obvious relevance to consumers, such as work on sulfanilamide, plant hormones, fabrics, and insecticides. In 1936, stories discussed rayon and chemical production at Tennessee Valley Authority plants; in 1939, they paid attention to liquid helium and nylon parachutes. It was a view of chemistry as integrated smoothly into – and essential contributor to – the scientific whole.

Analysis of content provides only one historical indicator. It is also important to look behind the scenes at how, why, and by whom content was constructed. Such analysis shows that during the organization's first decade, the challenge had been to gain attention to *any* science, to convince newspaper editors that the work of botanists, astronomers, and chemists had sufficient relevance to compete on the front page with election campaigns, business decisions, or murders. To do this, it was necessary to create a 'demand' for science news. Scripps had advised Slosson: "Anything that you could do in the way of attracting the attention of journalists to the subject of science will naturally create a demand for your product – and what is even more desirable, will create a demand by editors for scientific matter generally."[25] Slosson responded that Scripps was, as usual, correct: "The indirect effects of Science Service are as you surmise, proving to be as important as the direct action. In many cases newspapers have gone after articles for themselves, after having seen some of ours in print".[26] And as Slosson explained to a fellow scientist:

> We are concentrating our efforts largely upon the newspapers, since in this way we can reach the largest possible public. The newspapers, however, demand 'news', that is, something which has a definite event on which to hang the general information and necessary explanation.[27]

Once persuaded of science's potential for news value, editors then had to be convinced that science would sell. In one of his first promotional letters to advertise what became the *Daily Mail Report*, Davis promised that Science Service offered news of importance, news their competitors were getting, and news that was reasonably priced:

> Off the beaten tracks real news is breaking. What scientists and engineers are doing today will affect the world tomorrow. Are you getting this news?
>
> Science Service is covering this important field for over forty newspapers from Bermuda to San Francisco. A news report [...] formerly mailed weekly but beginning today to be mailed daily, brings them interesting, readable copy, scientifically accurate, yet understandable by the non-technical person. It costs them only the fraction of the pay of an office boy.[28]

Such efforts soon had a noticeable impact. By January 1924, Scripps executive H.L. Smithton wrote to Ritter about the publicity received by a recent meeting of the American Association for the Advancement of Science:

> The leading headlines of the [local] papers were given to the subjects of the convention and to interviews with the scientists. Collisions of the atoms displaced automobile and railroad collisions; slaying of bacteria and undesirable insects completely overshadowed similar 'activities' among humankind; pictures of scientists ornamented the pages hitherto decorated by pictures of statesmen and criminals. Believe me: the scientist had his 'day' in the way of publicity this time.[29]

Journalists also had to convince scientists to share information about their research, which sometimes meant persuading them to release results before formal publication. Given the competition in the news business, timeliness was essential. Editors liked to know that results were 'just announced' or that a story might 'scoop' rival papers. Science Service could not wait for scientists to release results according to their own timetable (which might give the appearance of staleness). In science, rushing into print had not yet become the norm. Davis tried to explain this situation to one newspaper editor in 1936: "News of science does not develop like news of war, politics, crime and sport. Practically all scientific news is the result of months or even years of patient research, and it is produced by men who would rather remain silent than make an announcement that was not thoroughly authentic."[30] To secure researchers' cooperation in the news process, Science Service had to build their trust, had to convince them that while it valued accuracy over haste, there were deadlines to be met.

The most persistent conflicts centered on who should determine the quality of science news. Should scientists alone be the judges of what was accurate and important? Many newspaper editors thought that scientists gave little indication of understanding that communicating successfully beyond their circle of experts required some compromise. A.H. Kirchhofer, managing editor of the *Buffalo Evening News*, complained in 1932 that scientists gave "little or no credit to the newspapers" for recent progress in science reporting and that their unwarranted criticism actually contributed to "misunderstanding" between the two groups. Scientists need to "come out of their shells" and take a "human as well as scientific view-point" if they want more attention to their work, he argued (Kirchhofer 1932, pp. 154-155). Another editor observed that the articles "which sell best are those which get down closest to the field of the ordinary, unlettered Sunday newspaper readers."[31]

Science Service's solution to both increasing the flow of news from the laboratories and insuring its accuracy developed by accident. In his first year, with a limited budget and tiny staff, Slosson wrote to several colleagues asking for suggestions of graduate students or other young scientists who might submit short reports about research on their campus. He placed notices in *The Scientific Monthly* and similar publications. Applications began to arrive and these part-time correspondents (or 'stringers') soon became the organization's extra eyes and ears, alerting staff to ongoing projects as well as to impending announcements.[32] Frank Thone had first interacted with Slosson that way in 1921.

By the 1930s, the staff had become quite skilled at identifying potential stringers (met at scientific meetings or recommended by trustees and other prominent scientists). Every year, they sifted through dozens of applications from graduate students, young professors, underemployed writers, and various technically trained people interested in trying popularization. No promises were ever made for payment in advance; disbursements for accepted articles or photographs ranged from $2.00 to $10.00. Because a stringer's name was rarely attached to the published story, popularization by these young scientists (many of them women) did not attract unwanted criticism from colleagues for 'publicity-seeking'.

The existence and vitality of this worldwide network of sources demonstrates that the flow of popular science information may have been more complex than historians have previously assumed. Only about one-tenth of

Daily Mail Report stories in the 1930s, regardless of discipline, appear to have been based on interviews conducted by Science Service's full-time staff. Instead, they transformed other material into 'news' – editing stringers' reports or sifting through page proofs for journals like *Science* and the *Journal of the American Medical Associatio*n (sometimes writing scientists for additional material before writing a summary).

