

**chapter 3**

**science and the public**

# Science and the Public

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Studies to assess public opinion on science, technology, and public policy are not new (2,3,4,5,6,7). The National Science Foundation has monitored public opinion toward science on a regular basis since 1972. The Foundation's *Science Indicators* series considers the opinions of the entire adult population in its estimates (4,5,6,7).

Despite differences in conceptual framework, the earlier studies in this area come to the same conclusion: only a small portion of the total electorate is interested in science, technology, and related public policy, and probably an even smaller portion is sufficiently knowledgeable about the science and technology involved in the public policy debate to make fully informed decisions.

Yet, policymakers represent all of the public and cannot ignore the concerns and preferences—no matter the extent of the misconceptions or how transitory the opinions might be of any portion. Additionally, not only is it important for them to know what public opinion is, but also on what it is based. Because policy makers need to discriminate among the perceptions and opinions of the different sectors of the public, this background paper first considers the pattern of “science understanding” and “science interest” among the U.S. population and then uses these classifications in the subsequent analyses of public opinion.

## UNDERSTANDING OF SCIENCE AND TECHNOLOGY

The OTA survey found that 16 percent of Americans rate their basic understanding of science and technology as “very good.” A majority (54 percent) rates its understanding as “adequate.” And 28 percent of adults say they consider their understanding of science and technology as “poor” (table 1).

There is relatively little difference by age in the distribution of those who feel they have a very good understanding of science and technology. The proportion of those under 35 years old that says it has a very good understanding (17 percent) is essentially the same as the proportion aged 65 and over (16 percent). Hence, there is no evidence of increased science understanding (as measured by self-rating) in younger individuals.

In contrast, there are clear differences in perceived understanding of science based on education. The proportion of adults who rate their science understanding as very good increases from

12 percent of high school graduates, to 18 percent of those with some college, to 29 percent of college graduates. Since educational attainment is inversely related to age (1), it would appear that if education is taken into account, the perceived understanding of science is actually lower in younger individuals.

One striking finding is a decline between 1982 and 1986 in the proportion of the population that rates its science understanding as very good. In an unpublished 1982 survey of the American public using an identical question, the Harris firm found 22 percent of the public reporting a very good understanding. Four years later, this background paper found that the proportion of the people who rated their understanding of science as very good had declined by 6 percentage points to 16 percent (1).

Table I.—Basic Understanding of Science and Technology

Question (Q3):<sup>a</sup>If you had to rate your own basic understanding of science and technology, would you say it is very good, adequate, or poor?

		Very good	Adequate	Poor	Not sure
<b>Total 1986</b> .....	<b>(1,273)<sup>b</sup></b>	<b>16%</b>	<b>54%</b>	<b>28%</b>	<b>1%</b>
1982 <sup>c</sup> .....	§	22	53	25	1
<b>sex:</b>					
Male .....	(635)	23	57	20	
Female .....	(638)	10	52	35	2
<b>Age:</b>					
18 to 34 .....	(546)	17	59	23	<1
35 to 49 .....	(343)	16		27	2
50 to 64 .....	(252)	14	46	37	3
65 and over .....	(127)	16	53	30	1
<b>Education:</b>					
Less than high school .....	(165)	14	49	34	3
High school graduate .....	(458)	12	54	33	1
Some college .....	(300)		61	20	1
College graduate .....	(347)	29	57	14	<1
<b>Race:</b>					
White .....	(1,096)		55	28	1
Black .....	(140)	23	54	23	<1
<b>Place:</b>					
Central city .....	(383)	19	57	23	1
SMSA <sup>d</sup> remainder .....	(583)	16	54	28	1
NonSMSA .....	(307)	13	52	33	1

<sup>a</sup>The code number of the question in the survey instrument (see app. B.)

<sup>b</sup>Percentages are presented as weighted sample estimates. The unweighted sample base is presented in parentheses so that the sampling variance for these estimates can be calculated.

<sup>c</sup>Unpublished Harris survey.

<sup>d</sup>Standard Metropolitan Statistical Area.

