FORMAL PROPOSAL

PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

DIRECTORATE FOR SCIENCE EDUCATION

Cover Page

FOR CONSIDERATION BY NSF ORGANIZATIONAL UNIT

RESEARCH IN SCIENCE EDUCATION

IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? Yes ___ No x ; IF YES, LIST ACRONYM(S):

PROGRAM ANNOUNCEMENT/SOLICITATION NO.: SE 80-55F

CLOSING DATE: None (March 9, 1981)

NAME OF SUBMITTING ORGANIZATION TO WHICH AWARD SHOULD BE MADE (INCLUDE BRANCH/CAMPUS/OTHER COMPONENTS)

University of Pennsylvania, Annenberg School of Communications

ADDRESS OF ORGANIZATION (INCLUDE ZIP CODE)

3451 Walnut St., Philadelphia, Pa.19104(Office of Research Administration)

TITLE OF PROPOSED PROJECT (10 word limit)

The Role of Television Entertainment in Public Education About Science

REQUESTED AMOUNT

Direct - $ 124,828
Indirect 64,888
total $ 189,716

PERIOD OF PROJECT OPERATION:

Starting Date: Oct. 1, 1981

Duration in Months: 24

PRINCIPAL INVESTIGATOR'S NAME AND SOCIAL SECURITY NO.*

(Name only one person) (Dr., Prof., Mr., Ms.)

Dr. George Gerbner 560-26-1969

PI PHONE NO. Area Code: 215

Office: 215-243-7041

Home: 215-MI9-7479

PI DEPARTMENT	DISCIPLINE	PI ORGANIZATION
Annenberg School	Communications	University of Pennsylvania

Number of the Preliminary Proposal which preceded this Formal Proposal: R____

Characteristics of Study: Category I (Circle one)

Subject Matter to be Studied

CHECK ALL APPROPRIATE BOXES

- ☐ Early Adolescence
- ☐ Technology
- ☐ Women
- ☐ Cognition
- ☐ Continuing Education Component
- ☐ Minorities
- ☐ Physically Handicapped
- ☑ Science Literacy
- ☐ Other
- ☐ Informal Education Component

FOR PROGRAM USE ONLY

- ☐ Significant Development Component
- ☐ P.I. new to Science Education Research

TARGET POPULATION (Check all that apply)

- ☐ Pre-School
- ☐ Grades K-4
- ☐ Grades 5-8
- ☐ Grades 9-12
- ☐ Undergraduates
- ☐ Graduates
- ☑ Other

*Submission of social security numbers is voluntary and will not affect the organization's eligibility for an award. However, they are an integral part of the NSF information system and assist in processing the proposal. SSN solicited under NSF Act of 1950, as amended.

PRINCIPAL INVESTIGATOR	AUTHORIZED ORGANIZATIONAL REP.	OTHER ENDORSEMENT (optional)
NAME: George Gerbner	NAME: Anthony Merritt	NAME:
SIGNATURE:	SIGNATURE:	SIGNATURE:
TITLE: Dean and Professor of Communications	TITLE: Director, Office of Research Adminis.	TITLE:
DATE: 3/4/81	DATE: 3/4/81	DATE:

The Role of Television Entertainment in Public Education About Science

CONTENTS

APPENDIX B

NOTICE OF RESEARCH PROJECT
SCIENCE INFORMATION EXCHANGE
SMITHSONIAN INSTITUTION
NATIONAL SCIENCE FOUNDATION
PROJECT SUMMARY

EXHIBIT II-8

PROJECT NO. (Do not use this space)
NSF AWARD NO.

1. NAME OF INSTITUTION (INCLUDE BRANCH/CAMPUS & SCHOOL OR DIVISION)

University of Pennsylvania, Annenberg School of Communications

2. MAILING ADDRESS

3451 Walnut St., Phila. Pa. 19104 (Office of Research Administration)

3. PRINCIPAL INVESTIGATOR AND FIELD OF SCIENCE/SPECIALTY

George Gerbner, Communications

4. TITLE OF PROJECT

The Role of Television Entertainment in Public Education About Science

5. SUMMARY OF PROPOSED WORK (LIMIT TO 22 PICA OR 18 ELITE TYPEWRITTEN LINES)

This study will examine the role of television in the cultivation of public conceptions of science, technology, and scientists. Most Americans encounter science and technology most often in the form of "regular" dramatic television "entertainment." Results from a pilot study show that between 60 and 70 percent of all fictional network television programs contain unambiguous and explicit thematic references to science, while scientists are relatively rare, specialized characters with some forbidding and dangerous aspects. Those who watch more television have less confidence in the scientific community, particularly among those who "otherwise" represent science's strongest supporters. This study will draw upon our videotape and data archives of samples of television programs aired between 1969 and 1979 to analyze representations of scientists, science, and technology embedded in prime-time television drama. Based on these findings, we will commission a survey to examine the extent to which television drama cultivates images and beliefs about science, and different levels of scientific literacy, in different groups of adult viewers, which must be taken into account in both policy decisions and formal educational efforts about science.

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DIVISION (OFFICE) AND DIRECTORATE	PROGRAM	
SCIENCE EDUCATION DEVELOPMENT & RESEARCH	Research in Science Education	
SECTION	PROPOSAL NO.	F.Y.

FOR DGC USE ONLY

START AND END DATES	AMOUNT GRANTED

NSF FORM 4 (7-78) 1. Proposal Folder 2. Program Suspense 3. Division of Grants & Contracts 4. Science Information Exchange 5. Principal Investigator 6. Off. of Govt. & Pub. Progs. 7. Assistant Director

THE ROLE OF TELEVISION ENTERTAINMENT IN PUBLIC EDUCATION ABOUT SCIENCE

TOPIC

We propose to investigate the role of television in the cultivation of public conceptions of science, technology, and scientists. This research will also apply the results of a pilot study, and the cumulative findings of a long series of investigations of the relationship of television watching to conceptions of social reality, to problems in the public understanding of science and in science education and literacy.

The principal questions we propose to address are:

1. What types of representations and information about scientists, science, and technology are embedded in television programs?
2. What types of images and beliefs about science does television tend to cultivate in different groups of viewers?
3. What levels of scientific literacy are associated with television watching in different groups of viewers?
4. What public conceptions and attitudes toward science are cultivated by television viewing that formal educational efforts about science must consider and attempt to illuminate or overcome in order to attain any success?

There is no doubt that television is the most prolific and pervasive disseminator of messages and images about science (and nearly everything else) in modern culture. No other cultural or educational source of information about science reaches so many people, and so often. Between 60 and 70 percent of all television programs feature explicit and unambiguous thematic references to science and technology. Preliminary research (Gerbner, et al., 1980c) suggests that while science is a common theme in network dramatic programming, scientists are relatively rare, specialized characters with some forbidding and dangerous qualities.

Our recently concluded pilot study (Gerbner, et al., 1980c) yielded striking and even somewhat shocking conclusions which, if supported by this more definitive study, may suggest significant changes in both television program and science education policies. Heavy television viewing has been found to be associated with lower levels of confidence in the scientific community, particularly among those who "otherwise" represent science's best supporters -- better-educated, younger, higher-income viewers. Viewing also seemed to discourage the choice of science-related occupations among adolescents. The present study seeks to extend and elaborate these findings through (1) detailed and comprehensive analysis of the mass-mediated image of science, technology, and scientists, and (2) focused investigation of the consequences of cumulative exposure to these portrayals.

Even though television has, over the past three decades, become the major source of information and news in our society, very little research has been devoted to ascertaining the kinds of information about science and technology prevalent in television programming and how that information is related to people's scientific knowledge and conceptions. Media-related research about "science" has primarily focused upon news and newspapers and been concerned with the degree of accuracy in science news items.*

Other researchers have documented the importance of mass media as sources of information about science (Ubell, 1963; Wade and Schramm, 1969). Kreighbaum (1959) noted that reader enjoyment increases when the article presents and discusses facts rather than theories, focuses upon specifics

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* Estimates of the accuracy of the coverage given to specific scientific issues and controversies range from low (Tankard and Ryan, 1974; Pulford, 1976) to moderate (Tichenor, et al., 1970) to high (Shaw and VanNevel, 1967; O'Keefe, 1970). Many of these studies are reviewed by Cronholm and Sandell (in press).

rather than generalities, and has a human interest component.

There has also been concern with assessing the impact of science reporting, especially in light of the fact that most people do not act upon scientific information they may read about (Robinson, 1963). For example, very few people change smoking habits or begin to use seat belts as a result of reading reports published in newspapers and/or magazines. As with studies dealing with news accuracy, hints about the impact of science news on public opinion and understanding generally come from studies which focus upon specific events or discoveries (e.g., Friedman, in press; Pfund and Hofstadter, in press; Shepherd, in press.)

Of course, media influence may extend beyond public understanding (or misunderstanding) of science "to affect the very boundaries and scope of... policy" (Pfund and Hofstadter, in press). In some ways, simply the quantity of media attention may help determine public attitudes, quite apart from the evaluative nature of that attention. Mazur (in press) argues that an increase in media coverage of a scientific technology leads to an increase in public opposition, which in turn declines as coverage wanes. For example, opposition to nuclear power ebbed and flowed in virtually perfect correspondence with the quantity of media coverage of the Three Mile Island accident.