Through the years, the staff also became adept at exploiting access to the research community. They routinely covered the meetings of major scientific, medical, and engineering associations, persuading organizers to send advance copies of programs, and speakers to send copies of papers. Science Service did its part by voluntarily embargoing news articles until after a researcher's presentation had been delivered, thereby adjusting the newspapers' demand for timeliness to the scientists' desire for credit. To speakers reluctant to provide advance texts, Science Service explained that having a written paper helped to insure accuracy and "intelligent reporting" even if a journalist could be present at a session.[33] As one staff writer explained, science reporting required attention to detail: "All science stuff at meetings is written from the papers; it is impossible to sit down at a convention session and take notes for a story in the same fashion as you do anything else on that order."[34]

Sometimes local stringers were dispatched to interview prominent scientists or obtain exclusive information. In 1938, Davis attended the annual British Association for the Advancement of Science meeting in London and, like all good journalists, paid attention to the scientific gossip. On September 6, he wired his Washington office the news that: "EO LAWRENCE BUILDING TWO NEW MAGNETS FOR FURTHER WORK RADIOSODIUM."[35] Physics and chemistry editor Robert D. Potter then telegraphed a stringer in Berkeley, California (where physicist Ernest O. Lawrence had his laboratory), asking "CAN YOU RUSH COLLECT WIRE DESCRIBING SETUP AND ITS SIGNIFICANCE. TELL LAWRENCE THAT GUSTAV HERTZ BERLIN JUST ANNOUNCED 59 PERCENT PURE NEON MASS 22 BY DIFFUSION METHOD AND IS SENDING HIM SAMPLE." The stringer, George Pettitt, responded immediately; Potter folded the text into a *Daily Mail Report* datelined September 7 ("California Cyclotron Apparatus Being Enlarged and Improved to Make Possible Medical and Biological Research"); and the bookkeeper was instructed to pay Pettitt $5.00. Such rapid-fire exchanges became commonplace in the 1930s as physicists, chemists, and biologists raced to the frontiers of knowledge, and journalists competed to make the first dispatches from those intellectual front lines.

5. Chemistry on the airwaves

In developing such stories, Science Service perceived itself as facilitating the flow of ideas in society rather than engaging in public education. Especially in radio, pedagogical motives would have been suspect. Broadcasts that centered on intelligent conversations about science with (and for) fellow citizens fit radio's entertainment focus in the 1930s; education did not. Through a one-on-one interview preceded by the latest 'science news of the week', listeners could share a science 'adventure' and Science Service could accommodate the agendas of the networks that controlled access to the airwaves.

Science Service became involved in radio quite early in the development of commercial broadcasting. Soon after Washington, D.C., station WCAP began operation in 1924, its manager asked the National Research Council (NRC) to arrange weekly talks by scientists. Lectures by such experts provided convenient, free content that stations could schedule between musical concerts. NRC's scientists knew little about radio, so they turned to Science Service, appointed Slosson to a Committee on Radio Talks, and the two groups arranged their first 10-minute talk for June 6, 1924.

The talks sought to inspire rather than educate, and were aimed at a broad audience. Slosson, for example, admonished H.E. Howe, editor of *Journal of Industrial and Engineering Chemistry*, not to make a discussion of modern glassmaking "too highbrow."[36] Speakers emphasized the adventure and excitement of research as they described helium, radium, explosives, coal, synthetic rubber, or the spinning of 'artificial silk'. "The progress of science is a continual excursion into the mysteries of the sphere; the impossible is continually being accomplished," one program began.

Popularity was measured by the number of listener requests for scripts or free bulletins. In the late 1920s, listeners consistently preferred either the annual forecasts of 'science to come' or information about poison ivy treatments; by the early 1930s, listeners were asking for scripts and bulletins on the same topics being emphasized in the *Daily Mail Report* stories – medicine, psychology, and engineering. [37] By September 1929, Science Service's 15-minute news and interview program (called either 'Radio Talks' or 'Science Service Series' in the schedules) had proved to be so successful that it was broadcast from the CBS station in New York City and over thirty network affiliates.[38]

Radio in the United States was changing, however. Advertiser-supported entertainment began to dominate the commercial networks (see Douglas 1999, Hilmes 1997, Smulyan 1994), and science programming was soon forced to compete with comedians, jazz singers, soap operas, detective dramas, sports, and live broadcasts of political events (LaFollette 2002). CBS began to pressure Davis to alter his program format – to 'work closer' to the news and to accent scientific 'personalities'. This shift in emphasis echoed changes in how science was being presented elsewhere in the media. Newspaper editors routinely accepted science as newsworthy and important, but remained biased toward 'breaking news' and celebrities. One NBC employee, attempting to persuade Davis to develop a new program for their network, explained that her bosses were:

> very anxious to have scientific material put before the public but only when and if it would be news. [...] with your knowledge of forthcoming events you can get it on the air before it breaks in the papers. They do want the personality himself or herself – you of course bring the person to the microphone, introducing them and framing the picture for them.[39]

Davis attempted to explain that science news is more "deliberate": it "does not break in the way that a murder or shipwreck or other news of that character happens."[40] He was fighting a losing battle, however, and he eventually remodeled his CBS series toward more scripted interviews with guest scientists and engineers and gave more attention to scientists as celebrities (or, more often, potential celebrities). His broadcasts also increasingly emphasized pragmatic accomplishments designed to appeal to Americans clawing through an economic depression – proven winners like 'That Perennial Public Enemy, Poison Ivy' and practical topics like highway transportation and household heating. Chemistry became an integral part of many interviews, from pharmaceutical research to discussion of road-building materials, crime detection, and oil exploration.

