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Science Broadcasting in Britain

In presenting science to a wide audience BBC television aims for more than just explanation of scientific findings.

Aubrey E. Singer

Every year, as part of its general programming aimed at broad audiences in peak hours, the British Broadcasting Corporation broadcasts a total of about 140 hours of science on radio and television.

Some 34 hours of this output are accounted for by the very-high-frequency television channel, BBC-1, with its eight 50-minute documentaries and weekly half-hour magazine-style program "Tomorrow's World." The documentaries have included a broad review of research on structure and function of viruses, vignettes of Francis Crick, Maurice Wilkins, John Kendrew, and Max Perutz when they received Nobel prizes in 1962, current problems in astronomy narrated by Fred Hoyle, exploratory interviews with four psychiatrists working in different areas of their field, a look at French plans and achievements in technology, and "Challenge," an annual review of the year's developments in science, technology, and medicine. "Tomorrow's World" is lighter, and may include an item on a new technical development in cars or a film on high-speed photography.

About 40 hours of science programs a year are transmitted over the ultra-high-frequency channel, BBC-2, mainly through the alternating fortnightly programs "Horizon" and "Life." Among the presentations of "Horizon" have been profiles of Joseph Needham, Albert Szent-Györgyi, and Richard Gregory.

BBC radio broadcasts about 60 hours of science a year. Its science broadcasting ranges over Home, Light, and Third programs, Network Three, and Schools, and includes such programs as "Science Survey," "Science Review," and "Who Knows?," special Third Program talks and series, and extensive educational programming.

BBC television's science programming for a general audience is primarily the responsibility of the Features and Science group. Over the last nine years we in this group have become, so to speak, prime contractors responsible for producing science television programs during peak hours. Ours is not, of course, the only effort the BBC makes to explain the substance of scientific and technological discoveries and to discuss their impact on everyday life, but it may serve as an example of the total effort.

In our effort to make our broadcasting coherent, we have over the years worked out some general ideas about science broadcasting. Broadcasting not only affects but is affected by the climate of opinion. Its ideas and attitudes arise from the community at large, and broadcasting journalism assimilates, manipulates, and amplifies these trends and then reflects the image back at its source. Hence the science broadcaster must gain his sense of direction by considering what the public knows and what it thinks about science. Broadcasting policy must be formulated in the light of the facts that the public hears much more than it used to about science and its impact, that the widening flood of scientific information makes it difficult for either scientist or layman to keep up, and that the dangers inherent in some of the most exciting fields of science make it difficult for laymen to trust scientists. Broadcasting must also do its part to ensure against the danger that education, faced with a flood of facts, will degenerate, as Jacques Ellul puts it in *The Technological Society*, from "an unpredictable and exciting adventure in human enlightenment" into merely "an exercise in conformity and an apprenticeship to whatsoever gadgetry is useful in a technical world."

Planning the Programs

Before looking at program policy in detail, however, it might be best to explore the origin of program ideas as well as the machinery we have for consultation with the scientists themselves.

The machinery most used by the producer when seeking ideas or advice on stories is informal. By and large he draws on his relationships with scientists who have appeared on our program in the past. (Of course, for reasons of temperament or misunderstanding things sometimes turn sour between a producer and his scientist-performer, but usually the producer and scientist end by maintaining a lasting informal association.) These associations, and our reputation built up over the years, serve as a point of entry into the world of science.

In contrast to this informal machinery, the formal point of contact is the

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Scientific Consultative Group. This body was formed according to a lesser recommendation of the well-known Pilkington Report, in which the Commission on Broadcasting suggested that the BBC's Board of Governors consider appointing an additional advisory committee on science. (The Pilkington Report also urged consideration of the appointment of a scientist to the BBC's staff to encourage and coordinate output; this suggestion was not taken, for previous experience had taught us that coordination of this sort did not really work and indeed discouraged the interest of the production departments.) The Consultative Group was established about 2 years ago under the chairmanship of Alexander Haddow, and its present membership of ten includes two members who were nominated by the then Department of Scientific and Industrial Research and two members each from the British Association for the Advancement of Science and the Royal Society. The group meets twice a year. It is the Corporation's sounding board in the "organized" world of science, and its suggestions, criticisms, and observations have proved extremely valuable.

