

SCIENCE ON THE AIR: NSF'S ROLE

High-quality science broadcasts initiated with the help of government funds have attracted sizable and devoted audiences on public television—yet the goal of reaching commercial television's wider viewership remains elusive.

George Tressel



WAYNE WILLIAMS

'How About ...' Don Herbert tapes a science report to be used by local television news programs. At its peak around 1987, "How About ..." was seen twice a week on 140 stations, reaching about 8 million viewers—a rare achievement for science on commercial television.

In 1976 I wrote a very intemperate letter to the director of the National Science Foundation, H. Guyford Stever. While I didn't keep a copy, it went something like this:

Recently, *Science* printed an account of your speech on the *public understanding of science*. With all due respect, the National Science Foundation does not know the meaning of those words.

To begin with, you think that the *public* reads *Scientific American*. Wrong! The public drinks beer and watches football.

You think that *understanding* means the ability to do the third law of thermodynamics. Wrong! To the public, understanding means knowing that scientists don't usually wear white coats, look like Einstein or chase helpless maidens.

You think that *science* means basic research. Wrong! To the public, science means medicine and how my car runs.

Now really, if you don't even know what the words mean, how do you expect to change the situation?

Much to his credit (and sense of humor), Stever responded with a phone call that went something like "We have a public understanding of science program. It needs a director. If you know so much, why don't you come here and put your money where your mouth is?"

Now 15 years have passed, and the science communication environment has changed radically. But the central issues have not. I went to Washington believing that:

▷ When most scientists (you can substitute any other interest group, such as doctors, engineers, professors or lawyers) say *public understanding*, they usually mean *public approval*. And love from the public is like love from a person: You can woo them and lead them down the primrose path, but ultimately you need to *earn* their respect.

▷ Most people do not *want* to know about science: They are preoccupied with money, family and trivial diversion. (At the time I thought that only about 15% were interested in science, based on the ratings of popular science television programs. I was wrong: About 20% are interested in science.) You are very unlikely to change this, at least among adults, no matter how clever you are or how much you are willing to spend.

▷ You can reach the attentive core group consistently if you package the material in an entertaining and intriguing style. And you can reach another 20% if you approach them indirectly, by talking about their health or some other personal issue. But you can affect the basic numbers only by reaching people while their interests and curiosity are still forming—when they are children.

▷ You can't communicate with "the public" efficiently or effectively by starting a *new* publication or other vehicle: You need to work with an established medium that already reaches an enormous audience—such as broadcasting, books and existing newspapers and magazines. These vehicles are run by people who are very experienced, very smart and who spend their days trying to figure out what people want.

I left Washington with all these beliefs reinforced, having participated in some of the successes and failures of

the 1970s and 1980s.

This article is a backward glance at those experiences and the reasons for success or failure. As a program officer and division director at the National Science Foundation, I was directly involved in the planning and support of most of the key broadcast projects initiated at the foundation, and indirectly involved in many others that spun off and asked us for support. An investor enjoys a unique vantage point from which to watch and learn as well as to shape science communication.

As the principal source of NSF policies and practices in this area for 15 years, I was able to see what worked and what did not. The number of sources of government support for science broadcasting is so small that the actions of a couple of program officers can amount to a *de facto* Federal policy. Early on, for example, Frank Withrow of the Department of Education and I both decided that all of our broadcast funding would require closed captions for the deaf and giving educational institutions the right to record programs off the air and use them free of charge for three years.

Despite numerous efforts, this period yielded only a single fully successful experience with commercial broadcasting and its massive audience. I hope the discussion here will make the reasons for this apparent: It has not been for lack of effort or commercial goodwill. Rather, the reasons are inherent in the lowest-common-denominator aspects of commercial broadcasting.

Beginnings

The 1970s were an exciting time for popular interpretation of science. NSF had established a "public understanding of science" program shortly after its inception,¹ but there was always confusion about its role—was it education or public relations?—and the program was relocated several times in response to shifting views. (At one point, the foundation approached the Advertising Council about a "public understanding" campaign; much to the council's credit it rejected the idea, on the grounds that science could not be reduced to an advertising slogan.) Until the mid-1970s much of the support was devoted to seminars and workshops studying the media and the audience—and criticizing their shortcomings. This is still a popular catharsis.

