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IV.C. ENHANCING RESEARCH AND DEVELOPMENT AND EXPANDING THE HUMAN FRONTIER

Since the beginning of civilization, mankind has sought to explore the frontier and increase its knowledge of the world. Today's frontiers are in space, communications, transportation, energy, manufacturing and materials, and biotechnology. This chapter discusses a range of programs and issues that are related to these frontiers: Federal research and development activities; space; and biotechnology. These endeavors are among America's most important investments in the future.

The budget proposes to allocate about \$76 billion for research and development, including

R&D facilities, in 1992. This is an increase of over \$8 billion, or 13 percent over 1991 levels. Within this total, the budget proposes over \$13 billion for basic research, an increase of \$1 billion, or 8 percent, over 1991.

The budget also proposes to allocate over \$16 billion for major space activities. This is an increase of \$2 billion, or 15 percent, over 1991 enacted levels.

The budget proposes several crosscutting investments that will build the base for the continuing expansion of the frontier of knowledge:

Table C-1. ENHANCING RESEARCH AND DEVELOPMENT AND EXPANDING THE HUMAN FRONTIER—HIGHLIGHTS

(Dollar amounts in millions)

	Budget Authority			
	1991 Enacted	1992 Proposed	Dollar change	Percent change
Basic Research				
Doubling the NSF budget	2,316	2,722	+406	+18
Increasing Basic Biomedical Research at NIH	4,634	4,968	+334	+7
Human Genome Project	135	169	+35	+26
Agricultural Research Initiative	73	125	+52	+71
Superconducting Super Collider	243	534	+291	+120
Applied Research				
High Performance Computing and Communications	489	638	+149	+30
Energy R&D	676	903	+227	+34
Advanced Manufacturing and Materials	1,316	1,310	-6	—
HIV/AIDS	1,152	1,210	+58	+5
Moving Fusion Energy from Science to Engineering	275	337	+62	+23
Aeronautics R&D	482	543	+61	+13
Expanding R&D at the National Institute of Standards and Technology	215	248	+33	+15
Maintaining National Security: Defense R&D	37,783	43,247	+5,464	+14
Expanding the Geographic Frontier: Space Exploration				
Space Transportation Infrastructure	4,801	5,517	+716	+15
Space Science	1,774	2,141	+367	+21
Mission to Planet Earth (Global Change)	954	1,186	+232	+24
Mission From Planet Earth	2,199	2,470	+271	+12
Expanding the Human Frontier through Biotechnology	3,788	4,107	+319	+8

a new initiative to advance America's high performance computing capacity; an increased emphasis on mathematics and science education; and a further installment in the U.S. effort to lead the world to a greater understanding of global change.

Lastly, the budget proposes to allocate \$4.1 billion as the Federal investment in *biotechnology*. This is an increase of \$319 million or 8 percent over 1991 enacted levels.

HIGHLIGHTS

The budget contains a number of new and expanded programs and initiatives. Examples include:

BASIC RESEARCH

An 18 Percent Increase for the National Science Foundation (NSF).—The budget proposes an increase of 18 percent overall for NSF, including a 16 percent increase for basic research. This will continue the Administration's commitment to double NSF's budget between 1987 and 1994. This increase is targeted primarily toward individual investigators at universities, who are essential to the U.S. scientific enterprise. In addition, a new program is proposed to provide state-of-the-art research instrumentation to academic researchers.

Increasing the Investment in Basic Biomedical Research at the National Institutes of Health.—The budget proposes an increase of \$334 million, or 7 percent over 1991, for basic research supported by the National Institutes of Health (NIH). The overall increase of \$498 million for all of NIH would allow an increase of 9 percent in funding of research project grants. This would permit over 600 additional grants to be funded.

Human Genome Project.—The budget proposes an increase of \$35 million, or 26 percent, to a total of \$169 million in the Departments of Energy and Health and Human Services (National Institutes of Health).

National Agricultural Research Initiative.—The budget proposes a 71 percent increase (\$52 million) to a total of \$125 million as the next installment in a new program in agricultural research, which will be competitive, based on merit, and designed to enhance production efficiency, food safety and environmental quality.

Superconducting Super Collider (SSC).—The budget proposes a \$291 million increase for the SSC to a total of \$534 million. This will support continued work toward the transition from prototype superconducting magnets to production and to begin construction of facilities. The funding level maintains the 10-year design and construction schedule.

APPLIED RESEARCH AND DEVELOPMENT

High Performance Computing and Communications.—The budget proposes an increase of \$149 million, or 30 percent, (to a total of \$638 million) for a new interagency program to help establish American pre-eminence in the fields of high performance computing and communications. This major initiative, involving eight Federal agencies (in addition to the private sector), will focus on the underlying research and the academic training needed to significantly accelerate the availability of the next generation of high performance computing systems and digital communications networks. The goal is to assist in the development of computing capability with roughly 1,000 times improvement over current systems by 1996.

Energy R&D.—The budget proposes an increase of \$227 million, or 34 percent for investments in targeted high-payoff technologies and strategies to increase the efficiency of energy use, to develop alternatives to petroleum and to advance new electricity technologies. This investment is guided by the National Energy Strategy.

Advanced Manufacturing and Materials R&D.—The budget includes over \$1 billion for R&D on advanced manufacturing technologies, including an increase of 15 percent for nondefense-related manufacturing R&D. In addition, the budget proposes \$84 million for the

National Science Foundation for a new initiative in materials synthesis and processing, which will take advantage of new opportunities in electronic and biomaterials. The budget also proposes \$93 million for R&D on all aspects of superconductivity.

HIV/AIDS.—The budget proposes a 5 percent increase to \$1.2 billion for biomedical and behavioral research on Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome. (The budget also proposes a total increase of \$558 million, or 15 percent, for HIV/AIDS research, treatment, prevention and income support.)

Aeronautics R&D.—The budget proposes an increase of \$61 million, or 13 percent, for aeronautics R&D in NASA, not including high-performance computing. The increase will support continued high-priority R&D on environmental issues associated with supersonic flight, as well as a new initiative in high-temperature propulsion materials. This work is intended to enable an informed decision by industry on future high-speed civil transports. In addition, a new program to address the phenomenon of aging aircraft will be initiated. Technology development for the joint NASA/DOD National Aerospace Plane program will be continued, leading to a future decision on a flight research vehicle.

Expanding R&D at the National Institute of Standards and Technology.—The budget proposes a 15 percent increase to a total of \$248 million for NIST. The long-term budget projection will result in a budget for NIST that is approximately doubled by 1996. The 1992 proposal will continue an effort begun in 1991 to expand NIST's ability to perform generic applied research and technology development and to address a growing number of important standards and measurement issues. In addition, the budget proposes \$36 million for the Advanced Technology Program.

Defense R&D.—The budget proposes a total of \$43 billion for R&D for national security. This amount includes more than \$40 billion for R&D supported by the Department of Defense, and nearly \$3 billion for defense-related R&D supported by the Department of Energy.

R&E Tax Credit.—The budget proposes to make the Research and Experimentation tax

credit permanent, and to reformulate the credit to increase its effective rate.

Encouraging R&D by Multinational Companies.—The budget proposes a 1-year extension in the rules for allocation by multinational companies of R&D expenditures incurred outside the U.S.

SPACE EXPLORATION

Space Transportation Infrastructure.—The budget proposes \$5.5 billion, an increase of 15 percent, for the critical elements of space transportation, including the Space Shuttle and expendable launch vehicles. The budget also proposes a major new program, jointly funded by NASA and DOD to develop a new launch system. This new capability was recommended by the Advisory Committee on the Future of the U.S. Space Program.