The process of developing scripts with scientists required considerable diplomacy and patience. Here, the correspondence between Davis and his potential guests or their representatives provides a valuable glimpse of the construction of popular science. When Du Pont Company scientist Henry J. Wing proposed the title "Application of Research in the Protective Coating Industry" for his radio talk, for example, Davis suggested that "Vanishing Varnishes" would be better "bait" to lure listeners.[41] Wing called that suggestion "snappy" but offered "Changing Varnishes" as "just as suitable and perhaps more accurate" and Davis acquiesced to Wing and the Du Pont representatives who had brokered the chemist's appearance.[42]

Davis also knew how to play the broadcasters' game. He injected humor, attempted to humanize scientists, and declared that "Effective methods of presentation include dialogue, dramatic programs with music, as well as other types of programs written for the ear instead of the eye."[43] When he interviewed Charles C. Concannon, chief of the Chemical Division of the U.S. Department of Commerce, in November 1937 about the generally uninspiring topic of tung oil manufacturing and use in waterproofing, Davis opened with the chipper observation that "There are a lot of C's in that name of yours, Mr. Concannon." To which the chemist replied, per the script, "Yes, and in chemicals and commerce. But there aren't any C's at all in tung oil, and perhaps I'd better start by spelling it."[44]

In May 1938, just as the series name was changed to 'Adventures in Science', CBS took over all production and added dramatization and new on-air personalities. The surviving correspondence reveals Davis' frustration at the abrupt changes. His exchanges with the network personnel reflect ever more tension. He struggled to articulate scientists' concerns about inaccuracy, sensationalism, and trivialization, but the radio executives remained convinced that dramatizing or fictionalizing science would attract huge audiences.

The CBS decision had probably been influenced by two educational programs that *were* attracting listeners through clever dramatization of serious topics. 'Cavalcade of America', a radio series produced and sponsored by the Du Pont Company, featured professionally written dramas about the lives of historical figures and aimed to instill confidence in the corporation. Its first episode in 1935 declared that Du Pont's research chemists worked "in the same spirit" as national patriots and pioneers.[45] By 1938, the series was extolling the importance of invention and ingenuity, and occasionally engaging in fanciful history of science to enliven its message. One episode created a chance meeting between nineteenth-century scientists Robert Hare and Benjamin Silliman, in which Silliman asserted that "The progress of science is like an endless chain, Mr. Hare, each link joining what is behind and what goes before."[46] Similar inspirational rhetoric infused the Smithsonian Institution's 'The World is Yours' series on NBC. Beginning in 1936, its half-hour dramas, co-produced with the U.S. Office of Education, starred a cheerful character called 'The Old-Timer', who explored topics from art to archeology, engineering to entomology. When the new CBS version of 'Adventures in Science' looked at Antoine Lavoisier, therefore, its writers imitated a familiar radio drama pattern, focusing more on that chemist's sensational death than his ideas.[47]

Within a month, CBS had dropped the dramatizations and shifted to an abbreviated interview format. On September 16, 1938, the CBS announcer introduced chemist Harold C. Urey by saying: "We're off today on the trail of a drop of water that spread itself into a thunderstorm and washed up on the tables of research scientists a thousand new problems to face and fathom. It's the story of Heavy Water, a magic potion as fascinating as any witch's brew and the key, perhaps, to the next door of human progress."[48] By the end of September, listeners had tired of such trivializations and tuned in elsewhere; the series was cancelled.

In late 1938, CBS asked Watson Davis to resume production with his previous news-and-interview format, but Davis was now keenly aware of who controlled the microphone and how easily he could lose access to the airwaves.[49] He and the trustees had consistently rejected commercial sponsorship. As long as the series remained a 'sustaining' (*i.e.*, non-commercial) program, with production partially underwritten by Science Service but the air time provided by the network (and therefore at the network's discretion), Davis had to attend to the CBS suggestions. As a consequence, the revived 'Adventures in Science' series blended attention to academic science with occasional promotion of research-based industries.

In February 1939, for example, CBS executive Sterling Fisher wrote to Davis that the network planned to cooperate with the Associated Grocery Manufacturers in their April 'Parade of Progress' campaign, and he asked Davis to arrange interviews with scientists "from the research laboratories of large food product companies."[50] Handwritten notes in the margins of the Fisher letter indicate that Davis immediately asked various grocers associations for suggestions of potential guests. Fisher continued the pressure with a telegram: "WOULD APPRECIATE ANY INFORMATION RE ADVENTURES IN SCIENCE APRIL 8 DEALING WITH EARLIER SUGGESTION MADE TO YOU RE INTERVIEWING SCIENTISTS IN LABORATORIES OF GROCERY FIRMS."[51] Davis, who was on the road, wired that Science Service staff should locate a guest with an acceptable industry connection: "PROBABLY SAFEST GROCERY PROGRAM WOULD BE SOME REPUTABLE SCIENTISTS CONNECTED GENERAL FOODS ... KINDLY EXPLORE BUT KEEP IT NONCOMMERCIAL." On his return to Washington, Davis wired Fisher: "WE ARE WORKING ON A FOOD PROGRAM FOR THE APRIL 8 ADVENTURES IN SCIENCE TO TIE IN WITH THE GROCERS' PARADE OF PROGRESS, IN ACCORDANCE WITH YOUR SUGGESTION."[52] They eventually scheduled Lewis W. Waters, Vice-President of General Foods, who spoke about "Better Meals Tomorrow" and assured listeners that "Food scientists and the food industry are helping to build a bigger and better America of tomorrow".[53]

The most unusual broadcast that year involved a chemist who did not appear. That program exemplifies the attempts to sensationalize science while also emphasizing its role in national preparedness. It also offers an example of how scientists' attitudes to popularization had evolved since Science Service had been founded. On Saturday afternoon, November 13, 1939, after his usual four-minute news segment (*e.g.*, world's highest and lowest-recorded temperatures, new building insulation materials, and discovery of a new undersea mountain off the Alaska coast), Davis declared "now let's turn to the war." One question "most often asked in connection with the war," he said, is about "the delay in using gas warfare": "The failure to use gas is puzzling to those of us who read about every man, woman, and child in warring countries of Europe fitted out with gas masks."[54] The program then focused on what had been advertised as a live interview of Winford Lee Lewis, inventor of lewisite.