In the early 1970s NSF's approach began to change. Ray Hannapel, one of the early program officers in science education, provided support to help Frank Oppenheimer start the Exploratorium, which is now regarded as the world leader in hands-on science and discovery learning. (See Robert J. Semper's article on page 50.)

Shortly thereafter, Richard Stephens, NSF's program director for public understanding of science, provided funds to establish the Association of Science-Technology Centers, which helped to spread the growing "science center" style and spawn hands-on museums throughout the world. Today there are many.

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Soon Stephens provided support to send a young public TV producer, Michael Ambrosino, to England to work with the BBC team that made a weekly science report, "Horizons." Ambrosino returned to propose a US series that would be modeled after the BBC series and largely staffed by colleagues from "Horizons," who would form a nucleus in Boston. The new series came to be called "Nova."

To make the cost and logistics more palatable (even then a weekly television program was a major investment), half of the series would be made up of "Horizons" episodes—camouflaged by new titles and a US narrator. With the new unit came Graham Chedd and John Angier, who ultimately spun off to establish the "Discover" series that continues today. So does the early "Nova" combination of self-produced programs and acquisitions from other sources.

At the same time, Stephens began to explore the potential of commercial broadcasting. He supported "Closeups," a series of public-service spots for children produced by Don Herbert and aired on NBC between Saturday programs. Each 30-second installment began with a close-up shot of a familiar object and was accompanied by a provocative narration. A typical one went something like "Here's a surface that has been exposed to a high temperature that has produced important chemical and physical changes. The substance has changed; the moisture has been driven off; the surface has become cracked and craggy"—at this point the camera zoomed out—"that's what's supposed to happen when you bake a cookie!"

Stephens also supported a one-hour special that I produced, on the state of science. "Science in the Seventies" won a silver medal from the Atlanta Film Festival and a statue from the Chicago Film Festival, attracted roughly one-third of the audience when aired on a local CBS station in competition with football and movies, and had little impact. The experience taught me a hard lesson about the extreme difficulty of placing such material on commercial network television, or even the Public Broadcasting Service. It pointed to station-by-station syndication as the only entrée to commercial broadcasting.

Funding of controversial programs

With Stephens's groundwork, the stage was set for a pragmatic effort to support working science communicators. "Nova" had begun, but was not yet entrenched. There had been a couple of tentative forays into commercial broadcasting. And there was a basis of support for the burgeoning field of hands-on science museums. (The rise of the museums, and of science journalism, is part of a pattern of increasing effort across a variety of media, but is beyond the scope of this article.) No well-articulated rationale for government support existed, however, and without one, trouble was inevitable.

Several early "Nova" programs treated controversial issues such as nuclear power, military uses of science and chemicals in the environment. The reaction was intense, and "injured parties" invariably claimed bad science. This hit the NSF in its most vulnerable spot, and it reacted by demanding that "Nova" get "better" scientific advice.

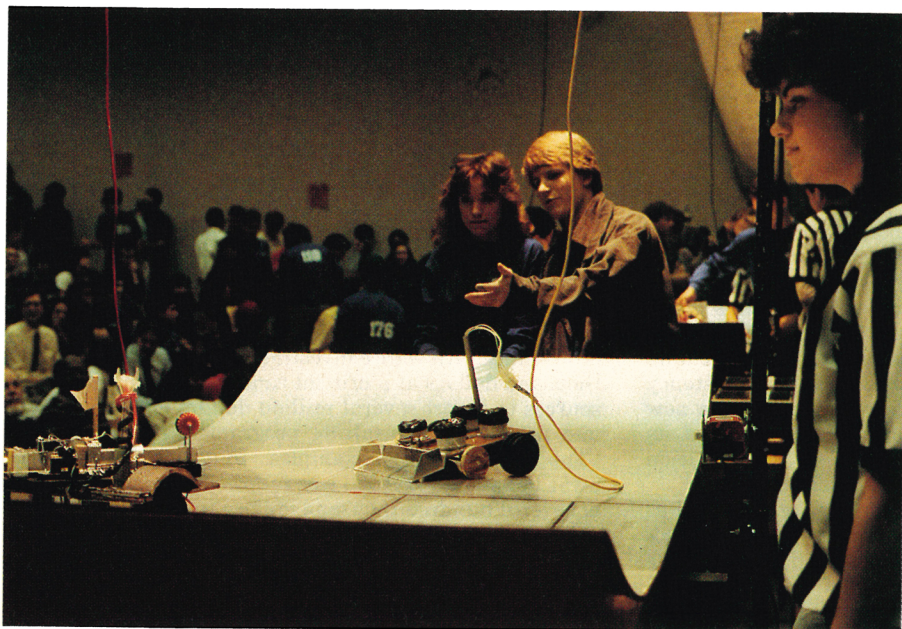
The producers reacted by claiming interference with their journalistic rights. By the time I arrived, the foundation had quietly served notice that it planned to withdraw support from its most effective public communication project.