Again, most of this research deals with relatively isolated events or issues, in the context of news reporting. But science news makes up a small percentage of all news (Nunn, 1979; Cronholm and Sendall, in press). Furthermore, studies of science coverage in the media have consistently revealed that most magazine stories are about biology (Hopkins, 1925; Searle, 1926; Koelsche and Morgan, 1964) and that, in general, media coverage (including television) is health-related (Finley and Caldwell, 1923; Shaw and Van Nevel, 1967; Sherburne, 1963; Lewis, 1977). Finally, while Sorenson and Sorenson (1973)

found that science content in magazines increased between 1964-65 and 1969-70 (most of this increase was in the areas of space, conservation, and the environment), the percentage of science news in newspapers decreased due to the 1970's (Nunn, 1979).

Researchers have seldom investigated the image of science in mass media entertainment, although "information" about science in this form may have pervasive and subtle consequences on the public's beliefs. Comstock and Tully (in press) analyzed the portrayal of "innovation" -- defined as "invention, experimentation, research, design, development" -- in a sample of films produced between 1939 and 1976. They found such "innovation" in less than four percent of the films, with differences over time and across genres, but a clear pattern emerged. Innovation was marked by benevolent motives, and was usually successful; but almost half the time, it had negative consequences on people (especially the innovators themselves) or on society.

Television content in particular has rarely been analyzed in relation to science. The only other systematic attempt to analyze the amount of science on television is almost 20 years old (Sherburne, 1963) and found that in 1963, six percent of all prime-time programming was devoted to science, with three-quarters of that time focusing upon medicine and psychology. This study concluded that "science on television as a whole is presented from a fantastic bias when one considers the role science is playing in our lives and the dramatic and exciting times through which we are all living" (p. 304).

It must be repeated, however, that none of this research links media representations with people's perceptions. No one, before our recently completed pilot project (Gerbner, et al., 1980c) had examined the role of television drama in presenting knowledge, discoveries, questions, and problems that shape public conceptions and understanding in this area.

The proposed analysis of television content (message system analysis) will draw upon our archives of dramatic prime-time programs in which the themes of science and/or technology appear. The results will provide an in-depth assessment and interpretation of the most stable and recurrent patterns of television's portrayals of scientific endeavors and activities, and illuminate the demography, personality profiles, roles, and fates of scientists.

The analysis of the impact of these messages on viewers' conceptions (cultivation analysis) will build upon the dimensions, themes, structures, and implications uncovered in television content. We will be able to utilize existing data bases for secondary analysis to only a small degree; thus, we propose to collect new survey data specifically designed to reflect the results of the message system analysis. This phase of the research will reveal the extent to which television cultivates images and evaluations about science, the nature of these images and of attitudes toward various areas of scientific research, beliefs about the potentials and limitations of science, "accurate" or "inaccurate" understanding of science, and notions about the competence, goals, and other qualities of scientists. Most importantly, we will examine these processes in order to determine whether television's contribution is complementary with, contrary to, reinforcing of, or diminished by, other social, cultural, and personal influences.

SIGNIFICANCE

At a time when serious questions are being raised about America's ability to maintain a leading or even competitive technological and scientific role in the international sphere, most Americans encounter science and technology most often on television.* These encounters are rarely with scientists, educators, or even through science programs (such as NOVA); the vast bulk comes in the form of "entertainment." While television drama is only one of many factors which may influence people, it may well be the single most common and pervasive source of certain conceptions relating to science and technology. Television drama reflects, establishes, and maintains the cultural context within which science and technology develop, occupational choices are made, and informational efforts are conducted. This research has implications for all three of these inter-related concerns.

The 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." Impediments towards public understanding and support of science have ramifications both for society's need to come to grips with the increasingly central role of science and technology in our daily lives and for the continued advancement of scientific research. The cultural and social context of these trends can be a critical determinant of priorities, directions, and goals as well as a subtle but consistent influence on public responses and endorsement. Television, as the "wholesale distributor" of most cultural imagery and values, including those relating to science, can be seen as the mainstream of the cultural climate regulating and

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* In contrast to the prevalence of science in drama, science news makes up about one percent of all news items, and even that declined during the 1970's (Nunn, 1979).

mediating these phenomena.

The proposed research is a continuation and extension of our ongoing research project, Cultural Indicators, which has been studying trends in the content of dramatic television programs and viewer conceptions of social reality since 1967-68. Our prior and ongoing studies have established a twelve-year data base and have demonstrated the feasibility of this type of research. The proposed research builds upon our accumulated findings and applies them in new areas, and also takes new theoretical and methodological refinements into account.

Television is the central and most pervasive mass medium in American culture and it plays a distinctive and historically unprecedented role. Its messages and lessons are part of a mass-produced and internally consistent symbolic environment into which all children are born and in which they will live from cradle to grave. Television is a total cultural system with its own art, science, statecraft, legendry, geography, demography, character types, and action structure.

No other medium or institution since pre-industrial religion has had a comparable potential to influence what people of a tribe, community, or nation have learned, thought, or done in common. Over 4 million hours of programming a year are discharged into the mainstream of common consciousness to claim the time and attention of 200 million Americans. The world of television encapsulates those selected features of the larger media culture that lend themselves best to its basic sales and socializing functions. Different time and program segments may complement and reinforce each other as they present aspects of the same symbolic world.

Over the past decade, we have found that television makes specific and measurable contributions to people's conceptions of reality that can be traced

to regular exposure to television's messages. Television viewing cultivates images, assumptions, and actions relating to violence, mistrust, and alienation (Gerbner, et al., 1978, 1979, 1980b); sex-role stereotypes (Signorielli, 1979; Gross and Jeffries-Fox, 1978; Gross and Morgan, in press); aging and older people (Gerbner, et al., 1980d,e); health-related conceptions and practices (Gerbner, et al., in press); sex (Gerbner, 1980); the family (Gerbner, et al., 1980a); occupational stereotypes and aspirations (Jeffries-Fox and Signorielli, 1979; Morgan and Gross, in press).

Our accumulated findings have led to the development of two refinements in our approach to investigating television's consequences, representing conditional processes which enhance or diminish cultivation, and called "mainstreaming" and "resonance." These will be critical conceptual frameworks for the proposed research. Briefly, "mainstreaming" implies that cultivation may mean a diminution of differences deriving from other influences, resulting in a convergence of the outlooks of heavy viewers from "otherwise" disparate groups upon a more homogeneous "mainstream" perspective. Consequently, cultivation may only be evident among those who are "out" of the "mainstream," and television viewing need not have an invariant, across-the-board impact.

"Resonance," relates more to the role of real-life experience in the cultivation process, and follows the occurrence of congruence between everyday reality and television's messages. When other information "fits best" with television imagery, the combination "resonates" and amplifies cultivation.

Examples of "mainstreaming" have already been found in preliminary inquiries into television's impact on attitudes towards science (Gerbner, et al., 1980c). Heavy television viewing is most strongly associated with lower levels of confidence in the scientific community for those groups who are "otherwise" most favorably disposed to science -- better educated, younger,

more affluent viewers -- and who have, overall, shown less decline in their confidence ratings for science over recent years (Etzioni and Nunn, 1974).

Comparable results have been found among adolescents.* We coded responses to an open-ended question asking, "What job would you like to have when you are out of school and working full time?" into two categories; one consisted of occupations relating to science and technology,** and the other was made up of all other occupations. Both at the same time, and over time, adolescent heavy viewers are significantly less likely to choose a science-related job, even after controlling for IQ, sex, grade in school, and social class.

Even more striking is the way the longitudinal relationship varies across different groups. While the longitudinal relationship holds up overall after controls (beta = -.15, $p < .05$), there is a significant interaction with IQ (partial = -.12, $p < .05$). This means that among those with medium and high IQ's (who are significantly more likely to select a science-related career), television's negative effect on choosing a science-related job a year later is particularly strong, even after controls are applied for sex, age, residual variance in IQ, and earlier career plans.***

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* Our cultivation analysis data archives contain several cross-sectional samples and longitudinal panels of adolescents (6th through 9th graders) attending a public school in surburban/rural New Jersey. Cross-sectional sample sizes range from 335 to 649; for the two-year panel providing the results referred to here, N=347.

** Over three years, 374 different jobs were given, of which 41 (11 percent) were coded as "science-related." Overall, about seven or eight percent of students gave science-related answers. Typical examples are biologist, aerodynamics, geneticist, astronaut, nuclear engineer, "work at NASA", and physicist.

*** When earlier plans were partialled out of later plans, the latter reflect "new information" or "change" in plans for a science career; when the demographics are also removed, later plans represents change which is not attributable to either earlier plans or background factors. For medium and high IQ students, earlier viewing level significantly predicts that "change" (r = -.26 and -.21, respectively; both $p < .01$). For low IQ students, r = .03 (n.s.).

Finally, there is an even stronger interaction between earlier viewing and earlier plans (partial = -.34, $p < .001$). This means that television's independent impact on adolescents' tendency to shy away from a science-related career is strongest of all among those who, a year earlier, had expressed the desire for a science-related occupation.

All this is highly noteworthy for two reasons. First, both adolescents and adults show evidence of "mainstreaming." Among adults, greater amounts of television viewing go with lesser confidence in the scientific community particularly for those who are "otherwise" among science's best supporters; among adolescents, television turns away from science those with higher IQ's, and those who had previously expressed an interest in a scientific career. Second, these preliminary findings are in some ways a sharp contrast to other general cultivation patterns. For adults, amount of television viewing generally shows positive associations with institutional confidence (Gerbner, et al., 1980c); for adolescents, television increases the status of occupational aspirations over time (Morgan, 1980). Evidently, "science" is an exception to a rule; television's implications for science are different from those for other institutions and other professional careers.

