Scientists on the TV Screen

George Gerbner, Larry Gross, Michael Morgan, and Nancy Signorielli

While other industrial countries beef up their science education, and American science and engineering enrollments decline, most Americans encounter science every night on television. That encounter, however, is not with scientists, educators, or even science programs. Science news and science programs are few and far between, and most Americans avoid them. Even the most popular regular program attracts only seven to ten percent of the viewing audience. That may account for over five million people, but such programming is still far from being the major daily source to cultivate public conceptions of and attitudes toward science. That source is general entertainment (mostly dramatic) programming, which consumes the bulk of viewing time of those living in America's 75 million households with television sets.

A recent report of the U.S. Department of Education and the National Science Foundation to the White House warned of a "trend toward virtual scientific and technological illiteracy." But illiteracy of any kind is no longer a question of cultural lack or lag. Americans are exposed to more science-related material in dramatic form than any other people in history. The question is, what kinds of conceptions and attitudes are cultivated by that massive discharge of vivid messages and images into the mainstream of the common symbolic environment? What contribution does television make to public understanding (or misunderstanding) of science? What are the consequences for the general cultural context in which science and technology develop, occupational choices are made, and informational efforts are conducted? We attempt here to provide a preliminary assessment of that context and to suggest some answers to those questions. A more definitive account will have to await a broader study now in preparation.

This study was conducted as part of our ongoing research called *cultural indicators*. The research design consists of two interrelated parts: (1) message system analysis—monitoring the world of television, and (2) cultivation analysis—determining the conceptions of social reality that television tends to foster in different groups of viewers.

Message systems analysis begins by selecting an annual week-long sample of prime-time (8 to 11 p.m., EST) and weekend-daytime (8 a.m. to 2. p.m. on Saturday and Sunday) network dramatic programming. Each program in the sample is videotaped, logged, and placed in the videotape archive. Message analysis data are generated each year by analyzing each of these programs according to an extensive recording instrument. In this data-gathering phase of the research, each program is coded by two independent pairs of trained observers who make detailed, objective records about different aspects of program content. Each program is coded twice (by separate coder-pairs) so the reliability of each item in the recording instrument can be tested. The program data come from 814 prime-time and 606 weekend-daytime dramatic network programs in the fall samples of each year from 1969 to 1979 and two samples in the spring of 1975 and 1976. Data on 1833 prime-time and 1144 weekend-daytime characters come from samples broadcast between 1973 and 1979. (The character analysis is based on a smaller sample because the coding of discrete occupations was not incorporated into the instrument until 1973.) The cultivation analysis comes from the General Social Survey of the National Opinion Research Center concerning respondents' confidence in the scientific community.

In media terms, science is bad news but good drama. Science is the subject of about one percent of all newspaper items (puzzles and horoscopes claim three times as much), and even that small percentage declined during 1970s. On television, however, science and technology themes appear consistently in about half of all dramatic network programs, and their frequency increased during the 1970s. Supernatural and occult themes on television were about one-third as frequent as science themes, in contrast to their ratio in newspapers.

More specifically, six out of ten prime-time and seven out of ten weekend-daytime (children's) programs involve a theme or aspect of life explicitly and unambiguously related to science, technology, or engineering (as we define *science*). Since the average viewer spends thirty hours a week in front of the television set, and a third of that viewing is of prime-time drama, at least one hour of each weekday evening's viewing includes programs that involve science. No other cultural or educational source comes close to presenting that magnitude of exposure.

Science is the main focus of four percent of prime-time and nine percent of weekend-daytime (children's) programs. Science has ranked consistently in the first ten of a list of twenty-one television themes. The eleven-year average places science seventh, after the themes of sex, home, violence, business, money, and entertainment (in that order).

Science is not limited to any particular genre, although it is slightly more frequent in serious and action dramas than in comedies. Consequently, it is also more likely to be associated with violence. There may, in fact, be a special affinity between sci-

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ence and violence on television: they occur together about ten percent more frequently than either occurs by itself.

When science is a theme, the place of action is more likely to be outside the United States and/or in the future than when science is not involved. In fact, television drama has no "future" without science playing a significant role in it; every program placed in the future features science prominently. All strange locations in space and/or time account for about one-third of the science-related programs, suggesting the exotic and dangerous aspects of the dramatic image of science. Other themes most clearly related to science are those of nature (including natural disasters), affairs of state and the mass media, foreigners and minorities, illness, and drugs. Most of these manifestations appear even more frequently and in more exaggerated forms in weekend-daytime (children's) programs.