There is also a formal point of contact with individual scientists (with the unorganized world of science, so to speak), in that from time to time we hold interdisciplinary meetings at which a group of scientists are invited to criticize and make suggestions for future programs. For instance, an important documentary program on geophysical disasters, "The Day the World Went Mad," arose from a suggestion made at one of these meetings by Sir Edward Bullard, head of the department of geodesy and geophysics at Cambridge University.

In practice, however, most ideas come from producers, who, because they are working continuously in the field, are creative and conscientious journalists who can anticipate and fairly reflect what is of sufficient importance to make good television and who are aware of reactions to past programs. They also know how to resist dull ideas from special-interest groups, for our charter wisely puts the BBC not on the side of the Government, the State, Parliament, or any pressure group, but on the side of its audience.

This brings us back to the question of program policy. In Features and Science the tactical policy that directly controls the shape of science programs is one which has evolved over the years. There are five main principles that guide us.

1) In asking the scientist to tell his own story we assume that the level of communication is between equals in intelligence, that the scientist will be addressing an audience that is well disposed toward, but has no special knowledge of, the subject matter. This concept is crucial, for it avoids the unfortunate tacit assumptions that result in condescension.

2) Oversimplication on our part is just as much of an enemy. Some science is extremely difficult, if not impossible, to treat in a nontechnical way. Nevertheless, we must make an effort.

3) The televising of science is a process of *television*, subject to principles of program structure and the demands of dramatic form. Therefore, in taking program decisions, priority must be given to the medium rather than to scientific pedantry. This is the only possible compromise acceptable to broadcasters and performers. Nevertheless, science broadcasting for a general audience is a target not merely of general criticism, but also of critical opinion within the scientific community.

4) Scientific programs designed for a general audience are in no way directly educational, still less instructive, in any formal sense. Rather they are designed to be entertaining at an intellectual level. One of the difficulties faced by broadcasters in this field lies in the fact that the performers work in a pedagogic tradition in which the normal means of communication is the lecture or scientific paper. Scientists tend to judge all other communication by these criteria.

5) Enjoyment of a program is not just a matter of understanding, it has far more to do with insight. Understanding of a scientific point is not necessarily the most important thing for the audience. People want more than this, they want to be able to see the scientist's relationship to his subject, to his colleagues, to his equipment, and to themselves.

Because, then, the aim of science broadcasting is not necessarily the propagation of science but rather the aim common to all broadcasting, an enrichment of the audience's experience, we have kept the final responsibility for science programming in the hands of broadcasters. Because our aim is to treat science as an integral part of experience, we have carefully avoided putting science in a department by itself and risking the formation of a scientific ghetto. Indeed, in television we have arranged matters so that the department with the main responsibility for science also bears a responsibility for feature output generally. Not merely are producers interchangeable, they are involved in many kinds of output.

The production staff working on science programs may or may not have grounding in science. Since science derives from fragmented disciplines, such a grounding is in any case unlikely to be of specific use in preparing programs. Unlike other fields of broadcasting, however, staff working in the field of science face serious problems arising from the impossibility of keeping up with all that is happening across the field. Thus science broadcasters need, more than others, to rely on specialists (who, incidentally, may not have a grounding in science) and on our own extensive contacts to determine what is important. These specialists are science journalists who can effectively spot the new and newsworthy work among the routine reports in a scientific journal. They are very rare birds; in Britain we have perhaps 10 such people, and to find and train people of the caliber we require, who have not merely the interest in things scientific but also the necessary grasp of human relationships, dramatic form, and journalistic flair, is a slow process.

Although it is broadcasting journalists who are responsible for the planning of the programs, our firm policy is that wherever possible we use the scientist to tell his own story, rather than using a professional middleman. After all, since it puts up most of the money for research, the public has the right to hear directly from those responsible just as surely as the scientist has a duty to communicate the new revelations of science, not merely to his own small community, but to the world at large. We do have difficulty from time to time in persuading a busy scientist to appear on our screen, but looking back over the last few years, I can think of few scientists of consequence who have not appeared on radio or television, some at considerable effort.