Space Science.—The budget proposes \$2.1 billion, an increase of \$367 million, or 21 percent, over 1991. This will support a broad range of space science activities, including astronomy, unmanned planetary exploration, advanced space communications research, and life sciences. These increases are consistent with NASA's space science strategic research plan and the recent recommendations of the Advisory Committee on the Future of the U.S. Space Program.

Mission to Planet Earth and the U.S. Global Change Research Program (USGCRP).—The budget proposes a total of \$1.2 billion for the USGCRP, a \$232 million or 24 percent increase over the 1991 enacted level. The 1992 increase will be used to continue a broad range of research efforts, including NASA's Mission to Planet Earth/Earth Observing System (EOS) and high priority, ground-based programs such as the World Ocean Circulation Experiment. EOS is a program designed to develop and fly a number of Earth-orbiting instruments that will collect important data from space on critical global change issues such as global warming, deforestation and desertification. During 1991, an external engineering review will be conducted on the implementation of the EOS program.

Mission from Planet Earth.—The budget proposes a total of \$2.5 billion, a 12 percent increase, for activities that will eventually lead

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to exploration of the Moon and the planets, including Space Station Freedom. In 1992, activities will focus on continued development of the Space Station and increased investments in long-lead exploration technologies such as nuclear power, nuclear propulsion and life support.

BIOTECHNOLOGY

The budget proposes nearly \$4 billion for biotechnology R&D.—Biotechnology offers unprec-

edented opportunities for improving the Nation's health, food supply and environment. In medicine, biotechnology is responsible for a generation of new products that will prevent and treat disease. Significant agricultural advances and environmental techniques are also underway. Twelve Federal agencies are working on biotechnology-related R&D and are developing priorities for future Federal investments.

ENHANCING RESEARCH AND DEVELOPMENT

Research and development (R&D) yields new knowledge, products and processes that, over the long term, result in economic growth and an improved quality of life for all Americans. Investment in research and development is a top priority for an Administration that believes in investing in the future. Investments in research and development form the foundation for the exploration of all of the new frontiers of today and tomorrow.

BACKGROUND: INCREASED INVESTMENTS IN R&D PROVIDE BENEFITS TO THE NATION

R&D investment provides both direct and indirect productivity benefits to society. In addition to the economic benefits associated with R&D, many studies suggest that private (industrial) R&D spending has a very high social rate of return. This social return appears to be much higher than the rate of return to the individual company funding the R&D, giving R&D spending the character of what economists call a "public good." One researcher estimated a social rate of return of 56 percent and a private rate of return of 25 percent for a specific group of innovations. Several decades of econometric research have demonstrated that private sector R&D investments are a strong positive stimulus for private productivity. There is also evidence that Federal R&D spending stimulates private R&D. This appears to be especially true for basic research or pre-competitive, generic applied research that contributes to many industrial sectors.

It is not possible to determine analytically the "optimal" level for total national investment in R&D or the best mix of R&D investments. However, the evidence that increased R&D investment adds to the productivity of the Nation, and that Federal investments are important, provides ample justification for increased Federal investment in R&D as well as for Federal action to increase the level of private R&D investment.

THE 1992 FEDERAL R&D BUDGET: OVERVIEW AND TRENDS

The budget proposes to allocate about \$76 billion for R&D, including R&D facilities. This is an increase of over \$8 billion, or 13 percent, over 1991 levels. Within this total, \$13 billion will be allocated for basic research, an increase of \$1 billion, or 8 percent, and \$12 billion for applied research, an increase of \$903 million, or 8 percent, over 1991. Federal civilian R&D will increase by 10 percent while defense-related R&D will increase by 14 percent.

The ratio of Federal R&D outlays to GNP has been holding steady in recent years at about 1.2 percent, after a sharp drop in the 1970s due to the end of the Apollo project and slower growth in defense. During the 1980s, defense R&D recovered considerably. Federal civilian R&D (excluding defense and space activities) has been nearly level for 30 years at about 0.4 percent of GNP. The budget provides increases and incentives designed to increase Federal R&D investment as a percent of GNP.

**Table C-2. THE BUDGET PROPOSES AN \$8.4 BILLION INCREASE
IN FEDERAL INVESTMENT IN RESEARCH AND DEVELOPMENT**
(Dollar amounts in millions)

	Budget Authority				Outlays			
	1991 Enacted	1992 Proposed	Dollar change	Percent change	1991 Enacted	1992 Proposed	Dollar change	Percent change
Governmentwide totals:								
Conduct of R&D:								
Basic Research	12,320	13,320	+1,000	+8	11,597	12,414	+818	+7
Civilian	11,296	12,278	+982	+9	10,623	11,362	+739	+7
Defense ¹	1,024	1,041	+17	+2	973	1,052	+79	+8
Applied Research and Develop- ment	51,791	58,758	+6,967	+13	51,839	55,650	+3,811	+7
Civilian	15,031	16,552	+1,521	+10	14,045	15,503	+1,458	+10
Defense ¹	36,760	42,206	+5,447	+15	37,794	40,147	+2,353	+6
Subtotal, Conduct of R&D	64,111	72,078	+7,967	+12	63,436	68,065	+4,629	+7
R&D Facilities	3,082	3,545	+464	+15	2,845	3,264	+419	+15
Total, Conduct of R&D and Fa- cilities²	67,192	75,623	+8,431	+13	66,281	71,329	+5,048	+8
Conduct of R&D by Agency:								
Defense-military	35,176	40,479	+5,303	+15	36,142	38,421	+2,279	+6
Health and Human Services	9,273	9,836	+564	+6	8,704	9,235	+531	+6
Energy	6,149	6,410	+260	+4	5,810	6,273	+463	+8
National Aeronautics and Space Administration	7,271	8,602	+1,330	+18	6,974	7,767	+793	+11
National Science Foundation	1,828	2,112	+284	+16	1,675	1,897	+222	+13
Agriculture	1,224	1,261	+37	+3	1,152	1,198	+46	+4
Interior	584	562	-22	-4	572	567	-5	-1
Environmental Protection Agency ..	433	491	+59	+14	418	450	+33	+8
Commerce	517	538	+22	+4	454	499	+45	+10
Transportation	407	435	+28	+7	373	411	+38	+10
Agency for International Develop- ment	385	413	+28	+7	337	445	+108	+32
Veterans Affairs	219	219	—	—	215	219	+4	+2
Other Agencies ³	645	720	+75	+12	611	684	+73	+12

¹Includes military-related programs of the Departments of Defense and Energy.

²Components may not add to totals because of rounding.

³Includes the Departments of Education, Justice, Housing and Urban Development, Labor, the Treasury, the Nuclear Regulatory Commission, Tennessee Valley Authority, Smithsonian Institution, and the Corps of Engineers.

As a percentage of total Federal domestic discretionary spending, total civilian R&D has declined from a peak of 25 percent in the Apollo years to about 13 percent in recent years.

Excluding space R&D, civilian R&D has remained relatively constant at about 10 percent of the domestic discretionary budget. Again, the budget seeks to increase this share.

The Federal Government currently accounts for about 44 percent of the total U.S. investment in R&D. Industry, academia, and non-profit organizations make up the remaining 56 percent. In 1991, it is estimated that total U.S. R&D expenditures, Federal and non-Federal, will be \$152 billion, an increase of 4 percent

over 1990, with Federal investments accounting for most of the increase. In total, the U.S. investment in R&D is about 3 percent of GNP. Trends in industry R&D funding, including initiatives to spur increased industry investment through the tax credit for research and experimentation, are discussed later in this chapter.

EXPANDING THE FRONTIER OF KNOWLEDGE THROUGH BASIC RESEARCH

Basic research provides the new knowledge that leads to new products and processes. Basic research, especially at universities, is an essential investment in the Nation's scientific and technological future, including its future scientists and engineers. For this reason, the budget places a major emphasis on increasing basic research. In total, the budget proposes an increase of 8 percent, or \$1 billion, above 1991 for Federal basic research support.