Lewis had developed a powerful respiratory irritant, chloro-vinyl-dichloro-arsine ('lewisite'), while working for the U.S. Chemical Warfare Service during World War I. Formerly chairman of the Northwestern University chemistry department, he was now director of scientific research for a Chicago firm. Davis had interviewed Lewis years before, in a September 1933 program on 'Friendly Germs', and so the chemist agreed to appear again but explained that he had been having trouble with his voice: "I will be glad to undertake the broadcast providing Mrs. Lewis [his wife, Myrtiela Mae Lewis] might give my talk in the event I am out of voice."[55] He assured Davis that she had a "most unusual speaking voice […] with exceptional enunciation" and that she had been "one of my chemistry students" so would be conversant with the topic. Mrs. Lewis did appear, in fact, reading her part from a prepared script that celebrated the "usefulness" of chemical weapons:

> Interviewer: The development of a country's chemical industry has a very real bearing on its disposition to use or not use chemical weapons.
>
> Mrs. Lewis: Yes, it has been frequently pointed out that a country with a strong chemical industry has a tremendous advantage in a conflict involving chemical weapons. Chemists, chemical knowledge, chemicals and chemical plants are needed to produce chemical weapons. These resources cannot be developed overnight.[56]

At the end of the broadcast, the announcer asked, "Would you like to have more information on war gases?" Listeners received a free bulletin ('War Gases') that described the chemical characteristics and physiological effects of substances like mustard gas, chlorine gas, lewisite, and toxic smokes.[57]

That episode demonstrates how much the scientific establishment's acceptance of popularization had changed. Many historians, myself among them, have long pointed to chemists' outrage at the news coverage of poison gas after World War I and have assumed that such outrage not only fueled their postwar campaigns to improve chemistry's public image but also left many scientific leaders leery of certain types of popularization. By 1939, however, an organization praised and supported by scientists, including the most prominent chemists of the time, was discussing poison gas research on its Saturday afternoon radio program and doing so without any apparent defensiveness. This circumstance suggests that the scientific establishment had embraced a more pragmatic acceptance of media attention, perhaps seeing participation in such communication as potentially useful in attracting economic and political support, as a necessary evil rather than an enemy of science's cause.

Several other late 1939 broadcasts sounded celebratory notes about chemistry and its contribution to national self-sufficiency and defense. Sidney D. Kirkpatrick, editor of *Chemical and Metallurgical Engineering*, assured listeners on December 4 that "America now has a chemical industry second to none [...] we are more nearly self-sufficient from a chemical standpoint".[58] And on December 25, Davis opened his annual 'Review of the Year' program by wishing listeners "A Merry and Scientific Christmas" and giving a "scientific balance sheet, to judge what has been important and significant".[59] "Long after the war of 1939 is forgotten," he explained, "the splitting of the uranium atom with release of energy, hinting practical production of power from within the atom, may be listed as the year's outstanding achievement." Davis then listed science's ten major contributions to American health and households, including "Number 6 [...] The success of the chemical sulfapyradine in treatment of pneumonia and the continued promising treatment of many other disease with sulfanilamide and related chemicals" and "Number 9 [...] Development of synthetic fibers for clothing, including nylon, vinyon, synthetic wool from milk". This last achievement was the subject of another Science Service project which combined department store mercantilism with adult education.

6. Chemistry in department store windows

Early in 1939, after a meeting of the Science Service executive committee, some members went to inspect a new exhibit about synthetic fibers, set up a few blocks from the National Academy of Sciences building.[60] It must have been a remarkable sight as a dignified trio – chemist W.H. Howell, Edwin G. Conklin of the American Philosophical Society, and C.G. Abbot, head of the Smithsonian Institution – stared at a display of women's clothing in the central window of the Woodward & Lothrop department store (Figure 2). The window, in which garments made of new synthetic textiles were surrounded by jars of the fabrics' constituent chemicals, represented Science Service's latest innovation: a traveling exhibit displayed in department store windows and sponsored by local newspapers which published a coordinated series of articles about the chemistry of 'Fabrics of the Future'.

On one side of the Woodward & Lothrop window (Figure 2) can be seen bottles of new chemicals and samples of metal and glass; on the other side, nylon stockings and lengths of rayon cloth. The mannequin's dress is made of lanital (synthetic wool). Over the front of the window is a 'spider web' design representing the 'spinning' of artificial fabrics. This project – both the middle-class context in which the exhibit was displayed and its central themes – exemplified the organization's attempts to diffuse science beyond traditional outlets and to infuse social and economic relevance into its news. What could be more accessible to Americans than a downtown department store? Or more appealing than the latest fashions?

Figure 2. Installation of the Science Service 'Fabrics for the Future' display in the window of the Woodward & Lothrop department store, Washington, D.C., February 1939 (SIA RU7091, Box 457). Courtesy of Smithsonian Institution Archives.