Of course, other departments in the Corporation which deal with science work in much the same way as Features and Science. Indeed, this has sometimes led to the same scientists being approached about the same matter by television and by such radio services as Home, Overseas, and Third Program, and it has been suggested that, to counter this, there be some form of central coordination. However, different programs, and their producers, may have different approaches to the same subject, and much of our programming strength lies in decentralization and the encouragement of individual journalistic initiative. Moreover, rather than being too busy to be bothered by such multiple approaches, in many cases scientists welcome them, especially if multiple fees are involved.

Other Efforts

Among the other departments of the BBC which undertake science broadcasting the Natural History Unit, based in Bristol, is most notable; it originates at least 90 hours of broadcasting a year, divided between BBC-1 and BBC-2. In addition, science and scientific affairs are reflected in all the BBC's output. The Drama Department produces such series as "R.3" and "Out of the Unknown," which keep scientific speculation within the public gaze. The Current Affairs Department provides topical coverage of space shots, the cost of technology, and medical subjects. The Documentary Department also takes a share of scientific coverage, and our correspondents in the News Division cover an average of about 120 stories related to science every week. In addition, on both television and radio, there are a great many daytime science broadcasts aimed at school and adult-education audiences. It should also be mentioned that our regional competitors on Independent Television produce some science programs.

Our television science programs on BBC-1 now regularly reach 4 to 6 million viewers. The figures for the ultrahigh-frequency channel are of course much smaller, but the potential audience is already 6 million, growing rapidly, and compares favorably with that of radio. In fact, the television channels alone now provide wide coverage of the whole field of science.

Can the impact of all this broadcasting be assessed? Not precisely. The number of people watching any particular program can be gauged, and surveys (as well as the 250,000 letters a year we receive) indicate whether audiences like or dislike a particular program, but such information provides only short-term rules of thumb for program planning. It does not reveal the long-term effects on the public.

In my mind there is no doubt, however, that over the last ten years our output on television has played a part in the growing awareness of the importance of science and its role in the community. The fact that our output has gradually increased (as has the coverage in the press) without any diminution of interest on the part of the public, and indeed, with steady demand for increased coverage, suggests that the main target, the building of a body of critical opinion, stands a chance of being reached.

NEWS AND COMMENT

1966 Nobel Laureate in Chemistry: Robert S. Mulliken

The award of the 1966 Nobel prize in chemistry to Robert S. Mulliken is a recognition of his leadership over the last 40 years in the development of the "molecular-orbital theory" of chemical structure. The award is unusual in that it is given to a man who, for most of his professional life, has been a member not of a chemistry department but of a physics department. And in this case it is given not for any experimental results but for the development of a purely theoretical method of description, analysis, and computation.

Yet chemists everywhere will feel that this award to Mulliken helps to restore the balance of recognition between the two rival descriptive theories of chemistry. These two theories, the "valence-bond theory" or "resonance theory" and the "molecular-orbital theory," are only different ways of applying to molecular structure the ideas and equations of quantum mechanics which were developed for atoms and electrons in the 1920's. But the contention between their adherents has divided the chemical world for a generation. The theories are supposed to be formally identical when all higher-order corrections are included, but in practice they are as different as night and day.

The resonance theory treats the molecule as made of interacting atoms, each one keeping its own electrons. This approach is more easily related to the historical structural formulas, and it was expounded in excellent monographs by Pauling and by Wheland in the early 1940's. Pauling was awarded the Nobel prize in chemistry in 1954 largely for his contributions to this theory.

The molecular-orbital theory differs in that it treats the "outer electrons" or "valence electrons" of a molecule not as being localized but as being spread out in electronic wave functions or "orbitals" over the atoms in a chemical bond or even over all the atoms of the molecule. Since these are the electrons that determine the spatial structure, chemical binding energies, ionization potentials, and spectra or light absorption of a molecule, these properties can be predicted if the electronic wave equations can be solved. The equations are so complex that exact solutions are impossible, even with the most advanced computers, but the approximate solutions appear to be getting better every year. The knowledge of the theory is spreading, and for fundamental calculations it is now used far more widely than its rival, and simplified versions of it are being taught to college freshmen and even to high school students. Many scientists contributed to the development of this improved approach—Hund, Hückel, Maria Mayer, Lennard-Jones, Coulson, and others—but it was Mulliken who had the fun-