SOURCE: Office of Technology Assessment, 1987.

## INTEREST IN SCIENCE AND TECHNOLOGY

Nearly a quarter of the public (23 percent) say they are “very interested” in scientific and technological matters. About half of adult Americans (48 percent) say they are “somewhat interested.” The remainder of the public says it is either “rather uninterested” (11 percent) or “not interested at all” (18 percent).

Science interest follows a demographic pattern similar to that of science understanding; both interest in and understanding of science and technology increase with education. The proportion that says it is very interested in scientific and technological matters increases from about 17 percent of those with high school degrees or less, to 28 percent of those with some college, to 40 percent of college graduates (table 2).

At the same time, age appears to make no real difference in science interest: 22 percent of persons 18 to 34, 25 percent of those 35 to 49, 22

percent of those 50 to 64, and 23 percent of persons aged 65 and older report they are very interested in science. Again, given the relationship between age and education this means that, controlling for education, interest in science is lower among the younger age groups.

As in public understanding, public interest in science also declined between 1982 and 1986. In 1982, an unpublished Harris survey found 29 percent of the public said they were very interested in scientific and technological matters (1). Using an identical question 4 years later, this study found that only 23 percent say they are very interested. This difference exceeds the maximum expected sampling variance associated with these samples. Therefore, the observed decline in the public's interest in science between 1982 and 1986 is statistically significant and cannot be explained by sampling error.

Table 2.—interest in Science and Technology

Question (Q1): <sup>a</sup> How much interest do you have in scientific and technological matters—are you very interested, somewhat interested, rather uninterested, or not interested at all?						
		very interested	Somewhat interested	Rather uninterested	Not interested at all	Not sure
Total 1988 .....	(1,273) <sup>b</sup>	230/0	480/0	11%	180/0	1%
1982 <sup>c</sup> .....	(1,254)	29	58	8	4	<1
<b>Sex:</b>						
Male .....	(635)	28		7	16	1
Female .....	(638)	18	14	14	19	1
<b>Age:</b>						
18 to 34 .....	(546)	22		13	14	<1
35 to 49 .....	(343)	25	9	9	15	
50 to 64 .....	(252)	22	47	9	20	2
65 and over .....	(127)	23	38	10	29	—
<b>Education:</b>						
Less than high school .....	(165)	18	37	13	31	2
High school graduate .....	(458)	17	50	13	20	1
Some college .....	(300)	28	57	8	7	<1
College graduate .....	(347)	40	49	8	4	<1

<sup>a</sup>The number of the question in the survey instrument (see app.B.)

<sup>b</sup>Percentages Presented as weighted sample estimates. The unweighted sample base is presented in parentheses so that the sampling variance for these estimates can be calculated.

<sup>c</sup>Unpublished Harris survey

SOURCE: Office of Technology Assessment, 1987

The proportion of the public reporting that it is very interested in science and technology in this survey (23 percent) is substantially smaller than that classified as very interested in science and technology in a 1985 survey (41 percent) (3). The difference can be explained by differences in wording of the questions between the two surveys. Questions in the earlier survey emphasize interest in new scientific discoveries and new inventions. The 1985 survey also found a 4- to 8-percentage-point decline in science interest between 1983 and 1985-comparable to the 6-percentage-point decline between 1982 and 1986 observed through this survey.

The apparent decline in public interest in science and technology cannot be explained by this single-instance survey. The survey can, however, show in what population segment the decline in interest occurred (1). Analysis of the data reveals no statistically significant decline between 1982

and 1986 in the proportion of college graduates (41 percent to 40 percent) or those with some college (28 percent to 28 percent) that is very interested in scientific and technological matters. Nor is there any significant decline in the proportion of these groups that is somewhat interested (table 3). In contrast, the proportion of those with less than a high school education that is at least somewhat interested dropped from 74 percent in 1982 to 55 percent in 1986. Similarly, the proportion of high school graduates who are at least somewhat interested dropped from 86 percent to 67 percent during the 4-year period examined. Hence, the survey findings document a marked decline in interest in science and technology among those without college education, rather than among all parts of American society. The source of this increased educational segmentation of science interest remains unknown.