Although science is a frequent theme of television drama, the scientist is a relatively rare and specialized dramatic character. The typical prime-time viewer encounters science and technology every night but a scientist only once a week, and a scientist playing a major role once every two weeks. Scientists comprise less than one percent of prime-time working characters. This proportion is less than half of the corresponding percentage in the U.S. labor force. (Women scientists as dramatic characters are, however, overrepresented on television compared to their tiny actual percentage in the country and to the small proportion of working women in the world of prime-time drama.) By comparison, television doctors and other health professionals number over seven times their real percentage of the population.

Underrepresentation of scientists in television drama means a sharply delineated and limited characterization and a relative restriction of the range of activities. Although positive portrayals outnumber negative, among the handful of scientists depicted fewer are youthful and involved in romance or family, and more are dangerous and headed for ultimate failure, than are medical and other comparable professionals or the general character population. The scientists' aggregate personality profile, also generally positive, shows them, in comparison to health professionals and other characters, to be relatively less attractive, fair, sociable, warm, tall, young, or peaceful—but very smart. On weekend children's programs they were also judged to be less rational and stable and much more violent than other characters.

We know from our and other studies that living and learning in the world of television, as most Americans do, tends to cultivate certain conceptions of reality. What about science and scientists? The evidence, fragmentary and suggestive as it is, comes from some related investigations and our cultivation analysis.

During the 1970s there was some change in the general public's level of confidence in the scientific community. Tom W. Smith's analysis of the National Opinion Research Corporation (NORC) General Social Surveys from 1972 to 1978 revealed that the proportion of respondents who expressed "a great deal of confidence" (versus only some or hardly any) in the scientific community showed an overall, though not steady, decline.

According to Amitai Etzioni and Clyde Nunn, who examined confidence in science from 1957 to 1973 in "The Public Appreciation of Science in Contemporary America," the loss of support for science has occurred most among politically weaker, less-informed, and less-educated groups; but Nunn argues elsewhere that the public's image reflects not so much rejection as ambivalence. Still, as noted by both Allan Mazur and the National Science Foundation, while absolute levels of confidence in science may be declining, the relative ranking of science, compared to twelve other institutions, has actually improved; only medicine gets a higher confidence rating. Jon P. Miller also stresses the relatively favorable rating. Thus, it seems likely that, in overall terms, the public's diminishing confidence in the scientific community is symptomatic of loss of faith in most institutions. Relatively speaking, confidence in science may even have improved. But television did not enhance the image.

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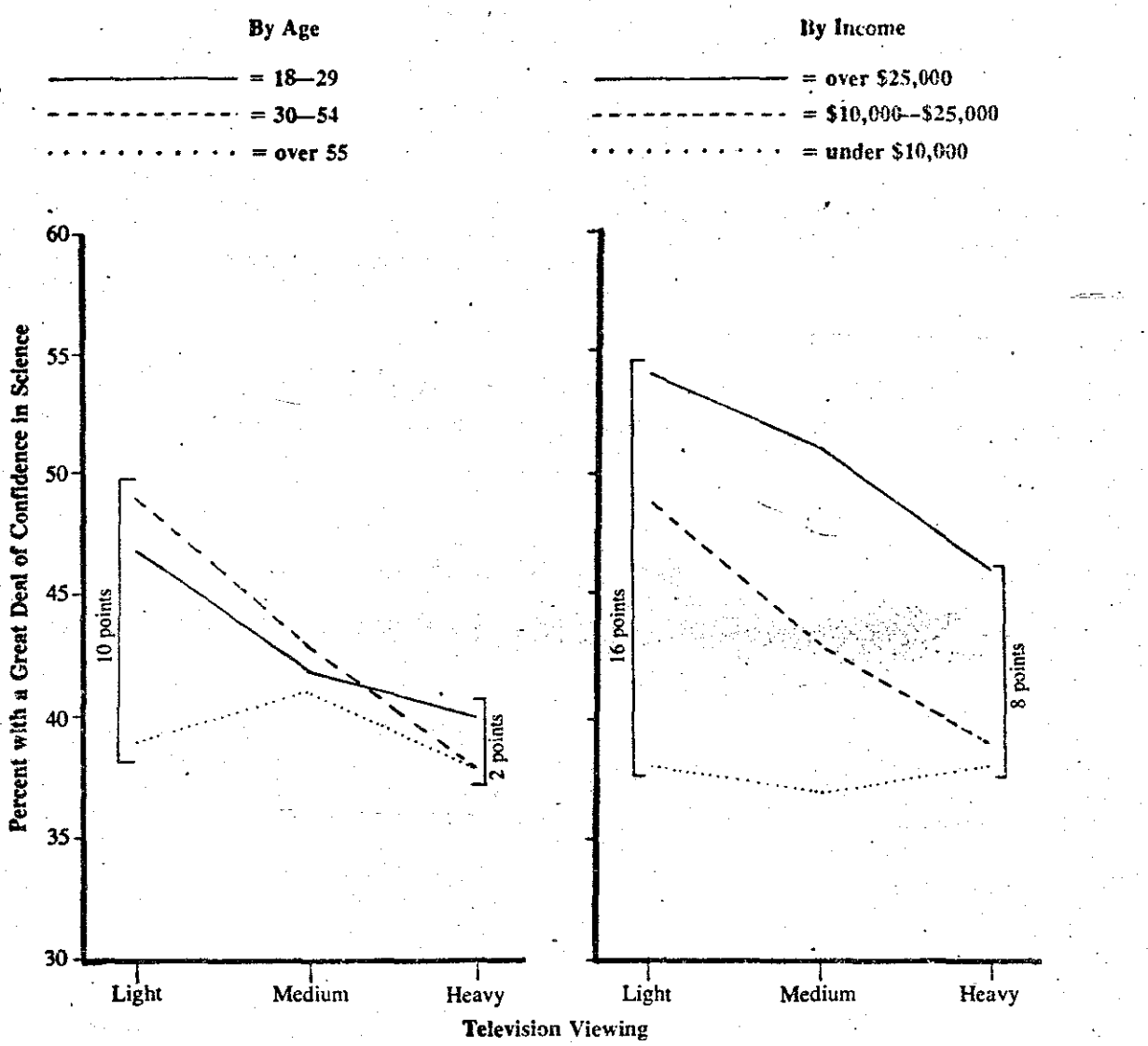
For large numbers of people, television drama is the primary or only source of information about science and scientists. Our preliminary analyses of NORC's General Social Survey data (from 1975, 1977, and 1978) suggest that amount of television viewing may be negatively related to people's level of confidence in the scientific community, particularly among certain groups of respondents.