Public reaction to the 'Fabrics of the Future' installation in Washington, D.C., sponsored by the *Washington Daily News*, proved to be enthusiastic. The store's advertising manager called it "one of the most instructive and interesting displays of a merchandise nature that we have been able to make in a long while […] spectators crowded the window throughout the day for the duration of the display."[61] Washingtonians' interest was so great that a competing newspaper, the *Washington Times-Herald*, even reproduced photographs of the window with a half-page of explanatory text. Similar praise came from newspaper sponsors and department store managers as the exhibit was shown in dozens of U.S. cities over the next two years.[62]

The series of six articles, written by Robert D. Potter, wove themes of national self-sufficiency, economy, creativity, efficiency, wizardry, and progress into a tapestry sprinkled with technical terms and domestic metaphors. The text offered substantial promises for chemistry as science's "wonder worker" and contributor to national defense. "The fibers and fabrics of tomorrow stagger the imagination and leave the mind speculating in fantasy that has a good chance of some day becoming true, regardless of how crazy it may seem," Potter wrote.[63] A promotional advertisement for the series read:

> CHEMISTS SYNTHESIZE TOMORROW'S FABRICS. 'Wool' out of milk [...] 'silk' out of coal, air and water [...] fibers of glass and metal [...] here are the wonders of modern science [...] bringing new discoveries to the home [...] influencing the nation [...] swaying international trade [...] even swinging the balance that may decide future wars. See what the future holds in store for Americans through modern research now molding the future.[64]

The articles outlined the significance of this work: how countries "under the spur of national defense" needed to develop synthetic fibers so that they might be "liberated from foreign imports that might fail in time of war" yet not "exhaust" their own natural resources.

Figure 3. Steps in making rayon, a photograph by Fremont Davis which was supplied with the Science Service 'Fabrics for the Future' newspaper series, 1939. The suggested caption read "Eight different chemical steps go into the making of acetate rayon in turning raw wood chips into the finest of fibers and fabrics." (SIA RU7091, Box 408, Folder 23). Courtesy of Smithsonian Institution Archives.

Chemists were described in the same glowing, positive terms found elsewhere in popular science in 1939: persistent, ingenious, creative, and able to identify the simplicity hidden in nature's complexity (LaFollette 1990). The articles emphasized traits like economy, frugality, and inventiveness. These "man-made wool fibers" were "economical" and cheap to produce because they used either less expensive raw materials or dairy by-products like dried casein powder. Potter praised chemists' "ingenuity" and creativity; in part six, he described how "two advertising men turned inventors" had developed a new rayon fabric they called "Perval", that "could be made so cheaply it would be thrown away instead of being sent to the laundry".

Figure 4. 'Lanital Lady', a photograph by Fremont Davis which was supplied with Science Service 'Fabrics for the Future' newspaper series, 1939. The caption explained that "various steps in the production of lanital – the synthetic 'wool' – have been used to create the lady.' The doll's head was 'wool' made from cow's milk; the hands held bottles of raw casein and milk (SIA RU7091, Box 408, Folder 23). Courtesy of Smithsonian Institution Archives.

Both the articles and photograph captions frequently referenced wizardry and alchemy: chemists were spinning cloth out of coal, and wool out of "mechanized sheep" or buckets of milk; they were "turning wood chips into the finest of fibers and fabrics" and making nylon "from coal, air and water". Figures 3, 4, and 5 show three of twenty-four photographs sold with the articles, some of them taken by the Science Service photographer but others (as was standard practice) obtained from industry sources and supplied with new captions.

As with so much of popular science of the 1930s, the articles assured readers a future of endless progress; they promised more science to come, with little attention to the consequences (LaFollette 1990, ch. 10). Potter suggested that the "great advances of the past" were "only a small part of what will appear in the future." "Still stronger" or "potent" products are "in store for the future" and this was just a "foretaste". As science continued to widen "its circle of achievement and usefulness", it would weave fabrics with longevity – "rot-proof", "moisture-proof", and "fire-proof". Even rayon's "future as a fiber" was not "exhausted" because chemists were devising new uses for it.

Figure 5. Synthetic wool suit, a photograph supplied by the Hamilton M. Wright advertising firm, which represented the Italian textile industry, for use with Science Service 'Fabrics for the Future' newspaper series, 1939. The suggested caption read "Synthetic wool, made out of the casein in cow's milk, was the basic raw material for this beautiful woman's three-piece suit. The casein cost 50 cents and was obtained from 63 quarts of milk." (SIA RU7091, Box 408, Folder 23). Courtesy of Smithsonian Institution Archives.

Although the series did not refrain from anthropomorphizing science (see the photograph of 'Lanital Lady', a 'doll' made of synthetic material, in Figure 4), its approach was more pragmatic than romantic. It promoted a spiritual duality. Nature remained the best fabric producer; scientists could only copy or improve on nature, not replace it. Science, however, provided an advantage in that its processes, unlike nature, could be controlled.

These articles also included a substantial number of domestic analogies and examples, as if the editors had made a conscious effort to appeal to women readers (although no explicit evidence of this approach survives in correspondence or is mentioned in the associated promotional material). The text as well as the photograph captions include many references to such products as flour, face powder, bread baking, aprons, upholstery, curtains, laundry, and frying pans. Four of the photos sent with the series explicitly depicted women's clothing – a blouse made of synthetic wool, nylon stockings modeled by female college students, and a three-piece suit made of synthetic wool (Figure 5) – and the store window display centered on the female mannequins.

These domestic and gender-linked references appeared in articles that were sprinkled liberally with technical details and terms, including detailed descriptions of the spinneret process and other aspects of synthetics production. Article two compared the chemical analyses of synthetic and natural wool, breaking them down into percentages of carbon, hydrogen, oxygen, nitrogen, and sulfur. Words like 'protein', 'coagulate', 'formaldehyde', 'bacterial enzyme', 'nitrocellulose', 'chemical bonds', and 'polyamides' were used throughout the text, usually without further definition, as if assuming that readers would find them as familiar as the associated references to milk production and sheep farming.