## SCIENCE EXPOSURE

Previous surveys have proposed the concept of "scientific attentiveness" as a useful approach to analyzing the concerns and preferences of the American people concerning science policy (3).

It has been suggested that those who are attentive to science and technology issues are far more likely to have fully formed attitudes in this area (3). A 1985 survey classified science attentive as

**Table 3.—interest in Science and Technology by Education**

Question (Q1):* How much interest do you have in scientific and technological matters—are you very interested, somewhat interested, rather uninterested, or not interested at all?		Very interested	Somewhat interested	Rather uninterested	Not interested at all	Not sure
<i>Education:</i>						
<b>Less than high school</b>						
.....	(69) <sup>b</sup>	26%	48%	14%	13%	
1986.....	(165)	18	37	13	31	2 %
<b>High school graduate</b>						
1962.....	(582)	24	62	8		1
1966.....	(456)	17	50	13	1	1
<b>Some college</b>						
1982.....	(294)	28	61		1	<1
1966.....	(300)		57	8	7	<1
<b>College graduate</b>						
1982.....	(306)	41	51		1	—
1966.....	(347)	40	49	8	4	<1

\*The code number of the question in the survey instrument (see app. B.)

<sup>b</sup>Unpublished Harris survey.

<sup>c</sup>Percentages are presented as weighted sample estimates. The unweighted sample base is presented in parentheses so that the sampling variance for these estimates can be calculated.

SOURCE: Office of Technology Assessment, 1987.

having both a very good understanding of science and technology and being very interested in scientific and technological issues. Applying this criterion, the 1985 survey identified only 20 percent of the adult population as scientifically attentive (3). Applying the criterion to somewhat different measures in this survey, only 8 percent of the public would be categorized as science attentive (table 4).

Yet this view of public knowledge and interest in science does not correlate with the public's outward behavior regarding science information. This study documents an active pattern of science information seeking among the public. One quarter of the public reports reading books or magazines on science and technology daily (6 percent) or weekly (19 percent). More dramatically, 36 percent say they read the science section of the news-

**Table 4.—Comparison of Science interest and Science Understanding**

Question (Q1):— How much interest do you have in scientific and technological matters—are you very interested, somewhat interested, rather uninterested, or not interested at all?  
 Question (Q3): if you had to rate your own basic understanding of science and technology, would you say it is very good, adequate, or poor?

	Understanding of science		
	Very good (209) <sup>b</sup>	Adequate (707)	Poor (316)
<i>Interest in science:</i>			
Very interested .....	50% [8] <sup>c</sup>	23% [13]	5% [1]
Somewhat interested .....	30 [5]	57 [32]	41 [10]
Rather uninterested .....	8 [1]	7 [4]	20 [5]
Not interested at all .....	10 [2]	12 [7]	32 [8]
Not sure .....	1 [<1]	<1 [<1]	1 [<1]

\*The code number of the question in the survey instrument (see app. B.)

<sup>b</sup>Percentages are presented as weighted sample estimates. The unweighted sample base is presented in parentheses so that the sampling variance for these estimates can be calculated.

<sup>c</sup>The number in brackets indicates the percentage of the total sample e.g., 50 percent of those who report a very good understanding of science also report they are very interested, and this subpopulation represents 8 percent of the total sample.

SOURCE: Office of Technology Assessment, 1987.

Table 5.—Sources and Frequency of Science Information

Question (F6): <sup>a</sup> How often do you (READ EACH ITEM) —daily, weekly, monthly, occasionally, hardly ever, or never?			
	Read books or magazines on science or technology (1,273) <sup>b</sup>	Read science section of newspaper (1,273)	Discuss issues related to science (1,273)
<b>How often:</b>			
Daily . . . . .	6%	15%	9%
Weekly . . . . .	19	21	21
Monthly . . . . .	15		
Occasionally . . . . .	35	4	37
Hardly ever/never . . . . .	18	17	16
Not sure . . . . .	7	11	6

<sup>a</sup>The code number of the question in the survey instrument (See app. B.)