The strength of U.S. investment in basic research is illustrated by several recent achievements:

- The NASA/NOAA Antarctic Ozone Expedition, combining satellite, aircraft, and ground-based research, discovered and documented the problem of the "ozone hole" in the Antarctic, and is currently investigating similar phenomena in the Arctic environment.
- An NSF-supported Presidential Young Investigator discovered a way to make large-pore molecular sieves. These molecular sieves are critical as catalysts for a wide variety of industrial processes, particularly petroleum processing and chemical separation. The new large-pore sieves have the potential to revolutionize the industrial processing of chemicals.
- NIH scientists successfully transferred genetically engineered cells to human subjects, paving the way for the world's first attempts at human gene therapy. The first gene therapy experiments involved placing a normal gene that helps the immune system develop normally into the white blood cells of a young girl who lacked this vital gene. It is hoped that this inserted gene

will enable the formation of a working immune system.

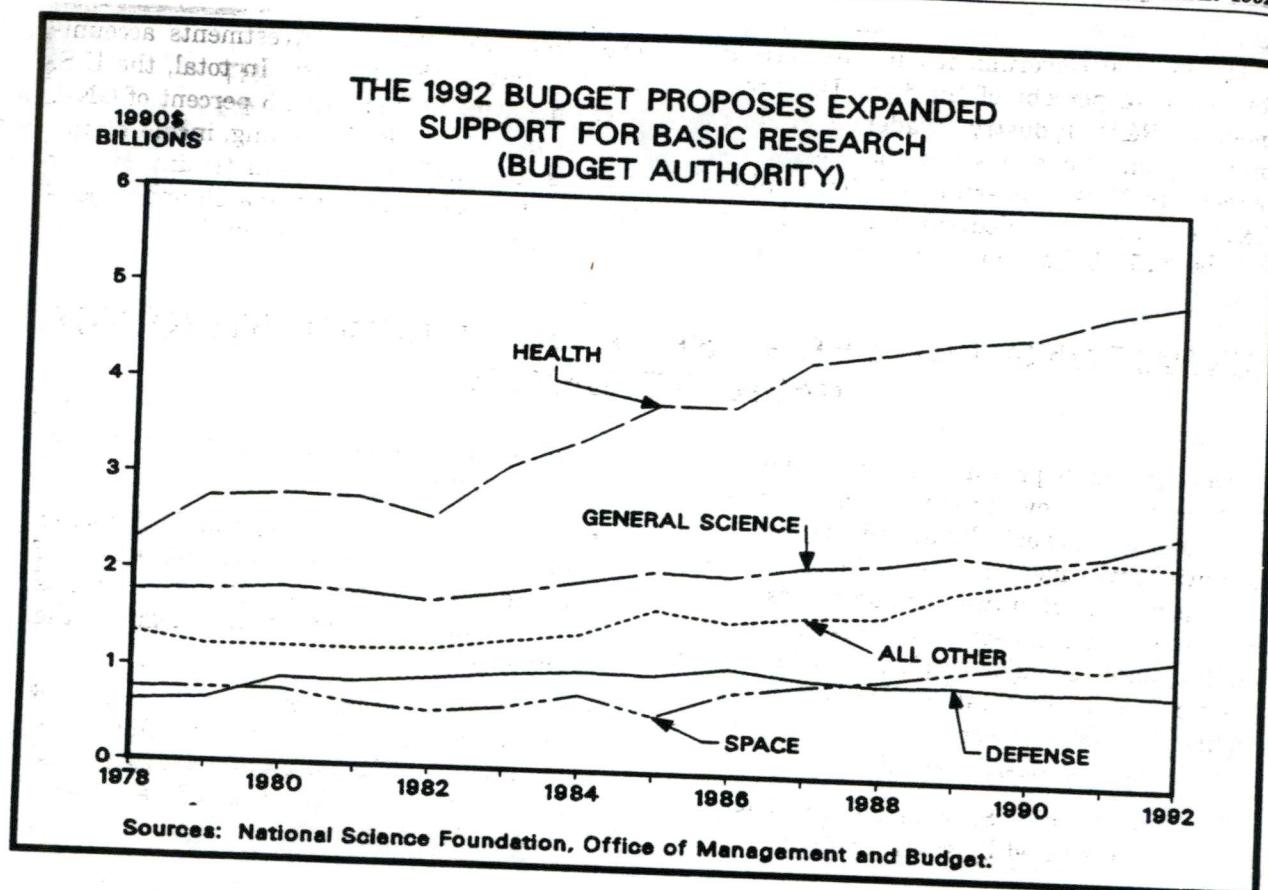
- NASA's Cosmic Background Explorer made unprecedented measurements of background radiation, giving scientists critical new evidence on the origin of the universe.
- Biomedical researchers have discovered the long-sought gene for cystic fibrosis, a fatal disease of children and young adults, opening the way to a host of new therapeutic approaches.

Key Indicators of the Vitality of Basic Research

Most basic research is performed in universities, and more than half of the R&D that universities perform is basic. The vitality of the "academic research enterprise" has been nearly impossible to measure. However, in recent years, scientists and policymakers have expressed serious concerns about its current and future vitality. Many experts argue that over the past several years, and despite large real increases in Federal funding, the activity level and research productivity of university researchers have not appeared to increase.

Funding Trends.—The historical trend in Federal support for basic research shows that during the 1980s such support increased overall by 50 percent in real terms, with significantly larger increases in health-related basic research. The figure below shows that real support for basic research has continued to climb in the early 1990's, particularly in health and space.

Measuring the Direct Economic Benefits.—Until recently, there has been no way



to gauge reliably the impact of academic R&D on industrial innovation.

Recent work (Mansfield), however, indicates that in several key industrial sectors, notably information processing, drugs and instruments, a significant proportion of new products and processes would not have reached the market had it not been for the contribution of recent academic R&D. A recent, but very preliminary, estimate of the average social rate of return to past investments in academic R&D was calculated to be 28 percent. It is important to note, however, that this figure must be viewed with caution as it is based on a large number of assumptions and simplifications.

In any case, the contribution of academic research to industrial innovation in several important sectors appears to be considerable, even apart from its more traditional benefits to the education of students, and to the acquisition of knowledge for its own sake.

Support for University Researchers.—

One indicator of the Federal Government's commitment to research is the total number

of research grants made to individual researchers, a figure that has been growing for two decades. Since most grants are for periods ranging from 2–7 years, in any given year only a portion (less than 25 percent) of an agency's grants are competitively renewed, or become, for that year, "new grants". Thus, rather than using the number of total grants as an indicator, some advocates prefer to use a measure based on just this "new grant" ratio. This indicator, or "funded rate of new grants" is defined here as the number of awards as a percent of the number of proposals. By this measure, the funded rate for new grants for the two largest Federal supporters of university research, the Department of Health and Human Services (National Institutes of Health), and the National Science Foundation, have declined over the 1980's from about 40 percent to about 30 percent (adjusted to exclude both multiple submissions by any one individual and for awards for research centers, which may serve many investigators).

A partial explanation may be that since 1970, for HHS, the total pool of biomedical

researchers (extramural) has grown by 140 percent, outpacing the 75 percent growth in principal investigators funded by HHS. In fact, it has been estimated that about 80 percent of all the American scientists in all fields who ever lived are alive today.

Funding rates for new grants have also dropped because of increases in the amount of money per grant (both direct and indirect cost components) and the average length of grants. Increasing award sizes, award lengths, or both, may tend to provide increased stability and productivity for a given investigator, but these actions also depress the number of subsequent new grants that are made.

