



MR WIZARD REVISITED

The man who introduced science to countless children via television has concluded that he can teach them more effectively with instructional films in the classroom.

Theodora Johnides

DON HERBERT, who spent 14 years trying as television's "Mr Wizard" to explain science to children, now thinks he can reach his 9-13-year-old audience better in the classroom with instructional films. Before turning to these films, Herbert also used the television medium for an adult-science series. However, he discovered that an adult's attitude to science is already molded in a fixed and often hostile form. So instead he determined to catch the child in school, where his interest in science usually begins. To this end, Herbert's classroom films draw upon the student's natural curiosity and maintain it with written responses during the presentation. The child's involvement, therefore, is personal rather than vicarious, as with "Mr Wizard."

I recently visited with Herbert to find out his background and philosophy in interpreting science to non-scientists. Although he graduated as a science teacher from Wisconsin State University at La Crosse in 1940, Herbert, instead of teaching, followed his penchant for acting. After a few years in the theater and in documentary radio, he combined his animated and affable personality with his interest in teaching and media communications to produce *Watch Mr Wizard* in 1951.

This program explained science to children with simple, or, as Herbert says, "homey," devices. Shown on the National Broadcasting Company

television network, it reached 1-3 million viewers, of whom about half were adults. Before leaving television, Herbert tried to reach adults directly with *Experiment*, a series of eight science films shown on National Educational Television. Here the objective was decidedly not to teach, but to intrigue the audience by revealing the scientist as a personality, with his science forming the backdrop.

Television and education

Whether he is working in television or in the classroom, Herbert considers himself "... primarily a writer, an interpreter, who happens to deal in the visual field." Therefore, he says, the result of his writing is seen rather than read. His decision to be seen in the classroom rather than on television is based on his concern for education, which conflicts with television's growing emphasis on entertainment. Commercial producers are usually averse to "educational" programs: Such programs are usually expensive, and are always difficult to produce, yet they appeal only to a small audience.

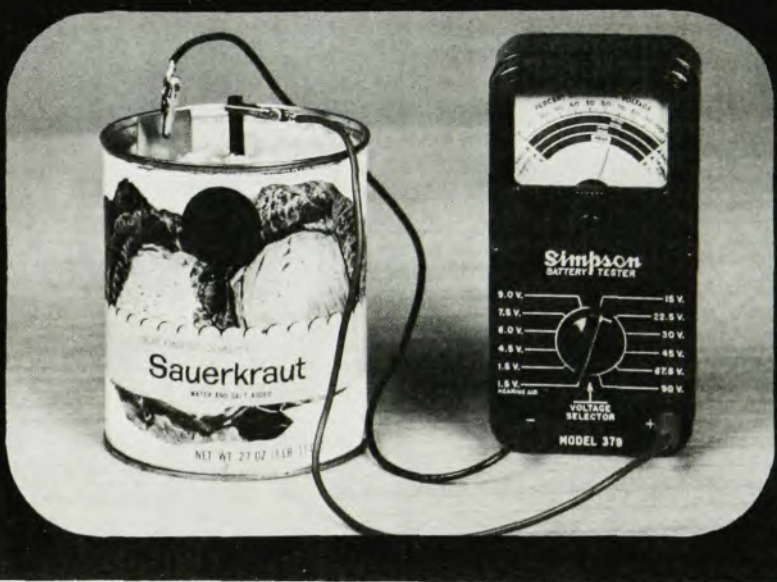
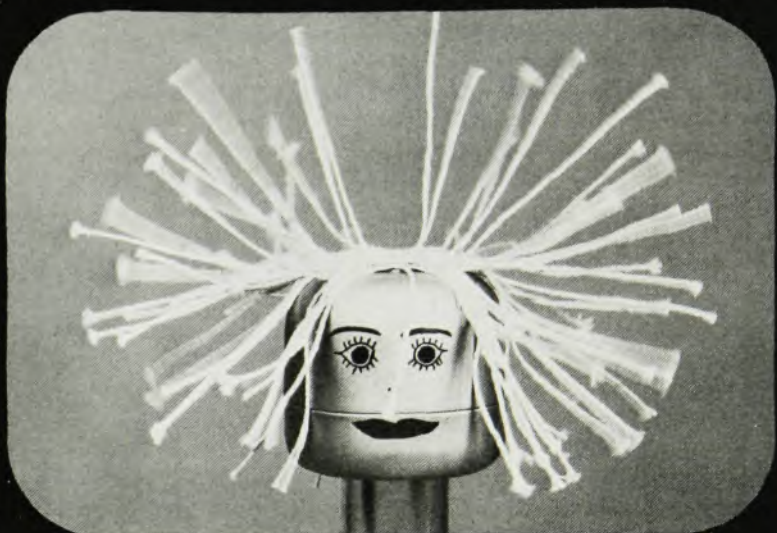
Although seen on over 100 NBC stations, "Mr Wizard" was not commercially supported after the first six years; it then became network sponsored. Its audience of 1-3 million was, as Herbert noted, a small number for commercial television. But he also sees it from a personal viewpoint: "If that many persons are interested, a method has to be devised for these minority audiences by either pay or educational television."