<sup>b</sup>Percentages are presented as weighted sample estimates. The unweighted sample base is presented in parentheses so that the sampling variance for these estimates can be calculated.

SOURCE: Office of Technology Assessment, 1987.

paper either daily (15 percent) or weekly (21 percent) (table 5). Such reports indicate an active interest in science and technology that is far more widespread than suggested by the narrow definition of scientific attentiveness. Frequent reading of books, magazines, and newspaper articles on science and technology is probably an important measure of science interest. The ability of the public to explain scientific terminology is discussed in chapter 6.

Reading about science is a passive activity. However, the survey finds that a substantial portion of the public also states that it regularly engages in active discussions of scientific issues. In fact, 3 out of 10 adult Americans say they discuss issues related to science either daily (9 percent) or weekly (21 percent). Opinions about science are probably formed through such active discussions of issues.

In addition to reading or discussing science issues, Americans are exposed to science and technology in other ways. Seventeen percent of the public report they have (or someone else in the household has) a science- or technology-related job. This self-reported prevalence of science-related jobs in the household varies from 4 percent of those with less than high school degrees to 38 percent of college graduates (table 6).

The rarest form of science exposure is actual involvement in scientific groups and organizations. Nonetheless, more than 1 in 20 Americans (6 per-

Table 6.—Science and Technology Occupations in Household

Question (F5): <sup>a</sup> Does anyone in your household have a science or technology related job?			
		Yes	No
Total . . . . .	(1,273) <sup>b</sup>	17%	82%
<i>Age:</i>			
18 to 34 . . . . .	(546)	20	79
35 to 49 . . . . .	(343)	22	78
50 to 64 . . . . .	(252)	13	88
65 and over . . . . .	(127)	8	91
<i>Education:</i>			
Less than high school . . . . .	(165)		
High school graduate . . . . .	(458)	4	86
Some college . . . . .	(300)	26	73
College graduate . . . . .	(347)	38	62

<sup>a</sup>The code number of the question in the survey instrument (See app. B.)

<sup>b</sup>Percentages are presented as weighted sample estimates. The unweighted sample base is presented in parentheses so that the sampling variance for these estimates can be calculated.

SOURCE: Office of Technology Assessment, 1987.

cent) reports activity in scientific groups or organizations. Among college graduates, nearly one in five (19 percent) reports being active in scientific groups or organizations (table 7). Thus, when passive activity, active discussion, and actual involvement in science organizations are considered together, the OTA survey suggests fairly widespread interest, observance of, and involvement in science and technology in America.

As one might expect, there is a strong relationship between exposure to science and understanding of science issues. A majority of those who feel they have a very good understanding of science

**Table 7.—Participation in Scientific Groups or Organizations**

Question (F7a): <sup>a</sup> Are you active in any scientific groups or organizations?		Yes	No
Total .....	(1,273)	<sup>b</sup> 6%	64%
<b>Sex:</b>			
Male .....	(635)	8	92
Female .....	(636)		96
<b>Age:</b>			
18 to 34 .....	(546)	6	94
35 to 49 .....	(343)	5	
50 to 64 .....	(252)		04
65 And over .....	(127)	2*	98
<b>Education:</b>			
Less than high school ..	(165)		98
High school graduate ...	(458)	3	97
Some college .....	(300)		93
College graduate .....	(347)	19	81
<b>Science orientation:</b>			
Observant .....	(626)	11	89
Nonobservant .....	(647)	2	98
<b>Science understanding:</b>			
Very good .....	(236)	18	82
Adequate .....	(707)	5	95
Poor .....	(316)		99

<sup>a</sup>The code number of the question in the survey instrument (see app. B)

<sup>b</sup>Percentages are presented as weighted sample estimates. The unweighted sample base is presented in parentheses so that the sampling variance for these estimates can be recalculated.