While individual investigator awards are still the predominant form of support, awards to groups of investigators (either small groups or larger centers) have been increasing, driven primarily by the need for interdisciplinary approaches to scientific problems. Each of these group or center awards is counted as a single grant, even though many researchers may be served. Thus, considering only the absolute numbers of awards is somewhat misleading. A more appropriate consideration should be the total number of researchers supported. By this measure, there are many more researchers supported by research grants today than at any previous time.

Although support for university researchers is most often cited as the key indicator of the health of overall Federal support for basic research, a number of other measures that have traditionally been used to measure research output (new knowledge). None of these is, by itself, a definitive indicator of the vitality of academic research, and none is universally accepted as an adequate output measure, since the "amount" of new knowledge contained in a research finding has no natural unit of measure. Taken together with information on support for researchers, these measures provide some insight into the overall strength of academic research. Several such measures are (1) numbers of publications, (2) "quality" of publications as measured by citation indices, (3) patents and (4) Nobel and other prizes.

Publications and Citations.—As an indicator of overall productivity, the number of science articles published by U.S. academic researchers (which produce about two-thirds of

all U.S. science and engineering articles in major journals) has increased markedly. By this measure, the U.S. is maintaining its large share of world scientific and engineering literature. In all fields, the U.S. has a greater percentage of world publications than does any other country. As an indicator of the impact that publications have on other research, citation data are often used. The level of citation of U.S. papers by foreign researchers suggests that U.S. researchers continue to exert a substantial impact on foreign publications, and thus on the world's store of scientific knowledge.

Patents.—University patenting increased greatly during the 1980s, due in part to the 1980 change in U.S. law that allowed universities and small businesses to retain title to inventions developed with Federal funds. U.S. universities received 2 percent of patents awarded to U.S. inventors in 1988, more than double the share in 1978.

Nobel and Other Major Prizes.—The U.S. continues to dominate the Nobel lists, and Americans often win other major, internationally-recognized prizes such as the Fermi Award in physics, the Wolf Award in chemistry and the Lasker Award in medicine. However, care must be taken with this measure as these selections are often made on the basis of research done many years (10–30) before. Thus, this indicator may have more value with respect to past support for research than present or future support.

The budget recognizes that support for principal investigators is an important measure of the vitality of the Nation's basic research effort. Thus, this support is the major theme underlying the initiatives in basic research proposed for 1992.

1992 Budget Initiatives in Basic Research

The budget proposes a number of major increases or new programs reflecting the President's support for basic research. These increases are intended to bolster basic research funding, especially that which supports individual investigators, and to provide those researchers with state-of-the-art equipment. Overall, the budget proposes over \$13 billion for basic research, an increase of \$1 billion, or 8 percent, over 1991.

Table C-3. THE BUDGET INCREASES FUNDING FOR BASIC RESEARCH¹
(Dollar amounts in millions)

Department or Agency	Budget Authority				Outlays			
	1991 Enacted	1992 Proposed	Dollar change	Percent change	1991 Enacted	1992 Proposed	Dollar change	Percent change
Health and Human Services	5,101	5,477	+376	+7	4,786	5,097	+311	+7
(National Institutes of Health)	(4,634)	(4,968)	(+334)	(+7)	(4,372)	(4,622)	(+250)	+6
National Science Foundation	1,719	1,987	+268	+16	1,560	1,784	+223	+14
Energy	1,726	1,759	+32	+2	1,650	1,654	+3	—
National Aeronautics and Space Administration	1,698	1,960	+262	+15	1,612	1,800	+188	+12
Defense-military	992	1,010	+17	+2	942	1,021	+79	+8
Agriculture	563	598	+36	+6	539	553	+14	+3
Other Agencies ²	521	529	+8	+2	507	506	-1	—
Total	12,320	13,320	+1,000	+8	11,597	12,414	+818	+7

¹Amounts reported in this table are included in totals for conduct of R&D.

²Includes the Departments of Interior, Commerce, Veterans Affairs, Education, Labor, the Treasury, Justice, the Agency for International Development, the Smithsonian Institution, Environmental Protection Agency, Tennessee Valley Authority, and the Corps of Engineers.

Doubling Basic Research Support Through the National Science Foundation.—The President remains committed to doubling the budget of the National Science Foundation (NSF) between 1987 and 1994. The budget proposes an overall increase of 18 percent, which would restore the doubling path for NSF. Over 70 percent of NSF's budget supports basic research, primarily at the Nation's colleges and universities. These funds go directly, through a competitive, merit-based process, to the best researchers and to the most talented young scientists and engineers. Individual investigators are a key element in maintaining the U.S. preeminent position in science and basic research. NSF also plays a major role in the governmentwide initiative to improve the quality of science, mathematics and engineering education, particularly at the pre-college level.

In addition to the large proposed increase aimed primarily at individual investigators, \$50 million is proposed to fund a new initiative to provide new, state-of-the-art instrumentation to university researchers. This initiative will be implemented through a competitive, merit-based program, and will be targeted toward instrumentation costing more than \$200,000, but less than \$4 million. The Federal funding for this initiative will be matched at least 50:50 by non-Federal sources.

Increasing the Investment in Basic Biomedical Research at NIH by 7 Percent.—

The budget proposes a \$334 million increase for basic biomedical research supported by the National Institutes of Health (NIH), the primary source of basic biomedical research discoveries in the world. The overall increase of \$498 million, or 6 percent, for all of NIH will allow an increase of 9 percent in the funding for research project grants awarded to individual investigators. This will permit over 600 additional grants to be funded.

Unlocking the Secrets of Human Heredity—the Human Genome Project.—The budget proposes a 26 percent increase for the third year of this 15-year effort to decode the information locked in the chemical building blocks that form human genetic inheritance. This \$35 million increase reflects a commitment to develop "maps" of human chromosomes and human DNA sequence data that will allow scientists to develop new diagnostic tests, therapies, or cures for some of the 4,000 known disorders in which genes are the dominant cause. Such diseases include cystic fibrosis, sickle cell disease, and muscular dystrophy. The genome project also will produce increased knowledge about how specific genes function and malfunction, and will help increase understanding of diseases characterized

by gene-governed chemical reactions, such as heart disease, cancer, and AIDS.

This project is being conducted jointly by the Departments of Energy and Health and Human Services. The budget requests a total of \$169 million for the project, \$59 million at Energy and \$110 million at Health and Human Services.

Concurrent with the project's efforts to advance the state-of-the-art in genetic "mapping," the project is also exploring safeguards that may be necessary as new genetic information is put to practical uses, addressing issues related to privacy of such information and fairness in its use.

This landmark project will allow the next generation to benefit from the knowledge gained through this investment. Future scientists will have tremendous amounts of new information about the structure of human genetic make-up available to assist them in their search for therapies and cures for the diseases that afflict this generation. The 1992 budget ensures that this project is able to forge ahead expeditiously.

Improving the Productivity of the Nation's Agriculture (the National Research Initiative).—The budget continues the commitment to the National Research Initiative (NRI), first proposed in the 1991 budget, by proposing \$125 million, an increase of \$52 million, or 71 percent, over the 1991 enacted level. In 1991, \$100 million was proposed as the initial installment, to be expanded by \$50 million each year to the extent that funds were awarded competitively and not earmarked for specific sites or institutions. Six categories of research will be funded: natural resources and the environment; nutrition, food quality and health; plant systems (including mapping of plant genomes); animal systems; markets, trade, and policy; and processes antecedent to adding value and developing new products.

Agriculture in the 1990s must emphasize the environment, more rational use of natural resources, the quality and nutrition of food, and economically stabilized production systems which benefit producers as well as consumers. The NRI responds to the major issues facing agriculture such as food safety, water quality, global climate change, pest management, sci-

entific human capital development, and farm income. The NRI will allow U.S. agriculture to broaden the science and technology base to meet demanding needs and exploit new opportunities more effectively. These imperatives coincide with recent advances in biological sciences and other new tools in science that present unique research opportunities to improve agriculture nationally.