"Resonance" should also play a role in the cultivation of images about science. In some ways, the notion of "resonance" builds upon a basic truism of communications research, that television's influence will be greatest when it either "reinforces" direct experience or when it is the primary source of information about an issue (Comstock, et al., 1978). In this case, we expect that such factors as people's relationships with actual scientists, the extent to which their own occupations are related to science, the extent to which their education included science courses, and exposure to and interest in science news in other media, will all mediate the effects of television in systematic ways.

In elaborating and refining these theoretical considerations and empirical findings, the most general significance of the proposed research will be that it will provide the first systematic and comprehensive attempt to determine whether television represents a friend or foe of science, to what extent, and for whom. Television's contribution to public understanding and conceptions of science and scientists may well represent a serious obstacle to support for science and technological development and establish formidable barriers to informational efforts aimed at improving scientific literacy.

PLAN

Message System Analysis

Our research paradigm begins with message system analysis, a flexible tool for making orderly, reliable, cumulative observations of programming content. Message system analysis is designed to investigate the aggregate and collective premises defining life in representative samples of mass-produced symbolic material. This analysis rests upon the reliable determination of unambiguously perceived elements of communications. Our existing data base and the data we propose to collect do not reflect what a particular individual sees on any particular evening but what large communities absorb over long periods of time. Moreover, we do not attempt to interpret individual programs, networks, or productions nor draw conclusions about artistic merit or the ability to "sell" products. The analysis isolates the patterns and symbolic structures that exist in the samples. The purpose of this particular message system analysis will be to provide systematic, cumulative, and objective observations of science and technology in the world of television.

The proposed message system analysis will be conducted on

prime-time network dramatic programs. While weekend-daytime (children's) programs frequently feature representations of science (Gerbner, et al., 1980c), due to both budget limitations and our concern with the impact of televised science on the general public, we will analyze prime-time programs only. Using our archive of week-long samples of television programs aired between 1969 and 1979, we will conduct an in-depth analysis of the portrayal of science and technology in all prime-time programs in which science and technology appear (506 prime-time programs or 62.2 percent of our total sample). The analysis will focus upon the program as a whole and the characters who populate these programs. When additional samples of programming are available (the 1980, 1981, and 1982 seasons) they will be incorporated into the analysis.

In message system analysis the principal aspects of methodology are the recording instrument, the sample, units of analysis, the training of coders, the assessment of the reliability of the observations, and data analysis techniques.

Recording Instrument: The first step of the proposed research will be to finalize and pilot test the recording instrument. The instrument will have two sections -- one focusing upon the entire program and one for the characters who populate the dramatic programs. A preliminary version of this recording instrument may be found in Appendix I.

The recording instrument, especially the sections dealing with the recording unit as a whole, will be designed using an analytic framework that isolates the overall portrayal of science and technology in regard to four basic notions -- what exists, what is important, what is right, and what is related to what. These notions are translated into four constructs called attention, emphasis, tendency, and structure (Gerbner, 1969). Attention is measured by determining the kinds of scientific or technological, etc. topics present and how often they appear. Emphasis examines these content elements in terms of their importance or relevance to the unit of analysis; that is, whether the topic is a minor, significant, or major focus of the program or news story. Tendency (often a difficult construct to operationalize because it is integrally related to questions of judgement), isolates whether a particular topic is presented in a positive, negative, or neutral fashion. Finally, the last construct, structure, determines what topics are related (appear together) in the entire message system.

We will isolate the overall image of science and technology by examining a large number of science-related topics including scientific experiments, technology, engineering, space exploration, satellites, nuclear power, energy, agriculture, food additives, genetics, birth and birth control, the weather, natural disasters, safety, public transportation, disease (including information about its prevention and cure), etc.

We will also examine all the characters who populate these programs. We will be especially concerned with determining the characteristics of those who are cast in science-related roles such as scientists, engineers, and various types of technicians.

We will include a number of demographic variables (age, sex, race,

socio-economic status, marital status), as well as a number of variables of a descriptive nature -- type ("good-bad"), success, committing violence, victimization, romantic and family involvement, degree of expertise, degree of achievement, and a series of 5 point bi-polar personality trait scales.

Data Collection: All of the new data collected with these instruments will be added to existing data for programs and characters. Thus, this data collection phase will be extremely efficient and only entail collection of data relating specifically to science and technology.

We will first review and revise the instrument, and make necessary additions and deletions. We will then conduct another extensive pilot test by having our staff code 10 programs. All problems encountered will be discussed, resolved, and the instrument revised accordingly. The pilot testing phase will also include development of the necessary and appropriate training materials. We will then hire and train coders and complete all data collection.

The Samples: The samples will consist of all prime-time programs in our video-tape archives (which date from 1969) as well as samples for the 1980, 1981, and 1982 television seasons. The time parameters of the sample from which these programs were selected are as follows: Monday through Saturday evenings from 8:00 to 11:00 p.m. EST and on Sunday evenings from 7:00 to 11:00 p.m. EST. Each program in the existing sample has been videotaped, logged, and placed in the video-tape archive. Thirteen samples have been drawn over this 11 year period. Eleven of these samples -- one for each calendar year -- are annual weeks of fall programming. In addition, in 1975 and 1976 (as part of our methodological work on sampling) two week-long spring

samples were selected. The new samples will follow the same time parameters.*

The size of the yearly sample -- one week of programming -- has been subjected to a number of methodological studies. We find that the week-long sample is adequate and that in regard to dramatic programming, the solid-week sample is at least as generalizable to a year's programming as larger randomly drawn samples for basic sample dimensions -- network, program format, program type, and tone (Eleey, 1969).

Moreover, analyses of variance conducted on violence-related content data collected over seven consecutive weeks of fall 1976 prime-time dramatic programming revealed no significant differences by week for dependent measures such as the number of violent actions, the duration of violence, and the significance of violence. There were, however, significant main-effects for program-related variables including network, type of program, time of broadcast, new or continued program, and so on; but there were no significant interactions by sample week (Signorielli, in press).

While a larger sample may increase precision, our past work has shown that, given our operational definitions and multidimensional measures that are sensitive to a variety of significant aspects of television content, the one-week sample yields remarkably stable results with high-cost efficiency.

Units of Analysis: Two basic units of analysis will be examined in this study: individual fictional stories and characters. The fictional story unit may be a play produced for television (including situation comedies), a feature film or a made-for-television movie broadcast during the sample period, or a cartoon story (of which there may be one or more in a single program as usually advertised in newspaper and magazine television listings). The character unit of analysis will examine major characters (those portraying roles

* The Fall 1980 strike by the Screen Actors Guild necessitated a Spring 1981 rather than a Fall 1980 sample for the 1980 season.

essential to the plot) and minor characters (all other speaking roles).

Coding and Training Procedures: In message system analysis coders are trained to do a specialized kind of observation. They must reliably make the discriminations required by the recording instrument and record them in specific form. Coders must focus only upon what is presented explicitly in the material they are coding and not how it might be judged by a critical viewer. Coders are instructed to be able to point to specific evidence in the program for each coding decision they make. They cannot fall back on or use their prior knowledge of specific programs. Their task is to generate the data for the subsequent analysis that will permit interpretation of the common message elements and structures that are available to the public of diverse viewers.

For the full analysis of these samples, a coding staff of about 16 coders will be recruited and hired to work for a maximum of 20 to 25 hours per week. The training period will require three to four weeks of instruction and testing. Training will begin with an introductory session devoted to item-by-item discussions of the recording instrument. The trainee groups will be subsequently split into randomly assigned coding teams of two each, and all coder-pairs will begin a training period in which they will view and code ten specifically selected dramatic programs that have been viewed and coded by the supervisory staff. Each coder-pair will work independently of all other pairs, and will return a joint coding for each program. Coder-pairs will then meet with members of our supervisory staff and discuss the difficulties encountered in the training exercise. Coders will continue to code training programs and consult with our staff until all problems are resolved.

The data generated by the coder-pairs on the training programs will be subjected to extensive reliability analysis. On the basis of these results, instructions and variables will be further discussed and if necessary, revised. Moreover, idiosyncratic coder-pairs will be isolated.

The coder-pairs who survive this testing process will proceed to analyze the samples of programs.

During both the training and data-collection phases of the project, the coder-pairs will be able to monitor the assigned videotape of the program as often as necessary. A subsample of the programs will be coded independently by two separate coder-pairs to provide double-coded data for the final reliability analysis.

Assessment of Reliability: Reliability measures are designed to ascertain the degree to which the recorded data reflect the properties of the material being studied and not the contamination of observer bias or of instrument ambiguity. Thereotically both types of contamination are correctable, either by refining the instrument or intensifying coder training; or, as a last resort, by eliminating the unsalvageable variable or dismissing the incorrigible coder. Measures of reliability thus serve two functions: as diagnostic tools in the confirmation of the recording process, and as final evaluators of the accuracy of a phenomenon's representation in the actual recorded data.