Let us first look at the association between amount of television viewing and confidence in thirteen major institutions (in descending order of general confidence—medicine, the scientific community, banks and finance, the military, education, the Supreme Court, organized religion, the press, major companies, the executive branch of government, Congress, television, and organized labor). According to simple bivariate patterns (the tables for these and other data have not been included because the text of the article is sufficiently explanatory), greater amounts of television viewing tend to go with greater confidence in the people who run most social institutions. With regard to these thirteen institutions rated by NORC respondents, heavy viewers are more likely than are light viewers to have "a great deal" of confidence in the people running eight of them (medicine, the military, education, organized religion, the press, Congress, television, and organized labor); seven of these relationships are significant (excluding Congress).

Of all thirteen, only two show significant overall negative associations with heavy viewing—major companies and the scientific community. The negative association between amount of viewing and confidence in the scientific community is particularly noteworthy because it is the second-highest-rated institution. While the overall negative association between television viewing and confidence in science is not enormously powerful, it is monotonic and significant: 46 percent of light viewers, compared to 42 percent of medium viewers and 39 percent of heavy viewers, have "a great deal" of confidence in the scientific community.

This relationship takes on a variety of different and interesting forms within different subgroups of respondents. The baselines and the intensity of association manifest wide fluctuations across different groups. Some of these variations within groups may be explained by a process we call *mainstreaming*. Mainstreaming implies that differences among groups deriving from other factors may be reduced or even disappear among heavy viewers.

Figure 1
Relationship between Amount of Television Viewing and Degree of Confidence in the Scientific Community



Groups who share the mainstream view (i.e., a relative commonality of outlooks cultivated by television) will often show no association between amount of viewing and a given outlook or perspective. But strong relationships may be found for those groups whose light viewers do *not* share that outlook. Thus, cultivation may often imply a convergence into a more homogenous mainstream, rather than absolute, across-the-board increments.

Figure 1 presents a graphic illustration of the concept of mainstreaming. It shows the relationship between amount of viewing and degree of confidence in the scientific community, broken down by respondents' age and income levels. We see that all viewers in certain subgroups—older and lower-income respondents—are much less likely than their counterparts to report having a great deal of confidence in science. They are already in the mainstream. These groups show virtually no association between degree of confidence in science and amount of viewing. But other subgroups whose light viewers have more confidence in science—younger, middle-aged, and middle- and higher-income respondents—show negative, monotonic, and significant associations with viewing. Clearly, television brings them into the relatively mistrustful mainstream.

This pattern holds also in terms of race. Non-white light viewers are *less* likely to express confidence in the scientific community and non-white heavy viewers show no evidence of cultivation. For whites, on the other hand, heavy viewing goes with a decrease in the level of confidence in the scientific community.

This association is essentially the same for both males and females, although females have less confidence in science than do males at every viewing level. The relationship is stronger among occasional newspaper readers than it is among daily readers. Although the relationshp remains negative and significant even for daily newspaper readers, it is possible that newspapers present a somewhat different image of science than does television, and that this alternative information diminishes television cultivation.