Federal funding for the NRI is necessary because: (1) the issues and opportunities are national in scope; the Nation as a whole is the beneficiary, not just individual states or industries; (2) the NRI undertakes research that does not, in general, produce specific patentable or marketable products, but knowledge that will be broadly applicable; (3) the need is urgent; the issues to be addressed require action now and cannot be delayed or taken up piecemeal; and (4) there are broader benefits, which are difficult to quantify, related to protection of the environment and public health.

The Administration is concerned about recent Congressional action which placed a cap of 14 percent on the recovery of indirect costs associated with grants made under the NRI. This action threatens the viability of the initiative.

Unlocking the Secrets of Matter and Energy—The Superconducting Supercollider and High Energy and Nuclear Physics:

- **The Superconducting Super Collider.**—The Superconducting Super Collider (SSC) will provide a collision energy 20 times greater than the current capability, resulting in new fundamental knowledge of matter and energy. The SSC Laboratory, under construction in Ellis County, Texas, will comprise a 54-mile circular tunnel in which superconducting magnets will accelerate counter-rotating proton beams. The SSC will employ 2,500 scientists, engineers, and technicians, and host an additional 500 visiting scientists.

The budget provides \$534 million for the SSC, an increase of \$291 million over the 1991 level. Much of the current effort focuses on research and development of the superconducting magnets. Work on other SSC components is also progressing. The

PROFILE OF THE UNITED STATES

This profile was created by the editors of *Information Please* from many data sources. Most figures are approximate. For detailed details about the United States, please refer to the appropriate sections of the *Information Please Almanac*. The figures given are latest available at presstime.



GEOGRAPHY

Number of states: 50
 Total area (1988): 3,615,100 sq. mi. Share of world land area (1988): 6.2%
 Highest point: Point Barrow, Alaska
 Northernmost point: West Quoddy Head, Me.
 Southernmost point: Ka Lae (South Cape), Hawaii
 Easternmost point: Wainwright Point, Alaska
 Geographic center: Butte County, S.D. (44° 58' N lat., 103° 46' W long.)

POPULATION

Estimated mid-1988: 246,100,000
 Density of population (1987): 1/4 mile west of Denver in Jefferson County, MO
 (1987): 118,31,000
 Whites (1987): 121,869,000
 Black persons (1987): 205,820,000
 Asian and other persons (1987): 56,709,000
 Breakdown by age groups (1987):
 Under 5 years: 18,251,000
 5-14 years: 34,147,000
 15-24 years: 38,252,000
 25-64 years: 122,917,000
 65 and over: 29,835,000
 Centenarians (est. 1985): 25,000 (proj. 2,000):
 over 100,000 (proj. 2080): over 1 million
 Median age (1987): 32.1
 Rural population (1986): 56,300,000
 Metropolitan population (1986): 184,700,000
 Families (1987): 64,491,000
 Average family size (1987): 3.19
 Home ownership (1983): 54,724,000
 Married couples (est. 1987): 52,286,000
 Unmarried couples (est. 1987): 1,614,000
 Single parents (1987): female, 6,297,000; male, 955,000
 Widows (1987): 11,123,000
 Widowers (1987): 2,120,000

VITAL STATISTICS

Births (1987): 3,829,000
 Deaths (1987): 2,127,000
 Marriages (1987): 2,421,000
 Divorces (1987): 1,157,000
 Infant Mortality Rate (est. 1988): 10/1,000
 Legal abortions (est. 1985): 1,588,550
 Expectancy (1986): White men, 72; white women, 78.9; black men, 65.5; black women, 73.6

MILITARY LABOR FORCE

Reserves (1987): 58,726,000 (94.5% employed)
 Active (1987): 17,074,000 (94.5% employed)
 Age 16-19 (1987): 6,640,000 (83.4%) employed
 Work at home (est. 1988): Full-time, 6 million, Part-time, 9 million.

INCOME AND CREDIT

Gross National Product (1987): \$4,488,500,000,000
 Personal income per capita (1987): \$15,340
 Average family income (1987): \$29,744
 Individual Shareholders (1985): 47,040,000
 Number below poverty level (1986): white, 22,183,000; black and other minorities, 14,100,000
 Number of billionaires (1988): 49
 Tax returns with reported adjusted gross income of \$1 million or more (1986): 35,875
 Credit market debt outstanding (1986): \$9,356,000,000
 Mortgage debt outstanding (1986): \$2,564,000,000
 Consumer credit outstanding (1986): \$724,000,000

EDUCATION

Public elementary and secondary pupils (est. 1987-88): 40,123,808
 Public elementary and secondary classroom teachers (est. 1987-88): 2,275,209, Men: 669,691, Women: 1,605,518
 Avg. annual salaries of public elementary and secondary classroom teachers (est. 1987-88): \$28,031
 Public high-school graduates (est. 1987-88): 2,419,698
 College graduates in the population (est. 1987): 31,600,000
 Money spent on elementary and secondary education (est. 1987): \$170,000,000,000

CONVENIENCES

Radios (1986): 43,282,000
 Radio stations (standard and FM, 1986): 8,807
 Television stations (1988): 1,347
 Automobiles (est. 1987): 139,041,000
 Households with telephones (March 1988): 85.3 million (92.9%)
 Newspaper circulation (morning and evening, Sept. 30, 1987): 62,826,273
 Cable TV subscribers (1986): 37,500,000
 Total TV homes (est. Jan. 1, 1988): 88,600,000
 Homes with VCRs (May, 1988): 59%
 Personal computers used at home (est. 1987): Over 20 million

CRIME

Total arrests (1987): 10,795,869; Males, 8,881,528, Under 18, 1,380,748; Females, 1,914,341, Under 18, 400,492
 Child neglect and abuse cases (1985): 1,299,400
 Prisoners under sentence of death (1987): 1,984
 Law enforcement officers killed (1986): 131
 Total murder victims (1987): 17,859
 Households touched by crime (Total 1986): 22,201,000 (25%)
 Violent crime (1986): 4,225,00 households (4.7%)
 Theft (1986): 15,582,00 households (17.3%)

NEC Estimates of School Statistics, 1987-88.

INFORMATION PLEASE

ALMANAC® ATLAS & YEARBOOK

1989

42ND EDITION

Tyler was POTUS in 1843

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1989

History of the Flag

Source: Encyclopaedia Britannica.

The first official American flag, the Continental or Grand Union flag, was displayed on Prospect Hill, Jan. 1, 1776, in the American lines besieging Boston. It had 13 alternate red and white stripes, with the British Union Jack in the upper left corner.

On June 14, 1777, the Continental Congress adopted the design for a new flag, which actually was the Continental flag with the red cross of St. George and the white cross of St. Andrew replaced on the blue field by 13 stars, one for each state. No rule was made as to the arrangement of the stars, and while they were usually shown in a circle, there were various other designs. It is uncertain when the new flag was first flown, but its first official announcement is believed to have been on Sept. 3, 1777.

The first public assertion that Betsy Ross made the first Stars and Stripes appeared in a paper read before the Historical Society of Pennsylvania on March 14, 1870, by William J. Canby, a grandson. However, Mr. Canby on later investigation found no official documents of any action by Congress on the flag before June 14, 1777. Betsy Ross's own story according to her daughter, was that Washington, Robert Morris, and George Ross, as representatives of Congress, visited her in Philadelphia in June 1776, showing her a rough draft of the flag and asking her if she could make one. However, the only actual record of the manufacture of flags by Betsy Ross is a voucher in Harrisburg, Pa., for 14 pounds and some shillings for flags for the Penn-

1. 11 states formally seceded, and unofficial groups in Kentucky and Missouri adopted ordinances of secession. On this basis, these two states were admitted to the Confederacy, although the official state governments remained in the Union.