Our reliability assessment requires the calculation of an agreement coefficient for each content item in the recording instrument. Five computational formulae are currently available for calculating these coefficients.* The agreement coefficients range from +1.00 to -1.00, where +1.00 indicates perfect agreement and .00 is agreement due solely to chance. A coefficient of .50 indicates that performance is 50 percent above the level expected by chance. We have defined acceptable levels of reliability as follows. Items

* The variations are distinguished by a difference function, the form of which depends upon the scale type of the particular variable being analyzed. Except for their respective scale-appropriate sensitivity to deviations from perfect agreement, the coefficients make the same basic assumptions as the prototype for nominal scales devised by Scott (1955). Thus, in the case of the binary variable, all formulae yield identical results (Krippendorff, 1970, 1980).

with agreement coefficients of .8 or above are considered as unconditionally reliable, items with coefficients between .6 and .8 are accepted conditionally, while items whose coefficients fall between .5 and .6 are used with extreme caution. Any item whose agreement coefficient is less than .5 will be excluded from any subsequent analysis and will be either revised or discarded before the next phase of message analysis data collection.

Reliability is thus ascertained by a statistical procedure that measures the agreement of trained analysts (beyond chance agreement) for each content item. If one were to substitute the perceptions and impressions of casual observers, no matter how sophisticated, the value of the investigation would be reduced, and its purpose confounded. Only an objective analysis of unambiguous message elements, and their separation from personal impressions left by unidentified clues, can provide the basis for isolating and understanding stable images in symbolic materials.

The Data and Data Analysis Techniques: The final set of data will be compiled from the double-coded reliability data base by randomly selecting one of the two codings for each program. As a last check against deviant coding, and before the final data selection, reliability measures will be computed for each coder-pair. This procedure will help identify problem coder-pairs who may not have been screened out in the training and pre-test phase. In such an instance, the data recorded by the questionable pair will be excluded from the final selection.

The final sample of data will be subjected to extensive analysis. Statistical techniques will primarily include multi-dimensional cross-tabulations. Association procedures, such as contingency and cluster analysis, will also be used to examine constellations of certain types of content data such as themes and binary characterization attributes. Where possible we will devise multi-dimensional

indices composed of a number of content items relating to a particular topic. These measures will enable us to take a number of different aspects of the portrayal of various topics into account; for example, how the topic is portrayed in the program, in characterizations, and so on.

Cultivation Analysis

Questions about the influence of a broad medium of enculturations are very different from the usual research questions about individual messages, campaigns, or programs. Thus, the traditional procedures used in media effects research must be reconceptualized and modified to be appropriate for the study of television's effects.

First, we cannot presume consequences, as conventional research paradigms often do, without prior investigations of content. Nor can the study of content be limited to isolated elements (such as news, commercials, particular programs) taken out of context, or to the selections made by individual viewers.

The world of television is an aggregate system of stories and images. The system as a whole plays a major role in setting the agenda of issues that people will agree or disagree about; it shapes the most pervasive norms and cultivates the dominant perspectives of society.

Much of the research on media effects has focused on the observation and measurement of behavior which occurs after a viewer has seen a particular program or even isolated scenes from programs. All such studies, no matter how clean the design and clear the results, are of limited value because they ignore a fundamental fact: the world of television consists of a complex and integrated system of characters, events, actions, and relationships whose effects cannot be measured with regard to any single element or program seen in isolation.

Neither can we assume that television cultivates conceptions easily distinguishable from those of other major entertainment media. (But we cannot emphasize too strongly the historically novel role of television in standardizing and providing the common norms for what had before been more parochial, local, and selective cultural patterns.) We assume, therefore, that television's standardizing and legitimizing influence comes largely from its ability to streamline, amplify, ritualize, and spread into hitherto isolated or protected subcultures, homes, nooks, and crannies of the land the conventional capsules of mass-produced information and entertainment. The effects of television are most likely to be those of the centralization and efficient organization and popularization of those elements of mainstream culture that best support the medium's institutional mission.

Cultivation analysis begins with and builds upon the patterns found in the world of television. The basic hypothesis underlying cultivation analysis is that heavier viewers of television, those more exposed than lighter viewers to its messages, are more likely to understand social reality in terms of the "facts of life" presented on television. To investigate this idea we design a series of questions about social reality. In these questions we examine a specific topic by juxtaposing the findings of our message system analyses with the findings of independent and/or direct observations, such as the U.S. Census figures, about real life.

For example, we have found that television drama grossly underrepresents older people. Those over 65, comprising 11 percent of the U.S. population (and growing), make up only 2.3 percent of the fictional population. We examined the impact of this message by constructing an index from responses to statements in the National Council on Aging's (NCOA) "Myth and Reality of Aging" survey (conducted by Louis Harris and Associates in 1974) asserting that the number of older people, the health of older people, and the longevity of older

people are declining.* A high score on this index reflected the television view of the world -- a generalized belief that older people represent a diminishing rather than a growing segment of American society (Gerbner, et al., 1980d). Our analysis of this index revealed that, even with other things held constant, heavy viewers are significantly more likely than light viewers to believe that older people are a vanishing breed.

As noted, we have found, in sample after sample, and on an increasingly wide variety of topics, that heavy viewers are significantly more likely to give "television answers" -- responses more congruent with the television image than with the "facts" -- to questions about their conceptions of social reality. The present study seeks to investigate the extent to which television cultivates images, values, and actions regarding science, technology, and related topics.

Variations in Susceptibility: We are seeking to elucidate aggregate patterns and relationships between amount of viewing and audience conceptions of reality. As part of this analysis, we always implement controls for major demographic variables that may threaten our inferences by causing both heavy viewing and the clusters of outlooks revealed in "television answers." These controls have primarily been used to guard against spuriousness; for the most part, the relationships we observe stand up well under such controls.

While the variables we hold constant clearly do not explain the associations, the patterns are not at all identical across subgroups. These conditioning and mediating variables offer considerable theoretical promise for cultivation analysis; by examining between-group differences in terms of factors

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* Factor analysis revealed that only a single dimension underlies these variables; they produce a moderate but acceptable alpha of .56 and more than adequately pass a series of validity checks (Gonzalez, 1979).

that may enhance or diminish associations, we can begin to understand which groups, on which issues, are more and less susceptible to the cultivation process.

Our latest published report (Gerbner, et al., 1980b) examined (in some detail) two general processes -- called "mainstreaming" and "resonance" -- which may help explain such variations in cultivation patterns among different groups. Again, "mainstreaming" implies that differences deriving from other influences may tend to disappear among heavy viewers; rather than absolute, across-the-board cultivation, the impact of viewing may be restricted to those who would not otherwise share a given perspective. "Mainstreaming" thus implies a convergence, a homogenization of outlooks among "otherwise" disparate groups.

"Resonance," on the other hand, occurs when a given feature of the television world is most congruent with the social circumstances of the viewer. In these cases, heavy viewers receive a "double dosage" of messages, and the interaction "resonates" with and amplifies television's impact. For example, the relationship between television viewing and fear of crime is most pronounced among those who live in high crime urban areas -- where the environment is presumably most parallel with the television image.

Important theoretical and empirical clues about factors which may mediate television's role in cultivating images and understanding of science come from a recent study by Miller and Barrington (in press). They analyzed direct and indrect influences on people's interest in science, acquisition of scientific information, and scientific knowledge. The primary direct determinant of these outcomes seems to be having taken post-high school science courses; general education level, sex, and employment in a science-related occupation also have some impact. Accordingly, we will take all these factors into

account, and expect them to illuminate "mainstreaming" and "resonance."

Dimensions of Analysis: The statistical analyses that will be performed to test our hypotheses range from the extremely simple to the methodologically sophisticated and complicated. Our simplest analysis involves tabulating the proportion of respondents who give the "television answer" to each question on the basis of television exposure, while controlling for personal and social characteristics. This analysis divides respondents into "heavy," "medium," and "light" television viewers (using as near to an even three-way split as possible) and then compares groups of viewers using two measures -- gamma and what we call the "Cultivation Differential" (CD). The CD is the difference between the percent of heavy viewers who give the television answer and the percent of light viewers who give this answer. The CD thus expresses the difference heavy viewing makes with respect to a particular concept.

Our statistical analysis will begin with examining two- to n-way contingency patterns. This procedure will allow us to assess the general differences in the conceptions and/or behaviors of light, medium, and heavy viewers, overall, and for specific subgroups one at a time. And, we will be able to clarify the extent and pervasiveness of an observed relationship and isolate highly susceptible subgroups, as well as provide important information about baseline differences on both independent and dependent measures.

Since crosstabular analyses do not fully guard against the possibility of spuriousness within any given demographic groups, we also calculate partial correlations for respondents within specific demographic classifications while simultaneously implementing relevant controls. For example, we examine nonwhite respondents while simultaneously controlling for their sex, age, education, income, newspaper reading, and so on.

We will then turn to statistical analyses that focus on the functional form of the association and tests for linearity. If we find that the relationship(s) does not manifest significant non-linearity (and it usually will not), we will employ more powerful correlational and regression procedures to evaluate television's independent contribution to beliefs, values, and actions. For example, first-order partial correlations will be used to test for spuriousness and hierarchical regression analysis (with amount of viewing entered after all control variables) will provide estimates of television's independent contribution by revealing whether viewing adds a significant increment to total explained variance.

We will also develop and use indices formed by summing responses to questions related to a specific topic. These indices will be tested for reliability (in terms of unidimensionality and internal homogeneity) to insure that each item actually belongs in the index. These indices will then be subjected to the same type of statistical analyses as individual questions.

When multiple indicators of a specific variable are available, we will set up complex structural equation models of television's influence and explicitly test the model's goodness-of-fit. This technique will provide an estimate of the relationship between true (unmeasured) constructs, measurement error, and residual disturbances in the equations. Other techniques we will employ for specialized analyses include canonical correlation, discriminant analysis, and analysis of covariance.