By April, with the exhibit almost fully booked, Science Service was turning down requests. "We appreciate your interest in the Science Service exhibit on 'Fabrics of the Future'. I regret that there has been such a great demand for this throughout the country by the newspapers [...] that it is not possible at the present time to arrange for its use by colleges," Potter wrote to a chemistry student in New York who had read about the exhibit in *Industrial and Engineering Chemistry*.[65] That spring, the exhibit traveled to major cities in Indiana, Ohio, and New York. During May, it was in the windows of the Joseph Horne Company in Pittsburgh, Pennsylvania, sponsored by the *Pittsburgh Press*. In June and July, the *San Francisco News*, *San Diego Sun*, and *Berkeley Gazette* sponsored California appearances, and other newspapers and stores in New Mexico, Texas, Alabama, North Carolina, New Jersey, and Michigan scheduled the project. Public reaction remained enthusiastic. In Buffalo, New York, "It didn't matter whether it was day or night, there were people examining the exhibit and all expressed amazement at it."[66]

Sponsored by the *Boston Transcript*, the exhibit went on display at the Jordan Marsh department store during the week of September 11, 1939, coordinated with the annual American Chemical Society conference. Davis asked chemist H.E. Howe to appear on the 'Adventures in Science' broadcast directly from the Boston meeting. In his introduction, Davis extolled the wonders of synthetic fibers, emphasizing (in the context of world events) that such fibers could step "into jobs previously performed by silk" from Japan, make use of products like milk casein that might otherwise go to waste, and help create new production jobs. Howe explained that chemists had "learned how to make synthetic substances that are better than rubber" because of research "initiated in pure or fundamental science without thought of immediate commercial application and without seeking the answer to any pressing industrial problem", a theme further reinforced in a November broadcast when Davis interviewed U.S. Department of Agriculture chemist E.O. Whittier about 'Wool from Milk'.[67] After each of these programs, listeners could obtain a free bulletin summarizing the newspaper series or a sample of 'synthetic wool'.

The 'Fabrics for the Future' exhibit continued on tour throughout 1940, shipped to the Princeton University chemistry department that summer, and on to Maine for a New England Association of Chemistry Teachers meeting, but the war interrupted any further plans for such multi-media approaches.[68] Starting in the 1940s, Science Service's efforts began to focus increasingly on science education projects and away from its news syndication activities, other than through radio.

7. Conclusion

What can the history of Science Service reveal about public images of chemistry and other parts of science and about how or why scientists engaged in the popularization process? Was the organization merely a promotional agent for scientists, or did it play a more complex, subtle role? Because Science Service, Inc., continued beyond those first decades, and focuses today on science education and the publication of the small weekly magazine *Science News*, there has been a tendency to see the past mirrored in the present, to regard its mission today as reflective of its initial purposes and approaches.

My research suggests a different interpretation, one that views the history of Science Service – like that of nations, corporations, scientific disciplines, or families – as having distinct phases. The first decades of its existence represented a phase that stretched until World War II. After that time, not just Science Service but also its contextual partners (the scientific community and mass media) changed. Watson Davis continued to deliver speeches declaring that accuracy and timeliness comprised the 'essence' of science news but his organization no longer needed to convince publishers or the public of science's relevance to every aspect of modern life, nor did it need to persuade scientists that public opinion mattered to the health of science. Consolidation of newspapers, market expansion, television, and internationalization – each altered the media marketplace in which Science Service had been functioning. Davis became preoccupied with promoting science education and the organization became a marginal (although still respected) player in the hard-nosed world of news journalism.

During the 1920s and 1930s, though, Science Service had facilitated communication between scientists and the public and been at the hub of a network of people creating what we now call 'science journalism'. In that initial phase, it negotiated standards for a new public-private space in which complex and potentially empowering information could be explained precisely to people with little or no education in science. It also cultivated relationships with corporate sources, especially in the chemical industry, and promoted popularization through dramatization, scientists as celebrities, and, as in the department store project on chemistry, the marketing of science through connection to consumer goods. Like nations, families, and other organizations, the history of Science Service is a complex mix of positive and negative outcomes.

Americans, Thone had argued, wanted information that was comprehensible and accessible, that could be rolled up, stuck in a pocket, and consumed on demand.[69] Scientists may have found such informality unsettling but Science Service's marketing success helped enable it. The popularization of science was strutting resolutely toward today's familiar landscape of multiple, diverse, and commercialized outlets. By the end of the 1930s, no one had to persuade newspapers to attend to science. From the *New York Times* to *Saturday Evening Post*, Hollywood movies to network radio, *Arrowsmith* to World's Fair exhibitions, science and scientists were accepted as suitable subjects for news, entertainment, promotion, merchandizing, and even satire. Understanding the development of Science Service during its formative years, and the motivations of the people associated with it, will assist historians in unpacking further the array of forces that shaped (and continue to shape) popular science content.

Acknowledgments

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Notes

[1] Frank Thone, 'The Press as an Agency for the Diffusion of Science', text of a speech to the American Association for Adult Education, May 21, 1936, p. 2; Smithsonian Institution Archives, Record Unit 7091 (hereafter cited as 'SIA RU7091'), Box 4, Folder 2.

[2] Ibid.

[3] Based on the author's research in Smithsonian Institution Archives manuscript collections, especially Record Units 45, 46, 83, 7183, and 7091 and Accession 90-105; materials housed in collections of the Smithsonian's National Museum of American History; 'Cavalcade of America' Collection at the Hagley Library; and Papers of James McKeen Cattell (MSS15412) at the Library of Congress.

[4] This latter emphasis on science education and 'science talent searches' arose in earnest only in the 1940s, a topic being explored by such historians as John Rudolph and Sevan Terzian.