Clearly, a rationale and a funding policy were needed. The most immediate issue was a "Nova" program about the Brown's Ferry nuclear power plant in Decatur, Alabama, where a careless worker had set the electrical system on fire while checking for air leaks with a candle. It is times like that which test one's *real* commitment to public understanding. One irate viewer wrote an angry protest on plain white paper, proclaiming himself "just a private, interested citizen"—forgetting to note that he was also the chair of the nuclear engineering department at a major university.

The first thing I did to deal with the issue was to write a defense of the program, noting that the producers had not used any of the most provocative footage of nuclear accidents. As examples, I mentioned pictures of the boiling-water-reactor explosions and pictures of workers in ominous-looking "space suits" after the accident at the Fermi nuclear power plant near Detroit. (Later Angier, the writer and producer, wrote to thank me for defending him. But he also noted that the reason he didn't use the provocative footage was that the information office of the Atomic Energy Commission—now the Department of Energy—had *removed* it from the public files. So much for DOE's commitment to public understanding.) I also began to articulate a number of criteria that proved critical to consistent, noninterfering public support of professional interpretation of science and science issues.

I and my colleagues in the public understanding program argued that *public* funding to promote advocacy is not needed or appropriate. Rather, the public needs scientific awareness, background and perspective, so that it can understand and weigh the conflicting claims of adversaries. This is no different from the public's need to understand the background of political, historical and economic issues. But by and large most educated persons have a more satisfactory preparation in those areas. Unfortunately, science and technology receive little attention in either pre-college or college curriculums. A typical college student today receives almost no science in elementary school and only one or two years of "general science" in high school. Many colleges require no science or only a casual touchy-feely "Science for Poets" survey.

Thus an "educated college graduate" may well have had only a general high school science course and a year of high school botany and zoology—and perhaps a minimal college overview. The result is little verbal or conceptual "vocabulary," and so it is not surprising to hear cocktail party conversation along the lines of "Well, I really don't know anything about science." This view was supported by a very insightful study of public understanding during the California nuclear initiative.² The study examined the decision-making process of people who voted on whether or not to allow nuclear power in the state. It found that they did not react from hysteria, that they understood the basic risk-benefit issue, but that they lacked sufficient science background to weigh the competing arguments.



'Discover: The World of Science.' This "tug of war" of machines at an MIT engineering competition appeared on an episode of the monthly one-hour Public Broadcasting Service program. The series, produced by the Chedd-Angier production company, became *"Scientific American Frontiers"* last month.



'The Mind.' Mental development was the topic of the second program in the nine-episode series produced by WNET, New York.

Before long it became accepted that our role was to support "balanced, objective and accurate" popular interpretation of science, and "BOA" became the catechism of NSF's public understanding program. We had to balance this definition of the appropriate use of taxpayers' money against a "First Amendment" responsibility not to interfere with the content of public communication. I argued that no one would want content decided by a government censor or "authority"—"least of all, by a little tinhorn bureaucrat like me!" The issue then became a question of adequate assurance that BOA was intended in a project and that a reasonable process for achieving it was in place. We asked grant applicants to do two things: set up an appropriate and balanced group of advisers who could assure that alternative views were considered, and establish a mechanism to insure that their advice got more than *pro forma* consideration.