SOURCE: Office of Technology Assessment, 1987.

says it reads the science section of the newspaper at least weekly (55 percent) and discusses issues related to science at least weekly (51 percent). These individuals are also likely to report that they read books and magazines about science or technology at least weekly (43 percent) and have someone in the household with a science- or technology-related occupation (33 percent) (table 8). **However public interest and exposure to science issues are not limited to people who are science knowledgeable. Two of five adults who feel they have only an adequate understanding of science (40 percent) and one in five who feel that their science understanding is poor (20 percent), say they read the science section of newspapers at least weekly.** Furthermore, it is not unusual for persons who say their science understanding is adequate (31 percent) or poor (18 percent) to report frequent discussions of issues related to science. **Interest in science issues in the United States is not restricted to the experts,** although it is more common among the better educated.

**Table 8.—Comparison of Science Understanding and Science Contact**

	Understanding of science		
	Very good	Adequate	Poor
Active in science organization .....	(209) <sup>a</sup> 18%	(707) 5%	(316) 1%
Science occupation in household .....	33	18	8
Read books or magazines on science or technology: daily or weekly .....	43	26	11
Discuss issues related to science: daily or weekly .....	51	31	18
Read science section of newspapers: daily or weekly .....	55	40	20

<sup>a</sup>percentages are presented as weighted sample estimates. The unweighted sample base is presented in parentheses so that the sampling variance for these estimates can be calculated.

SOURCE: Office of Technology Assessment, 1967.

## CONCERN ABOUT SCIENCE POLICY

The need to estimate the number of Americans who actually care about science policy underlies past attempts to define science attentiveness. In this survey, respondents were asked how concerned they are with science policy. **Nearly one-third of the American public (32 percent) report that they are "very concerned" about science policy. Most of the remainder of those questioned (50 percent) say they are "somewhat concerned."** Only 18 percent state they are '(not very concerned)' (11 percent) or '(not at all concerned)' (7 percent) about science policy (table 9).

The proportion of persons who say they are very concerned about science policy increases with age. Among those who are 18 to 34 years old, only 26 percent say they are very concerned with science policy. This very concerned group increases to 30 percent of those 35 to 49, 34 percent of those 50 to 64, and 44 percent of those 65 and over.

The proportion of the public that reports it is very concerned about science policy does not increase directly with education. However, college graduates are more likely than other groups to say they are very concerned with science policy (44 percent).

Concern about science policy increases with science understanding. Nearly half of those who believe they have a very good understanding of science (46 percent) also state they are very concerned with science policy, compared to a third of those who report an adequate understanding (34 percent) and a fifth of those who say they have a poor understanding (19 percent). It is noteworthy, however, that **concern about science policy is found across all demographic sub-populations.**

Table 9.—Concern About Science Policy

Question (Q2): <sup>a</sup> How concerned are You about government policy concerning science and technology—are you very concerned, somewhat concerned, not very concerned, or not concerned at all?		Very concerned	Somewhat concerned	Not very concerned	Not concerned at all	Not sure
Total 1986	(1,273) <sup>b</sup>	32%	50%	11%	7%	1%
<b>Sex:</b>						
Male	(635)	35	49	9	6	<1
Female	(638)	29	50	13	7	1
<b>Age:</b>						
18 to 34	(546)	26	52	13	9	—
35 to 49	(343)	30		8		<1
50 to 64	(252)	34	46	11	2	2
65 and over	(127)	44	36	12	6	2
<b>Education:</b>						
Less than high school	(165)	32	42	17	8	1
High school graduate	(458)		56	11	9	1
Some college	(300)	36	53	8	3	1
College graduate	(347)	44	45	8	2	<1
<b>Science understanding:</b>						
Very good	(236)	46	46	4	3	1
Adequate	(707)	34	52	10	4	1
Poor	(316)	19	50	18	13	<1

<sup>a</sup>The code number of the question in the survey instrument (see app. B.)

<sup>b</sup>Percentages are presented as weighted sample estimates. The unweighted sample base is presented in parentheses so that the sampling variance for these estimates can be calculated.

SOURCE: Office of Technology Assessment, 1987.