Samples: The various secondary analysis data bases in our archives do not contain many questions about science and technology and consequently we do not have a readily available source of data. The National Opinion Research Center's General Social Survey contains a measure of degree of confidence in the scientific community (noted above) and an item about whether we are spending too much or too little on space exploration (as yet unanalyzed).

No available survey contains both a range of items about science and technology and an appropriate television viewing measure. We are aware, however, of a recently conducted survey (Miller, 1980) focusing upon attitudes toward science and technology that also contains a television viewing question. If these data are made available we will include their analysis in our research.* In particular, we propose to collect new survey data that will be designed specifically to reflect the findings of our message system analysis. This survey will be conducted by a professional research firm, such as the Opinion Research Corporation, as part of a quarterly caravan survey. We have used this service in the past and find that it is a relatively efficient, reliable, and inexpensive way to collect data from a national probability sample.

Specific Analyses: The survey we will commission to collect new data will cover a number of dependent areas relating to scientific conceptions and understanding. The final instrument will include about 20-25 items, including television viewing and demographic measures.

Examples of the kinds of questions we will ask can be found in Appendix II. While detailed hypotheses must await the completion of our message system analysis, the questions will be concerned with general conceptions of science and scientific activity, the values and limitations of research, and images of scientists. We will also include a short true/false science "quiz" for evaluating "general scientific knowledge"; this will derive from the

* The television question in this survey measures self-reported hours of viewing per week. While we have some reservations about the ability of respondents to give accurate reports of weekly (as opposed to average daily) viewing, the breadth and richness of this survey's dependent variables will provide valuable information -- especially when analyzed in conjunction with primary data we propose to collect.

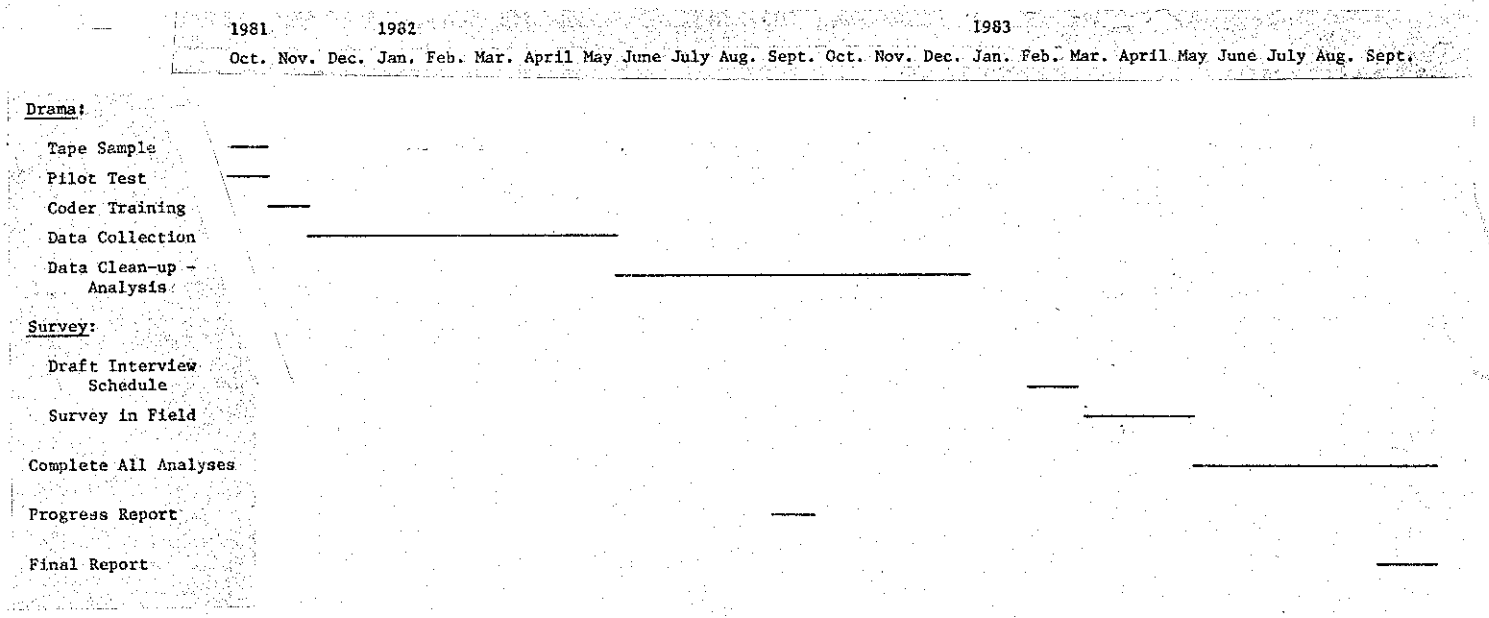
juxtaposition of the world of science on television with that of "reality" to measure the extent of television-induced "misinformation." Special controls will deal with respondents' personal experience with science and scientists.

The interface between message system and cultivation analysis will be based on the determination of whether television emphasizes or ignores various science-related topics, and the nature of their portrayal (e.g., positive or negative). These will be extrapolated into cultivation measures which deal with whether the respondent feels "good" or "bad" about science in terms of trust, competence, and the perceived benefits or drawbacks of the role of science in daily life. Again, we will emphasize the conditional influences of other factors, such as having taken post-high school science courses and being in a science-related occupation, to reach the fullest understanding of television's contribution to public education about science.

SCHEDULE OF ACTIVITIES

The proposed starting date is October 1, 1981 and the research will be completed by September 30, 1983. Figure 1 presents the proposed timetable for completing this research.

Figure 1: Schedule of Activities



PERSONNEL QUALIFICATIONS

The research paradigm presented in this proposal was developed and has been implemented, in a number of different areas, by the co-principal investigators (all at the Annenberg School of Communications, University of Pennsylvania): George Gerbner, Dean and Professor of Communications (Ph.D., Communications, University of Southern California, 1955); Larry Gross, Associate Professor of Communications (Ph.D., Social Psychology, Columbia University, 1968); Michael Morgan, Research Specialist (Ph.D., Communications, University of Pennsylvania, 1980); and Nancy Signorielli, Research Coordinator (Ph.D., Communications, University of Pennsylvania, 1975). Drs. Gerbner, Gross, and Signorielli have jointly conducted similar research since 1969; Dr. Morgan joined them in 1976.

The four co-principal investigators offer a unique mix of talents and considerable research experience. Over the past 12 years, they have developed the most cost-efficient and information-producing ways of conducting this type of research. The proposed project has grown out of, builds upon, and has benefited from their previous studies (see vitae in Appendix III.) Their work has been widely published and has made a substantial contribution to understanding the role of television in shaping viewer's conceptions of social reality.

ORGANIZATION AND MANAGEMENT PLAN

The project will be implemented by four Co-Principal Investigators. Dr. George Gerbner and Dr. Nancy Signorielli will have major responsibility for the Message System Analysis phase of the research; Dr. Larry Gross and Dr. Michael Morgan will oversee the research relating to Cultivation Analysis. Dr. Nancy Signorielli will serve as the Project Director (Project Manager) and will be responsible for coordinating the research. She will oversee all data collection, processing, and analysis and will supervise the support staff, (an Information Systems Technician, two Data Control Clerks, and Message System Analysis Coders).

The proposed survey of adults will be conducted by a survey research facility that has a "piggyback" survey such as Opinion Research Corporation's (ORC) Caravan Surveys. This decision will be determined in the second year of the project because the interview schedule must be based upon findings from the preceding phases of the project.

Each progress report as well as the final report of the research findings will be written by Drs. Gerbner, Gross, Morgan, and Signorielli. The complete Dissemination and Utilization Plans, including the proposed mailings, and possible press conference will be developed and implemented by the Co-Principal Investigators.

The total research support and facilities of the Annenberg School of Communications, a graduate school, and the University of Pennsylvania will be available to assist in this project.

DISSEMINATION OF RESULTS

The results of the research will be disseminated by popular and scholarly publication and by direct mailing. The principal precedents to guide that plan are the dissemination of the results of our recently completed research -- Aging with Television -- funded by the Administration on Aging, our recent report on Women and Minorities in Television Drama (Gerbner and Signorielli, 1979), and our annual television violence reports. We will issue a press release (and hold a press conference if advisable), prepare an article for publication in professional journals (e.g., Journal of Communication, Science, etc.), and a detailed technical report outlining the basic dimensions of the portrayal of science, technology, and related topics in dramatic programs and how these images are related to people's conceptions of science, technology, scientists and related topics.

REFERENCES

Comstock, George, Steven Chaffee, Natan Katzman, Maxwell McCombs, and Donald Roberts. Television and Human Behavior. New York: Columbia University Press, 1978.

Comstock, George and Heather Tully. "Innovation in the Movies, 1939-1976." Journal of Communication, Spring 1981, 31(2), in press.

Cronholm, Margareta and Rolf Sandell. "Scientific Information: A Review of Research." Journal of Communication, Spring 1981, 31(2), in press.

Eleey, M.F. "Variations in Generalizability Resulting from Sampling Characteristics of Content Data: A Case Study," The Annenberg School of Communications, University of Pennsylvania, 1969.

Etzioni, Amitar and Clyde Nunn. "The Public Appreciation of Science in Contemporary America," Daedalus, 1974, 103, 191-205.