Note that approval by these advisers was not required, only that they be present and heard. The quality and balance of this advice were considered as part of the review—before the grant was made. After the award, NSF meticulously avoided intruding in either the project or its content. As a result, our grants earned a reputation as "the hardest money to get, and the best to have."

The result has been many years of provocative programs about controversial issues—sometimes taking unpopular views. But by and large, they have served the BOA objective well. And there has never been interference in the content: NSF representatives have seen the programs at the same time as the public.

The requirement that projects have strong advice on their content was not always popular. Many grant recipients feared stultifying interference, but in the end it became clear that good advice does not mean loss of creative control. And the scientific advice insures quality and protects both project and funder. Even "Nova," steeped in the BBC tradition of independent journalism, came to rely on the process and continued it after NSF support was no longer an issue.

Focus on practical questions

With the carefully articulated rationale came a new focus on impact and effective communication. A new kind of reviewer entered the scene as part of a standing panel at

NSF that gave advice and helped both to formulate and to implement mass public communication concerning science. Modeled on the standing panels of NSF's biology division and the National Institutes of Health, this group of nine eminent physical, biological and social scientists, journalists, broadcasters, museum managers, educators and communication researchers provided the consistency and quality of experience that are critical to such a new and sensitive field. The panel immediately focused its attention on practical questions: audience, presentation skill and access to channels of communication.

Before long the grant applications were reviewed as potential investments in public communication, the issues were well articulated, and the discussions focused on the *pragmatics* of communication:

▷ What is the content? Is it important? Who are the advisers?

▷ Who will make up the audience? How large will it be? How cost effective will this project be? Will there be cost sharing?

▷ Who will package the presentation? What are their skills and track record? What is the intended communication channel? Do they have access to it?

▷ How will the impact be assessed in terms of both quantity and quality?

This increasing pragmatism reflected a conscious investment strategy, a growing body of audience research and a viewpoint that emphasized large-scale, cost-effective impact. Soon there were few projects being funded with audiences that were not measured in millions—either immediately, in the case of broadcasts, or over a period of several years, in the case of museums. It became a rule of thumb that a \$200 000 investment should deliver an audience of about one million.

One-shot broadcasts. This rule in turn precluded most single-broadcast projects. A television series like "The Brain" usually brings together funds from several sources. By being the first funder, with a much respected review process, NSF was a powerful help in acquiring other funds. An astute investment of a couple of hundred thousand dollars at a critical time could encourage other sources to invest several million dollars and to advertise and promote the resulting program. "The Brain" and "The Mind" are good examples. In each case, the initial award of about \$200 000 was followed by matching funds of several hundred thousand dollars from various National Institutes of Health, followed by contributions of several million dollars from corporate and public broadcasting sources. In each case, a \$200 000 initial investment resulted in a \$5 million to \$10 million television series.

"One shot" broadcasts lack this leverage. They are usually underadvertised, because it costs almost as much to promote a single program as a series. There is no time to build a reputation and an audience. And there are usually no cofunders, so a single program requires the same NSF support as a series. However, occasionally a proposal was so intriguing that it broke through this barrier. When that happened, we looked for a way to achieve the required impact by playing marriage broker to an established series like "Nova," for which the audience was assured.

This happened with *Stand and Deliver*, the story of high school teacher Jaime Escalante. The program director, Elizabeth Martin, was so intrigued with the theme and its relevance to important issues of minority math education that she helped to fund its place in PBS's "American Playhouse" series. Its star, Peter Olmos, brought it to the attention of Warner Bros, and the film

National Public Radio. At the 1988 international AIDS conference in Stockholm, Sweden, are (counterclockwise from the front left) reporter Patricia Neighmond, editor Anne Gudenkauf, reporter Ira Flatow, engineer Andy Rosenberg, reporter Richard Harris and reporter Frank Browning.





'Nature.' The golden eagle was the topic of an edition of the weekly one-hour PBS program produced by WNET, New York. The series, which began in 1981, focuses on animals and the environment.

was shown in theaters across the country as well as distributed widely on videotape, even before it appeared on PBS.