## SCIENCE OBSERVANCE

As mentioned earlier, surveys in the past have narrowly defined a science attentive public as only those individuals who have a very good understanding of science and who are very interested in science (3). **The OTA survey reveals, however that the people who say they are very interested in science are not always those who say they are very knowledgeable. Moreover—those who say they are very concerned about science policy are not always either very interested in science or very knowledgeable about science.**

Given the differences in understanding, interest, and concern among the population, **OTA defines the “science observant” public as those persons who say they have a very good under**

**standing of science, or are very interested in science and technology matters, or are very concerned with science policy.** A person holding any one of these positions is probably more likely to become aware of current science policy issues and debates.

Using this approach, approximately half the adult population of the United States (47 percent) can be classified as observant of science issues (table 10). Men (54 percent) are more likely than women (41 percent) to be observant of science issues. The prevalence of scientific observance increases with age from 43 percent among those 18 to 34 years old to 57 percent of those 65 and older. Although there is not a consistent relationship between education and science observance,

Table 10.—Profile of Population Classified as “Science Observant”

		observant	Nonobservant
Total	(1,273) <sup>a</sup>	47%	53%
<b>Sex:</b>			
Male	(835)	54	48
Female	(638)	41	59
<b>Age:</b>			
18 to 34	(548)	43	
35 to 49	(343)	45	55
50 to 84	(252)	50	50
65 and over	(127)	57	43
<b>Education:</b>			
Less than high school	(185)	47	53
High school graduate	(458)	39	61
Some college	(300)	51	49
College graduate	(347)	62	38
<b>Race:</b>			
White	(1,096)	48	54
Black	(140)	50	50
<b>Science understanding:</b>			
very good	(238)	100	
Adequate	(707)	44	56
	(316)	23	77
<b>Science interest:</b>			
Very Interested	(327)	100	
Somewhat Interested	(638)	38	62
Rather uninterested	(133)	26	74
Not interested at all	(168)	20	80
<b>Concern about science:</b>			
Very concerned	(419)	100	
somewhat concerned	(650)	24	78
Not very concerned	(126)	13	87
Not at all concerned	(69)	20	80

<sup>a</sup>Percentages are presented as weighted sample estimates. The unweighted sample base is presented in parentheses so that the sampling variance for these estimates can be calculated.

SOURCE: Office of Technology Assessment, 1987.

college graduates are more likely than other groups to be observers of science (62 percent).

The survey finds relatively little evidence that the science observant are substantially more likely to become engaged in political advocacy. The incidence of science observant among those who say they have voted in recent congressional elections (50 percent), local elections (52 percent), campaigned for a candidate (52 percent), or written to a public official (55 percent) is not much higher than the norm. Moreover, these somewhat higher

rates of political activity among science observant can be accounted for as a function of age, sex, and educational differences (l).

Finally, science observance is apparently non-partisan. The proportion of Republicans who are scientifically observant is 47 percent compared to 48 percent of Democrats. Among those who describe their political philosophy as conservative and among liberals, an identical 48 percent are scientifically observant (table 11).

**Table II.—Science Observance and Politics**

		Observant	Nonobservant
<b>Total</b> .....	(1,273) <sup>a</sup>	47%	53%
<i>Political philosophy:</i>			
<b>Conservative</b> .....	(478)	48	52
<b>Middle of the road</b> .....	(511)	45	55
<b>Liberal</b> .....	(233)	48	52
<i>Party affiliation:</i>			
<b>Republican</b> .....	(435)	47	53
<b>Independent</b> .....	(334)	44	58
<b>Democrat</b> .....	(441)	48	52
<i>Political activities:</i>			
<b>Written a letter to official</b> .....	(432)	55	45
<b>Contributed to political campaign</b> .....	(494)	58	42
<b>Campaigned for political candidate</b> .....	(153)		48
<b>Voted on local issue</b> .....	(748)	48	48
<b>Voted in congressional election</b> .....	(935)	50	50

<sup>a</sup>Percentages are presented as weighted sample estimates. The unweighed sample base is presented in parentheses so that the sampling variance for these estimates can be calculated.

SOURCE: Office of Technology Assessment, 1987.