The Pledge of Allegiance¹ to the Flag

"I pledge allegiance to the Flag of the United States of America, and to the Republic for which it stands, one Nation under God,² indivisible, with liberty and justice for all."

1. The original pledge was published in the Sept. 8, 1892,

sylvania navy.

On Jan. 13, 1794, Congress voted to add two stars and two stripes to the flag in recognition of the admission of Vermont and Kentucky to the Union. By 1818, there were 20 states in the Union, and as it was obvious that the flag would soon become unwieldy, Congress voted April 18 to return to the original 13 stripes and to indicate the admission of a new state simply by the addition of a star the following July 4. The 49th star, for Alaska, was added July 4, 1959; and the 50th star, for Hawaii, was added July 4, 1960.

The first Confederate flag, adopted in 1861 by the Confederate convention in Montgomery, Ala., was called the Stars and Bars; but because of its similarity in colors to the American flag, there was much confusion in the Battle of Bull Run. To remedy this situation, Gen. G. T. Beauregard suggested a battle flag, which was used by the Southern armies throughout the war. The flag consisted of a red field on which was placed a blue cross of St. Andrew separated from the field by a white fillet and adorned with 13¹/₂ white stars for the Confederate states. In May 1863, at Richmond, an official flag was adopted by the Confederate Congress. This flag was white and twice as long as wide; the union, two-thirds the width of the flag, contained the battle flag designed for Gen. Beauregard. A broad transverse stripe of red was added Feb. 4, 1865, so that the flag might not be mistaken for a signal of truce.

issue of *The Youth's Companion* in Boston. For years, the authorship was in dispute between James B. Upham and Francis Bellamy of the magazine's staff. In 1939, after a study of the controversy, the United States Flag Association decided that authorship be credited to Bellamy. 2. The phrase "under God" was added to the pledge on June 14, 1954.

The Statue of Liberty

The Statue of Liberty ("Liberty Enlightening the World") is a 225-ton, steel-reinforced copper female figure, 152 ft in height, facing the ocean from Liberty Island in New York Harbor. The right hand holds aloft a torch, and the left hand carries a tablet upon which is inscribed: "July IV MDCCLXXVI."

The statue was designed by Frédéric Auguste Bartholdi of Alsace as a gift to the United States from the people of France to memorialize the alliance of the two countries in the American Revolution and their abiding friendship. The French people contributed the \$250,000 cost.

The 150-foot pedestal was designed by Richard M. Hunt and built by Gen. Charles P. Stone, both Americans. It contains steel underpinnings designed by Alexander Eiffel of France to support the statue. The \$270,000 cost was borne by popular subscription in this country. President Grover Cleveland accepted the statue for the United States on Oct. 28, 1886.

On Sept. 26, 1972, President Richard M. Nixon

1. Called Bedloe's Island prior to 1956.

dedicated the American Museum of Immigration, housed in structural additions to the base of the statue. In 1984 scaffolding went up for a major restoration and the torch was extinguished on July 4. It was relit with much ceremony July 4, 1986 to mark its centennial.

On a tablet inside the pedestal is engraved the following sonnet, written by Emma Lazarus (1849-1887):

The New Colossus

Not like the brazen giant of Greek fame,
With conquering limbs astride from land to land;
Here at our sea-washed, sunset gates shall stand
A mighty woman with a torch, whose flame
Is the imprisoned lightning, and her name
Mother of Exiles. From her beacon-hand
Glows world-wide welcome; her mild eyes command
The air-bringed harbor that twin cities frame.
"Keep, ancient lands, your storied pomp!" cries she
With silent lips. "Give me your tired, your poor,
Your huddled masses yearning to breathe free,
The wretched refuse of your teeming shore.
Send these, the homeless, tempest-tost to me,
I lift my lamp beside the golden door!"

Presidents

Name and (party) ¹	Term	State of birth	Born	Died	Religion	Age at inaug.	Age at death
1. Washington (F) ²	1789-1797	Va.	2/22/1732	12/14/1799	Episcopalian	57	67
2. J. Adams (F)	1797-1801	Mass.	10/30/1735	7/4/1826	Unitarian	61	90
3. Jefferson (DR)	1801-1809	Va.	4/13/1743	7/4/1826	Deist	57	83
4. Madison (DR)	1809-1817	Va.	3/16/1751	6/28/1836	Episcopalian	57	85
5. Monroe (DR)	1817-1825	Va.	4/28/1758	7/4/1831	Episcopalian	58	73
6. J. Q. Adams (DR)	1825-1829	Mass.	7/11/1767	2/23/1848	Unitarian	57	80
7. Jackson (D)	1829-1837	S.C.	3/15/1767	6/8/1845	Presbyterian	61	78
8. Van Buren (D)	1837-1841	N.Y.	12/5/1782	7/24/1862	Reformed Dutch	54	79
9. W. H. Harrison (W) ³	1841	Va.	2/9/1773	4/4/1841	Episcopalian	68	68
10. Tyler (W)	1841-1845	Va.	3/29/1790	1/18/1862	Episcopalian	51	71
11. Polk (D)	1845-1849	N.C.	11/2/1795	6/15/1849	Methodist	49	53
12. Taylor (W) ⁴	1849-1850	Va.	11/24/1784	7/9/1850	Episcopalian	64	65
13. Fillmore (W)	1850-1853	N.Y.	1/7/1800	3/8/1874	Unitarian	50	74
14. Pierce (D)	1853-1857	N.H.	11/23/1804	10/8/1869	Episcopalian	48	64
15. Buchanan (D)	1857-1861	Pa.	4/23/1791	6/1/1868	Presbyterian	65	77
16. Lincoln (R) ⁵	1861-1865	Ky.	2/12/1809	4/15/1865	Liberal	52	56
17. A. Johnson (U) ⁶	1865-1869	N.C.	12/29/1808	7/31/1875	(*)	56	66
18. Grant (R)	1869-1877	Ohio	4/27/1822	7/23/1885	Methodist	46	63
19. Hayes (R)	1877-1881	Ohio	10/4/1822	1/17/1893	Methodist	54	70
20. Garfield (R) ⁶	1881	Ohio	11/19/1831	9/19/1881	Disciples of Christ	49	49
21. Arthur (R)	1881-1885	Vt.	10/5/1830	11/18/1886	Episcopalian	50	56
22. Cleveland (D)	1885-1889	N.J.	3/18/1837	6/24/1908	Presbyterian	47	71
23. B. Harrison (R)	1889-1893	Ohio	8/20/1833	3/13/1901	Presbyterian	55	67
24. Cleveland (D) ⁷	1893-1897	—	—	—	—	55	—
25. McKinley (R) ⁸	1897-1901	Ohio	1/29/1843	9/14/1901	Methodist	54	58
26. T. Roosevelt (R)	1901-1909	N.Y.	10/27/1858	1/6/1919	Reformed Dutch	42	60
27. Taft (R)	1909-1913	Ohio	9/15/1857	3/8/1930	Unitarian	51	72
28. Wilson (D)	1913-1921	Va.	12/28/1856	2/3/1924	Presbyterian	56	67
29. Harding (R) ⁹	1921-1923	Ohio	11/2/1865	8/2/1923	Baptist	55	57
30. Coolidge (R)	1923-1929	Vt.	7/4/1872	1/5/1933	Congregationalist	51	60
31. Hoover (R)	1929-1933	Iowa	8/10/1874	10/20/1964	Quaker	54	90
32. F. D. Roosevelt (D) ⁹	1933-1945	N.Y.	1/30/1882	4/12/1945	Episcopalian	51	63
33. Truman (D)	1945-1953	Mo.	5/8/1884	12/26/1972	Baptist	60	88
34. Eisenhower (R)	1953-1961	Tex.	10/14/1890	3/28/1969	Presbyterian	62	78
35. Kennedy (D) ⁴	1961-1963	Mass.	5/29/1917	11/22/1963	Roman Catholic	43	46
36. L. B. Johnson (D)	1963-1969	Tex.	8/27/1908	1/22/1973	Disciples of Christ	55	64
37. Nixon (R) ⁸	1969-1974	Calif.	1/9/1913	—	Quaker	56	—
38. Ford (R)	1974-1977	Neb.	7/14/1913	—	Episcopalian	61	—
39. Carter (D)	1977-1981	Ga.	10/1/1924	—	Southern Baptist	52	—
40. Reagan (R)	1981-—	Ill.	2/6/1911	—	Disciples of Christ	69	—