Meanwhile, Herbert is applying his



DON HERBERT'S new role is as a producer of classroom films. As television's "Mr Wizard" (left), Herbert explained science to an audience of 1-3 million viewers for 14 years.

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STATISTICS AND ELECTRICITY. These illustrations from the classroom films show equipment for demonstrating the statistics of radioactivity counting, a decorated Van de Graaff generator and a "sauerkraut-zinc" battery.

television experience to change the style of educational films. He relies mainly on his own ingenuity, but works closely with Morris Shamos, physics chairman and professor at New York University (Washington Square College), who was also adviser for over 800 "Mr Wizard" programs. In most educational films, Herbert explained, "... the student is a passive observer, as is the television viewer. So instead, I try to challenge the child in the classroom as I did the child-actor whom I worked with on 'Mr Wizard', only now the student's response would be with paper and pencil."

Curiosity and inquiry

The aim is to make each film an integral part of teaching science. This includes both presenting the factual concepts and encouraging an interest in science; this latter aim, Herbert says, contains the new emphasis on the scientific method. For the teacher, the film becomes a graphic replacement for classroom experiments and the basis for further discussion.

Before Herbert can make the film succeed, he must first challenge the child. The format, therefore, hinges upon the curious or the intriguing, so that viewing a film is an inquiry. Problems and solutions are devices to make students think; some questions are deliberately left unanswered. Thinking, Herbert says, is his only tool as a dramatist to arouse the child's interest.

But as a film maker, Herbert's primary tool is imaginative illustrations that capture this interest and that lend themselves to paper and pencil responses. They vary from simple homey devices, to scientific instruments and Herbert's own contrivances. The primary consideration is choosing illustrations that allow for written responses during the film. This is so important that the final script depends on what Herbert finds feasible in his workshop. Because this technique has limitations, he has devised many variations: matching games, multiple-choice tests, thought and discussion periods, data collecting and analysis and "do-it-yourself" experiments.

The child in the film *Water—Coming and Going* responds by answering multiple-choice questions and then drawing a diagram of the water cycle. Three simple experiments separately depict evaporation, condensation and precipitation. Questions after each experiment ask for explanations of the

effects. Students are then shown the correct answer by a "molecular-action model," which uses plastic balls for molecules and a moving plunger fixed to a saber-saw blade to stir them up.

These three concepts are combined in a water-cycle box, which illustrates evaporation and precipitation. In the box, a heat lamp at one end (standing in for the sun) evaporates water from a puddle (lake or ocean). Water drops condense on the roof of the box, and drops fall (rain) at the end that is remote from the lamp. Students observe these processes through the glass walls of the box and record them on their diagrams. The film, after this demonstration, reinforces the concept with cloud, fog and frost scenes that apply the student's knowledge to nature.

Illustrations in *Homemade Electricity* are not as elaborate. It shows various common and not-so-common sources of electricity; they include the flashlight battery and the "sauerkraut-zinc" battery; a bike generator and a Van de Graaff generator disguised as a doll whose hair stands on end, and a photoelectric cell and a photographer's exposure meter. The film explains the conversions of different forms of energy (chemical, mechanical, light and so on) into electricity.