[5] The absence of a comprehensive history of Science Service relates both to the complexity and size of its records and to an earlier failure by historians to recognize the importance of these records and how they might illuminate the history of science as well as its public presentation. The organization's multiple parallel filing systems intermingled editorial, business, and personal correspondence with drafts, notes, photographs, and other ephemera for hundreds of projects and activities. Records generated between 1921 and the early 1970s were donated to the Smithsonian Institution in several phases, but not all records were transferred, not all those were housed in the same location, and not all remained intact. The surviving records, located in the Smithsonian Institution Archives and in curatorial collections throughout the Smithsonian museums, comprise many hundreds of cubic feet of papers and photographs, much of it still without comprehensive finding aids and some still incompletely processed. For decades, only a small portion of the early records had been processed. In 2005, the author wrote a brief historical summary of Science Service's first forty years for a Smithsonian Institution Archives finding aid to Record Unit 7091, available online at <http://siarchives.si.edu/findingaids/FARU7091.htm>. Documents relating to the history of the collection are preserved at the Smithsonian Institution Archives, as part of the control files for Record Unit 7091.

[6] 'Document A - The American Society for the Dissemination of Science', dictated by E.W. Scripps on March 5, 1919; SIA RU7091, Box 1, Folder 1.

[7] Carbon copy of William E. Ritter to E.W. Scripps, May 13, 1921, mailed to E.E. Slosson; SIA RU7091, Box 1, Folder 3.

[8] E.E. Slosson to R.S. McBride, McGraw-Hill Book Co., Inc., April 5, 1921; SIA RU7091, Box 9, Folder 6.

9 Underlining in original. H.L. Smithton to W.E. Ritter, January 2, 1924; SIA RU7091, Box 23, Folder 6.

10 W. Davis to S.S. Seward, Jr., October 20, 1924; SIA RU7091, Box 74, Folder 6.

11 Rhees 1979 remains the definitive analysis of Slosson. Like many other historians, I have used it as a guide in interpreting correspondence in SIA RU7091, on which this section draws.

12 E.E. Slosson to Thomas T. Coke, February 7, 1921; SIA RU7091, Box 7, Folder 1. Coke had taken a degree in chemistry from Cornell University but had decided to shift careers and was then studying law at Yale University.

13 Slosson had originally been hired as 'Editor' of Science Service. He delivered hundreds of paid lectures every year. Income from those lectures was essential to Science Service. As a result, Slosson spent considerable time traveling and appears to have left the management of day-to-day operations (and therefore most news decisions) to Watson Davis.

14 W.H. Howell to W. Davis, June 24, 1936; SIA RU7091, Box 4, Folder 3.

15 W. Davis to David White, February 10, 1931; SIA RU7091, Box 131, Folder 9.

16 According to Davis, James McKeen Cattell and physicist Robert A. Millikan wanted to abolish the policy "that we do not operate as a publicity organization, that we charge for everything we send out and pay for everything we get." Davis stated that "there will be a stiff fight on this score, so far as I am concerned." W. Davis to J.W. Foster, Scripps-Howard Newspapers, February 12, 1931; SIA RU7091, Box 124, Folder 10.

17 H.L. Smithton to W.E. Ritter, January 2, 1924; SIA RU7091, Box 23, Folder 6.

18 W. Davis to F.J. Schlink, American Standards Association, May 12, 1930; SIA RU7091, Box 119, Folder 3.

19 Ibid.

20 Ibid.; the records of the *Daily Mail Report* often contain correspondence discussing published errors or scientists' complaints.

21 Ibid.; Davis's raw notes and data for this analysis are located in SIA RU7091, Box 129, Folder 11.

22 Mary Tressida has created a web exhibit ('Women of Science Service') that describes some of the staff and contributing writers. See <http://siarchives.si.edu/research/sciservwomen.html>.

23 Frank Ernest Aloysius Thone (1891-1949) majored in botany at the University of Iowa, and earned a Ph.D. from the University of Chicago in 1922. His work in California as assistant to William E. Ritter led to the contact with Slosson. After a few years of teaching and research, he became the Science Service biology editor in 1924.

24 These estimates are based on the author's analysis of 202 news stories from a sample of *Daily Mail Report* for weeks in September 1935, March 1936, December 1938, May 1939, and October 1939 located in SIA RU7091, Box 374. Newspapers subscribing to the *Daily Mail Report* received about 8 to 10 short news stories a day (40 to 50 each week). Science Service had retained the backup and drafts for each story at least through the 1960s. During the 1970s, when those records were transferred to the Smithsonian Institution, Smithsonian archivists unfortunately saved only a sample of the complete *Daily Mail Report* files, randomly selecting a

few weeks out of each year. The remaining files are located in SIA RU7091, Series 8 (Boxes 373-381).

25 E.W. Scripps to E.E. Slosson, August 1, 1921; SIA RU7091, Box 12, Folder 2.

26 E.E. Slosson to E.W. Scripps, September 2, 1921; SIA RU7091, Box 12, Folder 2.

27 E.E. Slosson to W.A. Cannon, Carnegie Institution of Washington's Coastal Laboratory, February 23, 1923; SIA RU7091, Box 16, Folder 1.

28 Science Service form letter sent to editors of newspapers from 'Watson Davis, News Editor', September 11, 1922; SIA RU7091, Box 60, Folder 2.

29 H.L. Smithton to W.E. Ritter, January 2, 1924; SIA RU7091, Box 23, Folder 6.

30 W. Davis to J.N. Heiskell, Editor, *The Arkansas Gazette*, October 22, 1936; SIA RU7091, Box 424, Folder 14.

31 Bruce Catton, Editor of *EveryWeek*, to Frank Thone, October 3, 1938; SIA RU7091, Box 199, Folder 11.

32 Many records of transactions with these stringers – job applications, correspondence, payment slips, and drafts – are preserved in Smithsonian Institution Archives Record Unit 7091, and represent an important resource for study. Especially notable are the 1930s applications from women with some science training who sought writing assignments to supplement their incomes.