1. F—Federalist; DR—Democratic-Republican; D—Democratic; W—Whig; R—Republican; U—Union. 2. No party for first election. The party system in the U.S. made its appearance during Washington's first term. 3. Died in office. 4. Assassinated in office. 5. The Republican National Convention of 1864 adopted the name Union Party. It renominated Lincoln for President; for Vice President it nominated Johnson, a War Democrat. Although frequently listed as a Republican Vice President and President, Johnson undoubtedly considered himself strictly a member of the Union Party. When that party broke apart after 1868, he returned to the Democratic Party. 6. Johnson was not a professed church member; however, he admired the Baptist principles of church government. 7. Second nonconsecutive term. 8. Resigned Aug. 9, 1974.

Vice Presidents

Name and (party) ¹	Term	State of birth	Birth and death dates	President served under
1. John Adams (F) ²	1789-1797	Massachusetts	1735-1826	Washington
2. Thomas Jefferson (DR)	1797-1801	Virginia	1743-1826	J. Adams
3. Aaron Burr (DR)	1801-1805	New Jersey	1756-1836	Jefferson
4. George Clinton (DR) ³	1805-1812	New York	1739-1812	Jefferson and Madison
5. Elbridge Gerry (DR) ³	1813-1814	Massachusetts	1744-1814	Madison
6. Daniel D. Tompkins (DR)	1817-1825	New York	1774-1825	Monroe
7. John C. Calhoun ⁴	1825-1832	South Carolina	1782-1850	J. Q. Adams and Jackson
8. Martin Van Buren (D)	1833-1837	New York	1782-1862	Jackson
9. Richard M. Johnson (D)	1837-1841	Kentucky	1780-1850	Van Buren
10. John Tyler (W) ⁵	1841	Virginia	1790-1862	W. H. Harrison
11. George M. Dallas (D)	1845-1849	Pennsylvania	1792-1864	Polk
12. Millard Fillmore (W) ⁶	1849-1850	New York	1800-1874	Taylor
13. William R. King (D) ⁷	1853	North Carolina	1786-1853	Pierce
14. John C. Breckinridge (D)	1857-1861	Kentucky	1821-1875	Buchanan

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TO: CHRISTINA MARTIN

WESTINGHOUSE SCIENCE AWARDS (Curt Smith)

IT'S A PLEASURE TO BE HERE AT THE SUPER BOWL OF SCIENCE.

IT'S PRETTY HARD FOR ME TO CLAIM I'M VERY ADEPT AT SCIENCE OR HIGH-TECH WHEN MY GRANDKIDS KEEP BEATING ME AT "NINTENDO."

ONE DAY MY SCIENCE TEACHER TOOK ME ASIDE AND SAID "WHATEVER YOU DO IN LIFE I HOPE YOU'LL HOLD THE TORCH HIGH -- AS LONG AS IT ISN'T A BUNSEN BURNER."

AN
DESPITE MY LACK OF PROFICIENCY IN SCIENCE, I DID TRY ~~ANOTHER~~ EXPERIMENT A COUPLE OF YEARS AGO THAT I'M A LITTLE PROUD OF. I CONNECTED A VCR TO A MICROWAVE OVEN AND WATCHED "GONE WITH THE WIND" IN ABOUT 12½ MINUTES.

BRILLIANT YOUNG AMERICANS LIKE THE 40 WE HAVE WITH US TODAY WILL BE REACHING FOR THE STARS, SO THAT FUTURE GENERATIONS OF AMERICANS MAY SOMEDAY STAND ON THEM.

ADVANCEMENTS IN SCIENCE ARE RESPONSIBLE FOR THE HIGH-TECH EQUIPMENT THAT HAS SERVED OUR MILITARY SO WELL IN THE PERSIAN GULF. IF THE CAUSE OF PEACE IS TO CONTINUE BEING SERVED BY AMERICAN MILITARY POWER, IT MUST CONTINUE BEING ADVANCED BY AMERICAN BRAIN POWER.

VOLUME 16

Jefferson to Latin

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since its destruction by an earthquake in 1933. Its port is at Mandrakion.

Ancient Kos is mentioned in the *Iliad* as an ally of the Greeks. It was settled by Dorian Greeks from the northern Peloponnesus and became the birthplace of Ptolemy II (Ptolemy Philadelphus), the poet Theocritus, the painter Apelles, and the physician Hippocrates, who founded a school of medicine there. It was occupied by Alexander the Great in 336 B.C. and in the ensuing centuries was controlled by Persians, Greeks, Egyptians, and Romans. It was captured by the Ottoman Turks in 1523, occupied by Italy in 1912, and was ceded to Italy by the Treaty of Lausanne in 1924 and then to Greece by the treaty of peace with Italy in 1947. Population: (1971) of the island, 17,939; of the city, 7,828.

KOSCIUSKO, Mount, kos-ë-us'kō, a mountain in southeastern New South Wales, Australia. It is located in the Snowy Mountains of the Australian Alps and, with an altitude of 7,305 feet (2,228 meters), is Australia's highest peak. It is snow-covered from May to September and bears evidence of Ice Age glaciation. The Snowy, Murray, and other rivers that form important units in the Snowy Mountains Hydro-Electric Scheme are fed by its snows.

The mountain was named by Sir Paul Strzelecki in 1840 after the Polish patriot Tadeusz Kościuszko. It rises in Kosciuszko National Park, a preserve of about 2,070 square miles (5,370 sq km), and is a major ski resort during the winter.

KOŚCIUSZKO, kōsh-choōsh'kō, Tadeusz Andrzej Bonawentura (1746–1817), Polish statesman and soldier, who fought in the American Revolution and led an uprising for national independence in his homeland.

Tadeusz (often written Thaddeus in English) Kościuszko was born in the Polish village of Merochowszczyzna on Feb. 4, 1746, to a family of noble origin. He began his military education at the Warsaw Corps of Cadets and then continued it in Germany, France, and Italy, specializing in fortification. He returned to Poland in 1774.

In 1776 he fled to France to escape the consequences of a love affair. He went on to America and joined the colonists in their war for independence from Britain. From 1778 to 1780 he supervised the fortification of West Point, and he later served under Gen. Nathanael Greene as an engineer and a cavalry officer. He ended the war as a brigadier general. Kościuszko's involvement in America's struggle for independence influenced his later life.

He returned to Polish service in 1784 and in 1792 led Polish troops against Russian forces that had invaded Poland to suppress the reformist constitution of May 3, 1791. When the Russians completed their occupation of Poland and forced Poland's King Stanisław II to renounce the constitution, Kościuszko went into exile. An underground resistance movement was formed in Poland in 1793 and Kościuszko was asked to lead it. Before a tumultuous gathering in Kraków in 1794, he vowed to restore Poland's independence. In his role as political and military head of the Polish insurrection, he exercised virtually dictatorial power. To promote greater equality throughout Polish society he issued the *Połaniec* Proclamation on May 7, 1794, which declared the serfs free. In April 1794 he routed the Russians



General Kościuszko figured prominently in both the American and the Polish struggles for independence.

at Racławice, leading an army that included peasants wielding pikes and scythes. But in October the Polish army was beaten at Maciejowice, where Kościuszko was wounded and taken prisoner. The insurrection collapsed and the national partition of Poland took place. Kościuszko was imprisoned in Russia until 1796.