Finley, Charles W. and Otis W. Caldwell. "Biology in the Public Press," in Francis D. Curtis, ed. A Digest of Investigations in the Teaching of Science. Philadelphia: D. Blakeston Son and Co., 1923.

Freimuth, Vicki S. and J. Paul Van Nevel. "Reaching the Public: The Asbestos Awareness Campaign." Journal of Communication, Spring 1981, 31(2), in press.

Friedman, Sharon M. "Blueprint for Breakdown: Three Mile Island and the Media Before the Accident." Journal of Communication, Spring 1981, 31(2), in press.

Gerbner, George. "Sex on TV and What Viewers Learn from It." Paper presented to the National Association of Television Program Executives Annual Conference, San Francisco, February 1980.

Gerbner, George. "Toward Cultural Indicators: The Analysis of Mass Mediated Public Message Systems" in George Gerbner, et al., (eds.) The Analysis of Communication Content: Development in Scientific Theories and Computer Techniques, New York: Wiley, 1969.

Gerbner, George, Larry Gross, M. Jackson-Beeck, S. Jeffries-Fox, and Nancy Signorielli. "Cultural Indicators: Violence Profile No. 9," Journal of Communication, 1978, 28(3), 176-207.

Gerbner, George, Larry Gross, Michael Morgan, and Nancy Signorielli. "Media and the Family: Images and Impact," Paper prepared for the National Research Forum on Family Issues, White House Conference on Families, Washington, D.C., April 1980a.

Gerbner, George, Larry Gross, Michael Morgan, and Nancy Signorielli. "The 'Mainstreaming' of America: Violence Profile No. 11," Journal of Communication, 1980b, 30(3), 10-29.

Gerbner, George, Larry Gross, Michael Morgan, and Nancy Signorielli. "Television's Contribution to Public Understanding of Science: A Pilot Project," The Annenberg School of Communications, University of Pennsylvania, 1980c.

Gerbner, George, Larry Gross, Michael Morgan, and Nancy Signorielli. "A Curious Journey into the Scary World of Paul Hirsch," Communication Research, 1981, 8(1), 39-72.

Gerbner, George, Larry Gross, Nancy Signorielli, and Michael Morgan. "Aging with Television: Images on Television Drama and Conceptions of Social Reality," Journal of Communication, 1980d, 30(1), 37-47.

Gerbner, George, Larry Gross, Nancy Signorielli, and Michael Morgan. "Aging with Television: The Final Report," The Annenberg School of Communications, University of Pennsylvania, January 1980e.

Gerbner, George, Larry Gross, Nancy Signorielli, Michael Morgan, and M. Jackson-Beeck. "The Demonstration of Power: Violence Profile No. 10," Journal of Communication, 1979, 29(3), 177-196.

Gerbner, George, Michael Morgan, and Nancy Signorielli. "Programming Health Portrayals: What Viewers See, Say, and Do," in National Behavior: Ten Years of Scientific Progress and Implications for the 80's, in press.

Gerbner, George and Nancy Signorielli. "Women and Minorities in Television Drama: 1969-1978," The Annenberg School of Communications, University of Pennsylvania, 1979.

Gonzalez, Mark. "Television and People's Images of Old Age," unpublished M.A. Thesis, The Annenberg School of Communications, 1979.

Gross, Larry and S. Jeffries-Fox. "What Do You Want To Be When You Grow Up, Little Girl?" in G. Tuchman, et al., (eds.) Hearth and Home: Images of Women in the Mass Media, New York: Oxford University Press, 1978.

Gross, Larry and Michael Morgan. "Television and Enculturation," in J.R. Dominick and J. Fletcher, (eds.) Broadcasting Research Methods: A Reader, Boston: Allyn and Bacon, in press.

Hopkins, Thomas L. "A Study of Magazine and Newspaper Science Articles with Relation to Courses in Sciences for High Schools," School Science and Mathematics, 1925, 25, 793-800.

Jeffries-Fox, Suzanne and Nancy Signorielli. "Television and Children's Conceptions About Occupations," in Herb S. Dordick, (ed.) Proceedings of the Sixth Annual Telecommunications Policy Research Conference, Lexington, Mass.: Lexington Books, 1979.

Koelsche, Charles L. and Ashley G. Morgan, Jr. Scientific Literacy in the Sixties, Athens: University of Georgia, 1964.

Krieghbaum, Hillier. "Reporting Science Information Through the Mass Media, Journalism Quarterly, Summer 1963, 291-292.

Kreighbaum, Hillier. "Public Interest in Science News," Science, April 1959, 129, 1092-5.

Krippendorff, K. "Bivariate Agreement Coefficients for the Reliability of Data," in E.F. Brigatta, (ed.) Sociological Methodology: 1970, San Francisco: Jossey Bass, 1970.

Krippendorff, K. Content Analysis: An Introduction to its Methodology, Beverly Hills: Sage, 1980.

Learning Environments for Innovation. A Report of the Commerce Technical Advisory Board, Washington, D.C.: U.S. Dept. of Commerce, May 1980.

Lewis, Sheldon. "Media Medicine." Television Quarterly, 1977, 1481, 48-58.

Mazur, Allan. "Media Coverage and Public Opinion on Scientific Controversies." Journal of Communication, Spring 1981, 31(2), in press.

Miller, Jon D. Attitudes Toward Science and Technology, a Survey. Personal Communication, 1980.

Miller, Jon D., R.W. Suchner, and A.V. Voelker. Citizenship in an Age of Science. New York: Pergammon, 1980.

Miller, Jon D. and Thomas M. Barrington. "The Acquisition and Retention of Scientific Information." Journal of Communication, Spring 1981, 31(2), in press.

Morgan, Michael. "Longitudinal Patterns of Television Viewing and Adolescent Role Socialization," unpublished Ph.D. dissertation, University of Pennsylvania, 1980.

Morgan, Michael and Larry Gross. "Television and Educational Achievement and Aspirations," in National Institute of Mental Health, Television and Behavior: Ten Years of Scientific Progress and Implications for the 80's, in press.

Nunn, Clyde Z. "Readership and Coverage of Science and Technology in Newspapers." Journalism Quarterly, 1979, 59, 27-30.

O'Keefe, M.T. "The Mass Media as Sources of Medical Information for Doctors." Journalism Quarterly, 1970, 47, 95-100.

Pfund, Nancy and Laura Hofstadter. "Biomedical Innovation and the Press." Journal of Communication, Spring 1981, 31(2), in press.

Pulford, Lynn. "Follow-Up of a Study of Science News Accuracy." Journalism Quarterly, 1976, 53, 119-121.

Robinson, Edward J. "Analyzing the Impact of Science Reporting," Journalism Quarterly, Summer 1963, 306-314.

Science and Engineering Education for the 1980's and Beyond, Associated Press Report, October 23, 1980.

Scott, William A. "Reliability of Content Analysis: The Case of Nominal Scale Coding," Public Opinion Quarterly, 1955, 17(3), 321-325.

Searle, Albert H. "A Study of Science Articles in Magazines," School Science and Mathematics, 1926, 26, 289-96.

Shaw, Donald L. and Paul Van Nevel. "The Informative Value of Medical Science News," Journalism Quarterly, 1967 (Autumn), 548.

Shepherd, R. Gordon. "Selectivity of Sources: Reporting the Marijuana Controversy." Journal of Communication, Spring 1981, 31(2), in press.

Sherburne, E.G., Jr. "Science on Television: A Challenge to Creativity." Journalism Quarterly, 1963, 300-305.

Signorielli, Nancy. "The Measurement of Violence in Television Programming Violence Indices," in J.R. Dominick and J. Fletcher, (eds.) Broadcast Research Methods: A Reader, Boston: Allyn and Bacon, Inc., in press.

Signorielli, Nancy. "Television's Contribution to Sex-Role Socialization," Paper presented at the Seventh Annual Telecommunications Policy Research Conference, Skytop, Pa., 1979.

Sorenson, J.S. and D.D. Sorenson. "A Comparison of Science Content in Magazines in 1964-65 and 1969-70," Journalism Quarterly, 1973, 97-101.

Tankard, James W. and Michael Ryan. "News Source Perception of Accuracy of Science Coverage," Journalism Quarterly, 1974, 51, 219-225.

Tichenor, Phillip J., Clarice N. Olien, Annette Harrison, and George Donohue. "Mass Communication Systems and Communication Accuracy in Science News Reporting," Journalism Quarterly, 1970, 47, 673-681.

Tichenor, Phillip J., C. Olien, and G. Donohue. "Community Control and Care of Scientific Information." Communication Research, 1976, 3, 403-424.

Ubell, Earl. "Science in the Press and Newspapers vs. Magazines." Journalism Quarterly, Summer 1963, 293-299.

Wade, Serena and Wilbur Schramm. "The Mass Media as Sources of Public Affairs, Science and Health Knowledge." Public Opinion Quarterly, 1969, 33(2), 197-209.

First Year: 1981-2

(SEE INSTRUCTIONS ON REVERSE BEFORE COMPLETING)

SUMMARY PROPOSAL BUDGET

APPENDIX C

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (MONTHS) Proposed	Granted
AWARD NO.		