Controlling for education reduces cultivation to small and non-significant proportions. But it would be a mistake to conclude that television viewing has no re-

lationship with confidence in the scientific community after education is taken into account. On the contrary; multiple controls *within* the low- and high-education groups reveal a number of specifications, persistent associations, and discrete instances of mainstreaming.

Two of these are particularly noteworthy. Among college-educated respondents, the association between viewing and degree of confidence in science is negative, monotonic, and marginally significant for those between 18 and 29, females, and those with high incomes. Two of these subgroups—those between 18 and 29 and those with high incomes—are among those with relatively high levels of confidence in science, as light viewers. They are out of the mainstream, and consequently show stronger evidence of cultivation.

Thus, rather than pointing to spuriousness, education level leads to specifications of cultivation. Among those who did not attend college, the association remains negative and significant for those with medium incomes and those between 30 and 54 years old. In the non-college group, the younger, non-white, and lower income respondents who are light viewers have the lowest confidence of all, yet they all show very slight *positive* and monotonic associations with television viewing. Although these are non-significant, the trend is consistent with mainstreaming. Heavy viewers in those groups with the *highest* levels of confidence in science tend to show evidence of the cultivation of a negative image, while heavy viewers in those groups with the *lowest* degree of confidence show slight signs of having a more confident perspective—evidence of positive cultivation. Both groups of heavy viewers are in the relatively homogenous mainstream.

One final comparison provides a particularly vivid illustration of this concept. We noted above that the relationship between viewing and confidence in the scientific community might be better understood in terms of the larger context of public confidence in other social institutions. It seems reasonable to suggest that the relationship between television viewing and confidence in science may be mediated by one's general degree of confidence in other institutions. Specifically, since (1) heavier viewing is often associated with higher institutional confidence; (2) heavier viewing is often associated with lesser confidence in science; and (3) higher confidence in science goes with higher general institutional confidence, then controlling for general orientation to a variety of social institutions should *increase* the negative association between viewing and confidence in the scientific community.

In order to assess this notion, we added up the confidence levels of all of the institutions rated by respondents, except the scientific community. These twelve items seem to form a reliable measure of general confidence; the internal homogeneity (measured by Cronbach's alpha) is a quite acceptable .77. We then divided the sample into those who scored low and high on this index and conducted our usual analysis of demographic subgroups.

We found that general level of confidence in institutions does make a large difference. Among those who have little confidence in the people running most institutions, there are almost no relationships between amount of viewing and confidence in the scientific community. While most of these relationships remain negative, only two are significant. Among those with more confidence in general, television viewing has strong, consistent, and significant negative associations with confidence in science. In many cases, the subgroup with the most positive general orientation shows the strongest negative association with science (i.e., mainstreaming). Even subgroups who showed no overall relationship (e.g., older respondents, low-income respondents) here reveal significant negative patterns.

These findings suggest that some of television's dubious imagery may be reflected in viewers' levels of confidence in the scientific community. Generally, the groups that tend to be the most mistrustful of science, those who are already in the television mainstream, show the least evidence of cultivation by the television image. In fact, viewing may actually improve excessively jaundiced and alienated outlooks on science. On the other hand, the groups on which public institutions depend most for support show the greatest indication of an association between television viewing and less confidence in science. These are the younger, better-educated, middle and higher income, and generally confident groups, those that usually provide the bulk of interest in and support for science. As long as members of this group watch little or no television, their confidence in the scientific community is the highest of all groups. But that confidence level declines among those members of these same groups who watch more television. The heavy viewers in the otherwise supportive group join the television mainstream where the generally more mistrustful and alienated are found.

This pilot study has found reasons for concern about and further investigation into images of, and viewers' understanding of, science. Television is the "wholesaler" of most images, including that of science. The image of science, although mostly benign, is linked with future, fantasy, and danger. The image of the scientist, although again largely positive, is a relatively rare, limited, and—compared to that of other characters—strange and forbidding image. Steady exposure to these images confirms the suspicion and mistrust of those who already harbor such feelings. However, the groups most positively inclined toward science appear to be the most susceptible to the relatively negative images presented on television. Television, on the whole, seems to make few friends for science but may confuse and alienate its potentially most likely students and supporters. We may have a serious national problem standing in the way of better understanding and support of science, a problem that merits further, broader, and more definitive investigation.□

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George Gerbner is professor of communications and dean of The Annenberg School of Communications at the University of Pennsylvania, as well as editor of the Journal of Communication. *He has written extensively on mass communication research and recently edited* Mass Media in Changing Cultures.

Larry Gross is associate professor of communications at The Annenberg School and co-editor of Studies in Visual Comparison. *His research is on the cultural determinants of symbolic behavior.*

Michael Morgan is research specialist at The Annenberg School. His research is on television's influence on role socialization and academic achievement.

Nancy Signorielli is research coordinator at The Annenberg School. Her research is on television images and their effects upon people's conceptions.