A similar case occurred when program director Michael Templeton encountered a proposal for a one-shot program about black astronauts. Over a period of negotiation that lasted for almost two years, he arranged for coproduction and airing by WNET, channel 13 in New York, assuring a wide audience and subsequent use in schools and minority programs.

Radio. By the late 1970s, NSF's policy of noninterference was so well established that we could explore ways to help with broadcast news. For example, although National Public Radio had periodically broadcast stories by science reporter Ira Flatow, it lacked any permanent science reporting staff or pattern of reporting. I asked Sam Holt, NPR's vice president for programming, what he would do in science reporting if support were available. In a very freewheeling discussion he replied that if money were not a problem he would establish a science unit and a cadre of "stringers" to cover science and technology on a continuing basis.

Thus was born the NPR science unit. Not long after, Martin, who was then the information officer for research at the Environmental Protection Agency, took the unprecedented step of transferring funds to NSF so that we could add an environmental reporter, Daniel Zwerdling, to the NPR team. This reflected an exceptional commitment to *real* public understanding: Transfer to NSF involved complete divorce from any content control whatsoever, and few information officers have such faith in unbiased reporting.

Ten years later science reporting is a staple of "Morning Edition" and "All Things Considered," and NPR's coverage of such events as the Challenger disaster has been without peer.

Print. The advisory panel agreed that print journa-

lism poses special "First Amendment" questions of potential interference with the normal reporting of science issues. Print journalism is a vigorous, well-established enterprise with a substantial and growing science component. The best of newspaper, magazine and book publishers use extremely skilled and well-qualified reporters who are able to listen to and question people working at the cutting edge of research and translate their work into popular terms. In the late 1970s, for practical purposes, broadcast science journalism did not exist, so there was little question of intrusion into an established undertaking.

Hence NSF journalism projects were largely limited to efforts to support the science reporting community as a whole. These included over a decade of support to the Council for the Advancement of Science Writing for its annual "New Horizons" meeting. Unlike earlier seminars for reporters, this was run by and for the working science journalism community; it continues to be an important source of stories, articles and broadcasts. Speakers are selected by the journalists themselves and scheduled so that stories can be filed from the meeting.

The panel also stressed the need for audience research and evaluation to document the impact of projects. Jon Miller of Northern Illinois University had already begun to formulate a model of public understanding and political decision making in the science arena. In the course of several projects he began to document the existence of a "science attentive" public—some 20% who actively require information and participate in science-related issues.³

He also documented the presence of a second stratum, of similar size among the public, who do not actively pursue or participate in science but find it interesting if the material is sufficiently personal or relevant. Finally, he showed the existence of a cohort of roughly 60% with no interest in science at all. This model has come to be fairly

well accepted, and over the past decade Miller has continued to detail and refine the general picture. Miller's larger concern is for political and decision-making processes, and he finds that similar percentages apply to most public issue areas, such as foreign affairs, energy and the environment. When the statistics for all these areas are aggregated, there remains a cohort of roughly 50% who have no significant interest in *any* serious policy area—a sad reflection of the quality of our educational system and the high dropout rates!

Many of us in the science communication business wish that the "attentive public" were larger, that more of the public had a verbal and conceptual science "vocabulary." We can wish that more people found science interesting, relevant, accessible and exciting. But this is unlikely to happen until we succeed in providing the familiarity and love of learning that begin at an early age. Most communicators recognize this limitation: They realize they are "translators" for a poorly prepared audience.

Informal education. As the impact and scale of NSF-funded projects increased, it was apparent that the confusion between education and public relations would have serious consequences and that the increasing success of museum and broadcasting projects demonstrated the viability of lifelong learning outside of the classroom. Oppenheimer articulated a salient difference between "learning" and "schooling," and many of us in the field began to search for ways to act on the underlying philosophy. I found myself saying again and again, "Most people, most of the time, learn most of what they know *outside* the classroom."

Together with colleagues at NSF I began to search for a phrase that would embody the concept: discovery learning, recreational learning, unintentional learning, extracurricular learning—to mention only a few. Finally, it appeared that the phrase "informal education" expressed the concept well, and it added the legitimacy of a name to a growing field and philosophy. Much later, after we had used the term persistently for a number of years, it became so widely accepted that we could use it to replace "public understanding" as the program title—and at the same time express a broader goal.