ORGANIZATION: University of Pennsylvania

PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR: George Gerbner

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title; A.6. show number in brackets)	NSF FUNDED PERSON-MOS. CAL.	ACAD	SUMR	FUNDS REQUESTED BY PROPOSER	FUNDS GRANTED BY NSF (IF DIFFERENT)
1. George Gerbner, Dean & Professor of Communications			.72	$ 3,500	$
2. Larry Gross, Associate Professor			.75	3,500	
3. Michael Morgan, Research Specialist	3			5,000	
4. Nancy Signorielli, Research Coordinator	3			7,075	
5. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
6. (4) TOTAL SENIOR PERSONNEL (1-5)				19,075	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. ( ) POST DOCTORAL ASSOCIATES					
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	3			3,375	
3. ( ) GRADUATE STUDENTS					
4. ( ) UNDERGRADUATE STUDENTS					
5. (2) SECRETARIAL-CLERICAL				4,625	
6. (16) OTHER coding (see attached)				10,800	
TOTAL SALARIES AND WAGES (A+B)				37,875	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				7,403	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)				45,278	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $1,000; ITEMS OVER $10,000 REQUIRE CERTIFICATION)					
TOTAL PERMANENT EQUIPMENT					
E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS) (to NSF)				200	
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES office supplies; coding forms, etc.				1,000	
2. PUBLICATION COSTS/PAGE CHARGES (rate - $0.04 per page)				750	
3. CONSULTANT SERVICES					
4. COMPUTER (ADPE) SERVICES (see attached)				5,000	
5. SUBCONTRACTS					
6. OTHER videotape - 50 tapes @ $20/tape				1,000	
TOTAL OTHER DIRECT COSTS				7,750	
H. TOTAL DIRECT COSTS (A THROUGH G)				53,228	
I. INDIRECT COSTS (SPECIFY)					
TOTAL INDIRECT COSTS				34,598	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				87,826	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS GPM 252 AND 253)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 87,826	$

PI/PD TYPED NAME & SIGNATURE*	DATE	FOR NSF USE ONLY
		INDIRECT COST RATE VERIFICATION
INST. REP. TYPED NAME & SIGNATURE*	DATE	Date Checked / Date of Rate Sheet / Initials - DGC / Program

NSF FORM 1030 (8-80) SUPERSEDES ALL PREVIOUS EDITIONS

*SIGNATURES REQUIRED ONLY FOR REVISED **BUDGET (GPM 233)**

(SEE INSTRUCTIONS ON REVERSE BEFORE COMPLETING)

Second Year - 1982-3
SUMMARY
PROPOSAL BUDGET

APPENDIX C

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (MONTHS) Proposed	Granted
AWARD NO.		

ORGANIZATION: University of Pennsylvania, Annenberg School of Comm.

PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR: George Gerbner

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title; A.6. show number in brackets)	NSF FUNDED PERSON-MOS. CAL.	ACAD	SUMR	FUNDS REQUESTED BY PROPOSER	FUNDS GRANTED BY NSF (IF DIFFERENT)
1. George Gerbner, Dean & Professor of Communications			.72	$ 3,850	$
2. Larry Gross, Associate Professor of Communications			.75	3,850	
3. Michael Morgan, Research Specialist	3			5,500	
4. Nancy Signorielli, Research Coordinator	3			7,775	
5. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
6. (4) TOTAL SENIOR PERSONNEL (1-5)				20,975	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. ( ) POST DOCTORAL ASSOCIATES					
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	3			3,710	
3. ( ) GRADUATE STUDENTS					
4. ( ) UNDERGRADUATE STUDENTS					
5. (2) SECRETARIAL-CLERICAL				5,085	
6. ( ) OTHER					
TOTAL SALARIES AND WAGES (A+B)				29,770	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				7,130	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)				36,900	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $1,000; ITEMS OVER $10,000 REQUIRE CERTIFICATION)					
TOTAL PERMANENT EQUIPMENT					
E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS) (to NSF)				200	
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES (office supplies)				500	
2. PUBLICATION COSTS/PAGE CHARGES (rate - $0.04 per page)				1,000	
3. CONSULTANT SERVICES					
4. COMPUTER (ADPE) SERVICES (see attached)				8,000	
5. SUBCONTRACTS for survey (Caravan type; see attached)				25,000	
6. OTHER					
TOTAL OTHER DIRECT COSTS				34,500	
H. TOTAL DIRECT COSTS (A THROUGH G)				71,600	
I. INDIRECT COSTS (SPECIFY) (65% of direct costs excluding $25,000 for survey subcontract)					
TOTAL INDIRECT COSTS				30,290	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				101,890	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS GPM 252 AND 253)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 101,890	$

PI/PD TYPED NAME & SIGNATURE*	DATE	FOR NSF USE ONLY
INST. REP. TYPED NAME & SIGNATURE*	DATE	INDIRECT COST RATE VERIFICATION: Date Checked / Date of Rate Sheet / Initials - DGC / Program

NSF FORM 1030 (8-80) SUPERSEDES ALL PREVIOUS EDITIONS

*SIGNATURES REQUIRED ONLY FOR REVISED **BUDGET (GPM 233)**

(SEE INSTRUCTIONS ON REVERSE BEFORE COMPLETING)

Entire Period - 1981-3

SUMMARY PROPOSAL BUDGET

APPENDIX C

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (MONTHS) Proposed	Granted
AWARD NO.		

ORGANIZATION: University of Pennsylvania, Annenberg School of Comm.

PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR: George Gerbner

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title; A.6. show number in brackets)	NSF FUNDED PERSON-MOS. CAL.	ACAD	SUMR	FUNDS REQUESTED BY PROPOSER	FUNDS GRANTED BY NSF (IF DIFFERENT)
1. George Gerbner, Dean & Professor of Communications			1.4	$ 7,350	$
2. Larry Gross, Associate Professor of Communications			1.5	7,350	
3. Michael Morgan, Research Specialist	6			10,500	
4. Nancy Signorielli, Research Coordinator	6			14,850	
5. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
6. (4) TOTAL SENIOR PERSONNEL (1-5)				40,050	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. ( ) POST DOCTORAL ASSOCIATES					
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	6			7,085	
3. ( ) GRADUATE STUDENTS					
4. ( ) UNDERGRADUATE STUDENTS					
5. (2) SECRETARIAL-CLERICAL				9,710	
6. (16) OTHER coders (part-time)				10,800	
TOTAL SALARIES AND WAGES (A+B)				67,645	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				14,533	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)				82,178	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $1,000; ITEMS OVER $10,000 REQUIRE CERTIFICATION)					
TOTAL PERMANENT EQUIPMENT					
E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS) (to NSF)				400	
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES office supplies, coding forms, etc.				1,500	
2. PUBLICATION COSTS/PAGE CHARGES rate - $0.04 per page				1,750	
3. CONSULTANT SERVICES					
4. COMPUTER (ADPE) SERVICES (see attached)				13,000	
5. SUBCONTRACTS for survey (see attached)				25,000	
6. OTHER videotape - 50 tapes @ $20/tape				1,000	
TOTAL OTHER DIRECT COSTS				42,250	
H. TOTAL DIRECT COSTS (A THROUGH G)				124,828	
I. INDIRECT COSTS (SPECIFY) (65% of direct costs excluding $25,000 for survey subcontract)					
TOTAL INDIRECT COSTS				64,888	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				189,716	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS GPM 252 AND 253)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 189,716	$

PI/PD TYPED NAME & SIGNATURE*	DATE	FOR NSF USE ONLY
INST. REP. TYPED NAME & SIGNATURE*	DATE	INDIRECT COST RATE VERIFICATION: Date Checked / Date of Rate Sheet / Initials - DGC Program

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University of Pennsylvania, Annenberg School of Communications

George Gerbner

Budget Justification (additional information)

1. Coding Costs:

Training: 16 coders @ 50 hours/coder @ $3.50/hour	$ 2,800
Coding: 1000 programs @ 1 hour and 2 coders per program = 2000 hours @ $4.00 per hour	8,000
Total	$ 10,800

2. Computer Costs:

Based upon exist rates for the Uni-Coll Corporation, a facility we have used for the past 12 years. All of our existing computer files are set up on this installation.

Overall costs are based upon many different charges, most of which are listed below. These rates reflect a special educational discount. In addition, there are shift (when the job is run) discounts that we try to take advantage of whenever possible.

BATCH CHARGES: CPU - $0.45 per second

STORAGE - $0.22 per kilobyte of virtual storage per second

DISK - $0.05 per EXCP

TAPE - $0.03 per second

Tape Mounts: $0.55 per mount
Tape Storage: $0.25 per tape per week
OSL Storage: $0.07 per track per day

Printing: $0.54 per 1000 lines plus $0.16 for materials

TSO Charges: connect time - $ 2.20 per hour

CPU - $0.62 per second

3. Subcontract: Survey

We propose to have the survey conducted by an organization specially suited to complete this work. In the past we have used Opinion Research Corporation, Princeton, New Jersey and found them quite reasonable and dependable. They conduct, several times a year, a Caravan Survey that consists of several simultaneously conducted small surveys. They insure, however, that the individual areas do not conflict with one another. We thus are able to have access to a national probability sample at fairly reasonable costs. The current unofficial quotes run to about $1,200 per question. The survey costs will include a small fee for preparation of the data tape. We will conduct all data analyses ourselves.