33 For example, W. Davis to Arthur F. Coca, April 26, 1938; SIA RU7091, Box 194, Folder 3.

34 Leonard H. Engel to Roger E. Chase, June 17, 1938; SIA RU7091, Box 194, Folder 1.

35 Potter, former science editor of the *New York Herald-Tribune*, joined the staff in 1934 and had responsibility for physics, engineering, and chemistry. Along with others on the Science Service staff, he was one of the founders of the National Association of Science Writers.

36 E.E. Slosson to H.E. Howe, June 17, 1924; SIA RU7091, Box 22, Folder 6.

37 Author's analysis of data in 'Survey of Requests Received for Science Service Radio Talks, 'Science News of the Week', June, 1926 – November, 1929', sent by W. Davis to the U.S. Advisory Committee on Education by Radio; SIA RU7091, Box 118, Folder 5. Data on the 1930s from a letter by W. Davis to Robert F. Elder, November 2, 1934; SIA RU7091, Box 154, Folder 2.

38 W. Davis, September 20, 1929; SIA RU7091, Box 102, Folder 8.

39 Margaret Cuthbert to W. Davis, November 30, 1934; SIA RU7091, Box 167, Folder 11.

40 W. Davis to Margaret Cuthbert, December 4, 1934; SIA RU7091, Box 167, Folder 11.

41 Henry J. Wing to W. Davis, September 10, 1935; SIA RU7091, Box 403, Folder 13.

42 Henry J. Wing to W. Davis, October 4, 1935; SIA RU7091, Box 403, Folder 13.

43 W. Davis to H. Bonnet, February 8, 1938; SIA RU7091, Box 193, Folder 3.

44 Script for radio talk ('The Romance of Tung Oil') located in SIA RU7091, Box 194, Folder 6.

45 'Cavalcade of America', Episode number 1 (1935), p. 1; Cavalcade of America Collection, Hagley Library.

[46] 'Cavalcade of America', Episode number 117 (1938), p. 11; Cavalcade of America Collection, Hagley Library.

[47] 'Adventures in Science' script for August 12, 1938; SIA RU7091, Box 386, Folder 1.

[48] 'Adventures in Science' script for September 16, 1938; SIA RU7091, Box 386, Folder 1.

[49] The series ran until 1958, with occasional interruptions for world events and Saturday afternoon football games.

[50] Sterling Fisher to W. Davis, February 7, 1939; SIA RU7091, Box 385, Folder 15.

[51] Sterling Fisher telegram to W. Davis, March 8, 1939; SIA RU7091, Box 385, Folder 15.

[52] W. Davis to Sterling Davis, March 11, 1939; SIA RU7091, Box 385, Folder 15.

[53] Draft outline of talk by Lewis W. Waters; SIA RU7091, Box 385, Folder 15.

[54] Script for 'Adventures in Science', November 13, 1939; SIA RU7091, Box 386, Folder 2.

[55] See W. Davis to W. Lee Lewis, September 26, 1939; W. Davis telegram to W. Lee Lewis, October 16, 1939; W. Lee Lewis to W. Davis, October 16, 1939; and W. Lee Lewis to W. Davis, October 25, 1939; SIA RU7091, Box 386, Folder 2. The interview section of the broadcast actually took place in the studios of station WBBM in Chicago, where a local announcer read questions to Mrs. Lewis from the prepared script. See annotated scripts for November 13, 1939, in SIA RU7091, Box 386, Folder 2.

[56] Script for November 13, 1939, broadcast; SIA RU7091, Box 386, Folder 2.

[57] Bulletin for 'Adventures in Science' broadcast of November 13, 1939; SIA RU7091, Box 386, Folder 2.

[58] 'Adventures in Science' script for December 4, 1939, p. 3; SIA RU7091, Box 386, Folder 6.

[59] 'Adventures in Science' script for December 25, 1939; SIA RU7091, Box 386, Folder 10.

[60] See 'Minutes of the Executive Committee of Science Service... February 11, 1939'; SIA RU7091, Box 4, Folder 7.

[61] James W. Hardey, quoted in 'Information Memorandum on Progress of Science Service, June 10, 1939', p. 5; SIA RU7091, Box 4, Folder 8.

[62] See other descriptions of crowds and compliments from newspaper editors in: W. Davis to Max B. Cook, April 21, 1939, and Austin Winant to Max B. Cook, July 19, 1939, and July 28, 1939; SIA RU7091, Box 427, Folder 77.

[63] Quotations throughout this section are taken not from the various published versions but from a mimeograph copy of the 'Fabrics of the Future' text, version of August 12, 1939, located in SIA RU7091, Box 408, Folder 23.

[64] Promotion box text suggested by Science Service for use with the 'Fabrics of the Future' Series, August 12, 1939, mailing; SIA RU7091, Box 385, Folder 39.

[65] Robert D. Potter to Sherman Finneran, April 1, 1939; SIA RU7091, Box 208, Folder 6.

[66] 'Information Memorandum on Progress of Science Service', June 10, 1939; SIA RU7091, Box 4, Folder 8, p. 6.

[67] Script for 'Adventures in Science', September 11, 1939, p. 5; SIA RU7091, Box 385, Folder 39. Also see script for 'Adventures in Science', November 20, 1939; SIA RU7091, Box 386, Folder 4.

[68] Science Service attempted to work with *Modern Plastics* magazine on a similar "plastics exhibit for newspapers and cooperating department stores", but that project never went beyond the planning stages. See correspondence in SIA RU7091, Box 220, Folder 2.

[69] Frank Thone, 'The Press as an Agency for the Diffusion of Science', text of a speech to the American Association for Adult Education, May 21, 1936, p. 2; SIA RU7091, Box 4, Folder 2.

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