Children: The ultimate answer

In early 1978, growing concern about science education created an opportunity to change the sorry base line of interest and understanding. The Children's Television Workshop offered to produce a large-scale daily television series that would excite children about the world of science, introduce them to basic phenomena and science concepts and provide a realistic, positive view of who scientists are and what they do.

Most scientists and media people were already convinced of the need for such a project, and the CTW proposal reflected over a year of preliminary study in cooperation with the best minds in science education, mass communication and children's broadcasting. The cost would be only pennies per viewing. However, there was no precedent within the National Science Foundation for a

television project of this magnitude. Even when shared among two Federal agencies, a corporate underwriter (United Technologies) and several private foundations, the \$10 million price was overwhelming.

Fortunately, broadcast projects at the Department of Education were directed by Withrow, who had long experience with the funding of "Sesame Street" and many lesser television series. The "father" of closed captioning, he was very quick to endorse the proposal and encourage interagency cooperation. That close cooperation was needed because no two agencies have the same schedules, financial requirements, monitoring policies, standards or priorities.

We agreed on a process that became a model of cooperation for the next decade and was incorporated into the policies of other agencies in both broadcasting and museum support. A joint review of a single proposal would be conducted on behalf of both agencies. This meant that there would be a single deadline, a single yes-or-no decision, a single administration and a single standard of performance. We also agreed that one agency would administer and monitor all of the funds so that there would be a single financial agent.

In the case of this first project, "3-2-1 Contact," Department of Education funds were transferred to NSF, but during the next decade this model was used again and again, with administration handled sometimes in one agency and sometimes in the other. Each time, the "primary funder" was chosen on the basis of which agency was most suited to the project, subject, review and administration. Other projects for which this process was used include "The Voyage of the Mimi," "The Brain," "The Mind" and, as described above, the science reporting unit of National Public Radio.

With the close and (usually) consistent support of NSF and the Department of Education, "3-2-1 Contact" became an exceptionally popular daily program. In 1988 it was being viewed periodically by *one-third* of all American children. Sixty percent of the viewers surveyed reported engaging in related after-the-program activities, and 84% of the parents of these viewers reported that their children discussed the program with friends, teachers and family. The program proved just as popular with girls and with minorities.

Today, reruns continue in most parts of the country, and new prime-time specials on such topics as medicine, AIDS and waste disposal appear periodically under the "3-2-1 Contact" name. A "3-2-1 Contact" magazine is read by a half-million children; videocassettes of episodes are being tested in the marketplace; and excerpts from the series are being repackaged for use in classrooms as supplements to major curriculums and textbooks.

In 1980, under the Reagan Administration, all of NSF's education programs, including ours, were discontinued. Within a few years, however, the crisis in science education led to a new and spectacular rebirth. Largely impelled by the success of "3-2-1 Contact" and the visible impact of hands-on science museums like the Exploratorium and the Ontario Science Center, NSF established an informal-science-education program that today has a



'3-2-1 Contact.' In an episode of the daily half-hour PBS show, Stephanie Chen Yu visited a landfill, a recycling plant and a garbage museum as she investigated the waste crisis. Here, Sven Gali (Marshal Efron) watches her shred paper. The series started in January 1980.

budget of over \$20 million.

One of the first acts of this new NSF unit was supporting another series, paralleling "3-2-1 Contact"—a daily mathematics program that would reach the same audience and encourage children to think of mathematics in a new light. Most children learn the mechanics of arithmetic but do not learn to solve problems, make estimates, work with probability or carry out most of the other applications that are the reason for arithmetic. The new series set out to remedy this.

Again through joint review and funding, NSF and the Department of Education were able to provide the basic support for a truly ambitious effort. It is no exaggeration to say that "Square One TV" exceeded almost everyone's expectations. Children across the country have begun to adopt the behavior of two blue-coated mathematician-detectives, Kate Monday and George Frankly, who solve mysteries on "Mathnet," a dramatic portion of the Square One program. The director of NSF's mathematics division was surprised to discover that she had become the idol of a four-year-old neighbor when he found out she was a mathematician.