Other Commitments of Senior Personnel

Work in Progress:

From:	Administration on Aging (90-AR-2176)
Title:	Aging with Television Commercials
Duration:	10/1/79 through 3/31/81
Funds:	$ 118,257 in direct costs
Time:	G. Gerbner, 8%; L. Gross, 5%; N. Signorielli, 33%

Applications Pending Review:

To:	NIMH
Title:	TV's Contribution to Images of Marriage and the Family
Duration:	7/81 through 6/84
Funds:	$ 311,058 in direct costs (for three years)
Time:	George Gerbner -- 8% or 1 month
(per year)	Larry Gross -- 8.5% or 1 month
	Michael Morgan -- 30% or 3.5 months
	Nancy Signorielli -- 30% or 3.5 months

To:	NIMH -- NCHSR Solicitation (Grants for Research on Health Promotion and Disease Prevention)
Title:	TV's Contribution to Health Images and Practices
Duration:	7/81 through 6/84
Funds:	$ 311,090 in direct costs (for three years)
Time:	George Gerbner -- 8% or 1 month
(per year)	Larry Gross -- 8% or 1 month
	Michael Morgan -- 30% or 3.5 months
	Nancy Signorielli -- 30% or 3.5 months

To:	The John and Mary R. Markle Foundation
Title:	Television's Contribution to Sex-Role Stereotypes and Public Morality: Toward a Theory of Conditional Effects
Duration:	1 year
Funds:	$ 49,872 in direct costs
Time:	George Gerbner -- 8% or 1 month
	Larry Gross -- 11% or 1.3 months
	Michael Morgan -- 25% or 3 months
	Nancy Signorielli -- 20% or 2.5 months

Appendix I

SCIENCE IN ENTERTAINMENT PROGRAMS

RECORDING INSTRUMENT DRAFT

February, 1981

I. The Program

Science Related Themes

For each of the following please code the following two items:

Emphasis:
0 = does not appear
1 = appears, minor to plot or story
2 = appears, significant to plot or story
3 = appears, major focus of plot or story

Tendency:
0 = does not appear
1 = presented in positive way
2 = presented in neutral way
3 = presented in negative way

1. new scientific discoveries
2. earlier scientific discoveries
3. inventions
4. scientific research and experiments
5. biology
6. chemistry
7. physics, physical sciences
8. social sciences
9. mental health
10. disease (prevention, cure)
11. drugs
12. technology
13. environment
14. engineering
15. space exploration
16. satellites
17. nuclear power
18. radio-active wastes
19. energy - oil (conventional)
20. energy - new (unconventional)
21. agriculture
22. food additives
23. astrology
24. genetics
25. birth control
26. birth defects
27. weather

28. natural disasters
29. safety
30. mass transportation
31. cars/driving
32. defense technology
33. armaments and weapons development/use
34. natural resources
35. other (write in) _____

36. List all "scientific facts, explanations, laws, truths," etc. that occur in the program.

37. Use of Science in Program
    0 = cannot code
    1 = personal gain
    2 = rational power
    3 = commit criminal act
    4 = solve criminal act
    5 = other, write in
    6 = mixed, write in

38. Presentation of Science
    0 = cannot code
    1 = constructive
    2 = mixed
    3 = malevolent

39. Overall Success of Science
    0 = cannot code
    1 = clearly successful
    2 = mixed
    3 = clearly unsuccessful

40. Consequences of Science
    0 = cannot code
    1 = positive (cures, health)
    2 = mixed
    3 = negative (death, disaster)

41. Presentation of Technology
    0 = cannot code
    1 = no technology
    2 = "in control"
    3 = mixed
    4 = "out of control"

II. Major and Minor Characters in Science-Related Roles

1. Relative Position of Scientist

0 = cannot code
1 = authority, boss, director
2 = co-worker
3 = underling, assistant
4 = works alone

STATUS: ADVISING AND ORDERING ROLES

2. Orders: Taking/Giving

0 = cannot code
1 = no orders given/taken
2 = only gives, never takes
3 = both gives and takes orders
4 = only takes orders, never gives

3. Explanation of Orders

0 = cannot code
1 = no orders given/taken
2 = orders given, no explanation
3 = orders given, sometimes with explanation
4 = orders given, always with explanation

4. Explanation of Orders Received

0 = cannot code
1 = no orders received
2 = orders received, never with explanation
3 = orders received, sometimes with explanation
4 = orders received, always with explanation

5. Work Setting of Scientist

0 = cannot code
1 = not seen in work setting
2 = office only
3 = laboratory only (includes hospital lab)
4 = office and laboratory

6. Nature of Employment

0 = cannot code
1 = government
2 = university
3 = private corporation
4 = independent/consultant
5 = police
6 = hospital
7 = other, describe

7. Work Patterns	0 = cannot code 1 = works only by him/her self 2 = works with others 3 = both
8. Nature of Work	0 = cannot code 1 = not seen doing any work 2 = personally determines own work 3 = is given problem to solve, work to do by others 4 = mixed
9. Focus on Work in Program	0 = cannot code 1 = plot includes work-related problems 2 = work incidental to plot 3 = work is significant to plot 4 = work is a major focus of plot
10. Use of Scientific Jargon	0 = cannot code 1 = does not use scientific jargon, talk 2 = uses jargon, does not explain 3 = uses jargon, explains meaning 4 = uses jargon, others appear to understand
11. Importance of Work for Character	0 = cannot code 1 = work seems to be incidental to character's life 2 = work is somewhat important to character 3 = work is very important for character 4 = character is a workaholic
12. Ultimate Success of Character in Work	0 = cannot code 1 = character appears to be successful in work 2 = character mixes in work-related success 3 = character unsuccessful in work
13. Happiness of Character in Relation to Work	0 = cannot code 1 = character appears happy with work 2 = character both happy and unhappy, mixed, ambivalent 3 = character unhappy with work

14. Use of Equipment

0 = cannot code
1 = does not use scientific equipment
2 = uses equipment, background
3 = uses equipment, action focuses around use

Personality Trait Scales: (coded on a 5 point scale)

15. systematic - unsystematic
16. mysterious - nonmysterious
17. accurate - inaccurate
18. competent - incompetent
19. conscientious - unconscientious
20. compatable - incompatable
21. weak - strong
22. ideological - nonideological
23. materialistic - nonmaterialistic
24. observant - unobservant
25. independent - dependent
26. right - wrong
27. obscure - clear
28. selfish - altruistic
29. narrow - broad
30. sane - insane
31. motivated - unmotivated

Appendix II: Sample Questions for Cultivation Analysis

Science in General: Do you feel that you strongly agree, agree, or strongly disagree with the following statements.

New technologies based on scientific discoveries make our lives change too fast.

Technological know-how is largely responsible for our standard of living in the United States.

Future scientific research is more likely to cause problems than to find solutions to our problems.

Scientific discoveries make our lives change too fast.

Scientific discoveries are largely responsible for our standard of living in the United States.

Scientific discoveries tend to break down people's ideas of right and wrong.

Scientific discoveries are making our lives healthier, easier, and more comfortable.

Scientific Research: How likely is it that we can find out by scientific study why people behave as they do? Do you think it is not possible at all to understand human behavior scientifically, is it possible to understand some things but not others, or is it possible to understand almost everything about human behavior by scientific study?

People have frequently noted that scientific research has produced both beneficial and harmful consequences. Would you say, that on the balance, the benefits of scientific research have outweighed the harmful results, or have the harmful results of scientific research been greater than its benefits?

Outer Space Explorations: Do you think that any benefits are likely to come from exploring outer space?

Do you think that any harmful consequences are likely to come from exploring outer space?

Nculear Power: Do you think that any benefits are likely to come from building more nuclear power plants?

Do you think that any harmful consequences are likely to come from building more nuclear power plants?

Disease: Do you think scientists will isolate a cure for cancer in your lifetime? what about other presently "incurable" diseases?

Do you think scientists should develop further ways to test for and isolate fetuses with birth defects?

Confidence in Professionals: How much confidence do you have in: scientists; the scientific community; doctors, lawyers, politicians, teachers, labor unions (a great deal, only some, hardly any)

Scientists: Do you think that what most scientists do is pretty exciting or is it boring and tedious?

Do you think that most scientists have a full and happy family life, or are scientists mainly concerned with their work?

Do you think that what most scientists do can be dangerous to them or is their work pretty safe?

How old do you think most scientists are -- are they mostly between 30 and 40 years old, between 40 and 50, between 50 and 60, or over 60?

Compared to other occupations, how would you rate the job scientist -- would you say it is better than most other jobs, about the same as most other jobs, or worse than most other jobs?

Media Questions: On the average day, about how many hours do you personally spend watching television?

How often do you watch a television newscast -- every day, a few times a week, once a week, less than once a week, or never?

How often do you read a newspaper -- (same categories as TV news)

Controls:

- Demographics (sex, age, marital status, education, race, occupational status, income)

(Does/Did) the organization for which you (work/last worked) conduct or sponsor scientific or technological research?

(Does/Did) your job require you to use the results of any of this research?

(repeat BOTH for spouse)

- While you were in college, did you take any courses in chemistry, physics, or biology? How many?

Controls continued:

Are any of your close friends or relatives scientists?

How often do you read news stories about science in newspapers? in magazines? (very often, once in a while, hardly ever)

General Understanding of Science: Some things are studied scientifically; some things are studied in other ways. Would you say you have a clear understanding of what it means to study something scientifically, a general understanding of what it means, or no understanding of its meaning?

Would you say that astrology is very scientific, sort of scientific, or not at all scientific?

During the next 25 years or so, would you say it is very likely or not very likely that researchers will discover: a way to predict when and where earthquakes will occur; more efficient sources of cheap energy; a cure for the common forms of cancer; a way to put communities of people in outer space; new ways of effectively reducing the crime rate; a way to economically desalinate sea water for human consumption?