Although these two films stress the usual curriculum topics, in others Herbert attempts to portray the impact and importance of a scientist's tools. The microscope is dramatically presented as a powerful instrument with which students can measure the eye of a needle, draw the shapes of two crystals and observe the behavior of snails. The film *How Much Is Enough?*, on sampling random events, opens with a sparkler whose output of sparks is regular when viewed in total, but irregular if a screen cuts off all but a small fraction. Then the concept of "signal plus background" is illustrated with a uranium sample and geiger counter. The count continues when the sample is completely shielded, so proving the existence of background radiation. Sample times, for the background count, from ten seconds to one minute are tried. How many trials do we need if the average is to be meaningful? During the film, the student counts the clicks himself, records the data and works out the statistics.

Herbert has produced these four films and two others in the past year and a half, under the title *Science 20*. He does all the writing and narration,

some of the photography and works with only a four-person staff: Shamos as adviser, a workshop assistant, a director and a film editor. Each film has a teacher's guide that outlines the films, the responses and the techniques; in addition the guide supplies background information and a bibliography.

Distributing the films, handled for Herbert by Prism Enterprises, is the major difficulty in making educational films. Most people will not buy an expensive film, Herbert explained, without previewing it. Even if they decide they want the film, budget cuts may prevent them from buying it. Hence, he says, "... there is a long delay between production and payment that usually discourages a beginning producer."

Physicists and the public

Herbert considers the interpretation of science, whether to children or adults, a personal responsibility. Many physicists, he says, are beginning, as educators, to feel that their science must and should be explained to the public. Shamos, Herbert's example of a physicist who realized this some time ago, is now concentrating on the elementary-school curriculum. He is convinced, as is Herbert, that a person's scientific interest begins there.

There are enormous problems in dealing with adults. Because they have been removed from science since high school or college, the scientist must redefine terms without being too condescending. "You do not treat adults," he says, "much differently than you would a smart child." But what a physicist, or any other scientist, is really contending with is an adult's attitude, especially in the film medium.

All the great dramatic films, he believes, emphasize character, situation and resolution. The audience relates to the film by identifying with the protagonist, who is usually solving some social problem. But science almost always excludes these aspects. The adult is looking for science's importance in his daily life, and therefore can not see its long-range value.

Herbert tried to change this attitude by making a scientist the protagonist in his *Experiment* series, shown on NET. Instead of teaching the audience about science, Herbert wanted to intrigue them. He feels that there is an immediate prejudice towards science films, because the audience expects to be taught some-

thing. So he instead looked over the scientist's shoulder, showing the interaction between his personality and his science.

For these films, Herbert worked with an advisory council: Warren Weaver, vice-president of the Alfred P. Sloan Foundation; Loren C. Eiseley, professor and head of the anthropology department at the University of Pennsylvania; Robert S. Morison, director of the biological-sciences division at Cornell University; Mark Kac, mathematics professor at Rockefeller University, and Frank Press, professor and head of the geology and geophysics department, Massachusetts Institute of Technology. With the help of this advisory committee, Herbert's science specials covered such topics as volcanos, weather models, sharks, white blood cells and the chimpanzee.

In one film, Peter van de Kamp, director of the Sproul Observatory at Swarthmore College, was introduced in his living room playing the piano before his nightly trek to the observatory. Herbert, who was narrator, thus reveals van de Kamp as a musician and also as a collector of old Chaplin films and a home-movie maker. After capturing the personality of the man, the film shows his tools as a scientist: the large refractor telescope, photographic plates and 25 years of data compilations. All of which led to the discovery of the planet near Barnard's Star.

Closeup of Mars used a behind-the-scenes approach to show the development of the camera system on Mariner 4. Robert Leighton, physics professor at Cal Tech, tells the audience about the problems and successes he and his workers encountered in designing the camera system that could weigh no more than 11 pounds and use just 10 watts of electricity. In another film the laser and maser and their future applications are discussed by Arthur Schawlow, head of the physics department at Stanford University, and Charles Townes, professor-at-large at Berkeley.

In these films, as in "Mr Wizard" and the new educational films, Herbert is using his ingenuity to unravel the complexity of science, drawing on any device that will make science simpler and more coherent—but above all to make it interesting. For the future, Herbert plans to stay with classroom films, hoping, thereby, to change the attitude of future adults. □