Recently it was possible to conduct a well-controlled study of the impact of the series. In a community where the series is not broadcast, children who were shown the series each day, with no other intervention, were observed to have substantially increased ability in solving practical mathematics problems. Even more important, they increased the variety of *ways* that they solved problems.

I believe that this has profound implications. It seems to demonstrate that children are not "passive" when they watch truly exciting television. Rather, they are mentally participating in the problem solving they see on the screen. They are both practicing problem solving and developing the self-confidence that lets them devise their own ways of solving other problems.

The experience of these two series, "3-2-1 Contact" and "Square One TV," together with that of the growing number of hands-on science museums, points to an important opportunity to change the public understanding of science. Children who are exposed to the excitement of science and mathematics, who have firsthand experiences through the exhibits and activities of science centers and science clubs, will have a "vocabulary" of experience and interest that will make them a different kind of audience.

Unfortunately we do not yet have enough consistency of support, either in money or in commitment, to realize this potential. "Informal education" has been incorporated into our vocabulary, but it has not been incorporated into a sustained environment for all children.

Commercial media: Broader audiences

In the past two decades our skill and insight into the public communication of science have increased greatly. We know that we can appeal to the "attentive" portion of the public, and we know that we can work with children to encourage their interests and increase their vocabulary and body of experience. If we could do the latter tasks consistently, we surely could raise the number of sophisticated and "science literate" adults.



'Square One TV.' George Frankly (Joe Howard) and Kate Monday (Beverly Leech) use math and logic to catch the bad guys who have stolen a new, top-secret weather plane. The "Mathnet" segment of this PBS math show for 8-to-12-year-olds is patterned after "Dragnet." The daily half-hour program has been on the air since January 1987.



'Watch Mr. Wizard.' This very popular commercial television program of the 1950s featured Don Herbert and children.

In the meantime it is tempting to engage in fantasy. A common belief is that we would reach a different audience "if only we could use *commercial* television." Those who say this are usually innocent of the costs and the "lowest common denominator" basis of commercial broadcasting. It reaches such a broad audience just *because* it seeks and appeals to the lowest common denominator.

One exception helps to make the point. Don Herbert had been "Mr. Wizard" on an extremely popular science program for youngsters throughout the early years of commercial television. To this day, many of the scientists who grew up during that period tell stories of how important it was to tune in each week to be with their friend and do experiments with batteries and light bulbs, vinegar and baking soda. Many years later, in the 1970s, Don and Norma Herbert proposed to reach the adult audience by taking advantage of the burgeoning field of local television news programs. Following the precedent set by Don Meier, producer of "Wild Kingdom," they decided to bypass the issue of access to network television and syndicate a science news report, "How About . . .," directly to local news directors, who would insert the material into their news programs.

The series, cofunded by NSF and General Motors Research Laboratories, was given to stations without charge, on a locally exclusive basis, through a contract that required that they air at least two segments each week and provide audio and visual identification of the sponsors. The latter proviso insured that viewers would know that the series was subsidized, but we also included our usual requirement of science advisers and our rule against participation in the content by either NSF or GM. In addition, the Herberts appointed advisory panels of eminent scientists and station news directors.

The project was long-lasting and successful. "How

About . . ." was broadcast for ten years as part of local commercial news programs; at its peak, it was seen twice a week on 140 stations. It had an audience of about 8 million, largely in smaller markets where the technical and pictorial quality of Don Herbert's work were greatly appreciated. But it could not have existed or been so successful if not for Don Herbert's unparalleled talent for interpreting difficult concepts in everyday language, a format that made him appear to be part of the staff of the local station, the formidable marketing skills of Norma Herbert, and the subsidy from GM.

The attentive audience for most popular science material is limited. Occasionally, as with "How About . . .," it is possible to reach further by inserting material in other programs. But most efforts to exploit the audience of a lowest-common-denominator medium are doomed to fail: 60% of the public *does not want to know*.

This is not a tragedy: The same numbers apply to every major issue and intellectual area. If we are only interested in persuasion—and that is too often the case—we do not deserve better. If we are truly committed to *understanding* then we can do better. We know how to serve the current audience well and we know how to change the size and attitudes of the next generation.

All it takes is money and commitment.

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