In 1797 he traveled to the United States and established a lasting friendship with Thomas Jefferson. He hastened back to Europe in 1798 where the ferment caused by the rise of Napoleon encouraged him to believe he could advance Poland's cause. He discovered, however, that a restored democratic Poland did not suit the goals of any European power. His proposal to Czar Alexander I in 1814 to establish a large Polish state with a liberal social order was also ignored. After this rebuff Kościuszko retired to Solothurn, Switzerland, where he died on Oct. 15, 1817. He was buried in Kraków's cathedral alongside the Polish kings.

Kościuszko's life spanned the entire era of 18th century democratic revolutions, of which he remains an outstanding figure. It is an irony of history that his ideas were ahead of their time in his own homeland.

PETER CZAP, JR., Amherst College
(1920; rev. ed., Norton 1942); *Stanisław M. Kosciuszko* (1920; rev. ed., Norton 1942); *Hamman, Mieczysław, Kosciuszko in the American Revolution* (1943; reprint, Kosciuszko Foundation 1975); *id., Kosciuszko, Leader and Exile* (1946; reprint, Kosciuszko Foundation 1975).

KOSHER, kō'shər, in Judaism, a term that designates whether foods individually or in combination, or their mode of preparation or processing, are in accordance with biblical and rabbinical rules. The term *kosher* (the Ashkenazic form of *Kasher*) means "clean" or "proper" and the system of dietary laws is known as *kashrut*. Orthodox and Conservative Jews are obliged by tradition to "keep kosher," whereas Reform Jews are not. See **DIETARY LAWS**.

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EDITED BY

JOHN P. FOLEY

WITH AN INTRODUCTION BY

JULIAN P. BOYD

VOLUME TWO

"I have sworn upon the altar of God eternal hostility against
every form of tyranny over the mind of man."—*Thomas Jefferson*

NEW YORK / RUSSELL & RUSSELL

ginia] which prescribes the selection of the youths of genius from among the classes of the poor, we hope to avail the State of those talents which nature has sown as liberally among the poor as the rich, but which perish without use, if not sought for and cultivated.—NOTES ON VIRGINIA. viii, 390. FORD ED., iii, 254. (1782.) See GENIUS.

7723. SCHOOLS, Government of.—If it is believed that the elementary schools will be better managed by the Governor and Council, the Commissioners of the Literary Fund, or any other general authority of the government, than by the parents within each ward, it is a belief against all experience.—To JOSEPH C. CABELL. vi, 543. (1816.)

7724. SCHOOLS, History in.—At these [Virginia public] schools shall be taught reading, writing, and common arithmetic, and the books which shall be used therein for instructing the children to read shall be such as will, at the same time, make them acquainted with Græcian, Roman, English, and American history.—DIFFUSION OF KNOWLEDGE BILL. FORD ED., ii, 223. (1779.)

7725. SCHOOLS, Trustees.—I have received your favor, informing me that the Board of Trustees for the public school in Washington had unanimously reappointed me their President. I pray you to present to them my thanks for the mark of their confidence, with assurances that I shall at all times be ready to render to the institution any services which shall be in my power.—To ROBERT BRENT. v, 196. (M., Sep. 1807.)

7726. SCHOOLS, Visitors.—I had formerly thought that visitors of the school might be chosen by the county, and charged to provide teachers for every ward, and to superintend them. I now think it would be better for every ward to choose its own resident visitor, whose business it would be to keep a teacher in the ward, to superintend the school, and to call meetings of the ward for all purposes relating to it: their accounts to be settled, and wards laid off by the courts. I think ward elections better for many reasons, one of which is sufficient, that it will keep elementary education out of the hands of fanaticising preachers, who, in county elections, would be universally chosen, and the predominant sect of the county would possess itself of all its schools.—To JOSEPH C. CABELL. vii, 189. FORD ED., x, 167. (P.F., 1820.)

7727. SCHOOLS, Wealth and.—In the elementary bill they [the Legislature] inserted a provision which completely defeated it; for they left it to the court of each county to determine for itself when this act should be carried into execution within their county. One provision of the bill was that the expenses of these schools should be borne by the inhabitants of the county, every one in proportion to his general tax rate. This would throw on wealth the education of the poor; and the justices, being generally of the more wealthy class, were unwilling to incur that burden, and I believe it was not suffered to commence in a single county.—AUTORIOGRAPHY. i, 48. FORD ED., i, 67. (1821.) See ACADEMY, EDUCATION, LANGUAGES, and UNIVERSITY.

7728. SCIENCE, Acquirement of.—The possession of science is, what (next to an honest heart) will above all things render you dear to your friends, and give you fame and promotion in your own country.—To PETER CARR. i, 395. (P., 1785.)

7729. SCIENCE, American field of.—What a field have we at our doors to signalize ourselves in. The Botany of America is far from being exhausted, its Mineralogy is untouched, and its Natural History or Zoology, totally mistaken and misrepresented. As far as I have seen, there is not one single species of terrestrial birds common to Europe and America, and I question if there be a single species of quadrupeds. (Domestic animals are to be excepted.) It is for such institutions as that [Harvard] over which you preside so worthily to do justice to our country, its productions and its genius. It is the work to which the young men whom you are forming should lay their hands. We have spent the prime of our lives in procuring them the precious blessing of liberty. Let them spend theirs in showing that it is the great parent of science and of virtue; and that a nation will be great in both, always in proportion as it is free.—To DR. WILLARD. iii, 16. (P., 1789.)

7730. SCIENCE, Common property.—The field of knowledge is the common property of mankind, and any discoveries we can make in it will be for the benefit of yours and of every other nation, as well as our own.—To HENRY DEARBORN. v, 111. FORD ED., ix, 86. (W., 1807.)

7731. SCIENCE, Delight in.—Nature intended me for the tranquil pursuits of science, by rendering them my supreme delight.—To DUPONT DE NEMOURS. v, 432. (W., March 2, 1809.)

7732. SCIENCE, Elementary works.—I have received a copy of your mathematical principles of natural philosophy, which I have looked into with all the attention which the rust of age and long continued avocations of a very different character permit me to exercise. I think them entirely worthy of approbation, both as to matter and method, and for their brevity as a text book; and I remark particularly the clearness and precision with which the propositions are enounced and, in the demonstrations, the easy form in which ideas are presented to the mind, so as to be almost intuitive and self-evident. Of Cavallo's book, which you say you are enjoined to teach [in William and Mary College], I have no knowledge, having never seen it; but its character is, I think, that of mere mediocrity; and, from my personal acquaintance with the man, I should expect no more. He was heavy, capable enough of understanding what he had read, and with memory to retain it, but without the talent of digestion or improvement. But, indeed, the English generally have been very stationary in latter times, and the French, on the contrary, so active and successful, particularly in preparing elementary books, in the mathematical and natural sciences, that those who wish for instruction, without caring from what nation they get it, resort universally to the latter language. Besides the earlier and invaluable works of Euler and Bezout, we have latterly that of Lacroix in mathematics, of Legendre in geometry, Lavoisier in chemistry, the elementary works of Haüy in physics, Biot in experimental physics and physical astronomy, Dumeril in natural history, to say nothing of many detached essays of Monge and others, and the transcendent labors of Laplace. I am informed by a highly instructed person recently from Cambridge, that the mathematicians of that institution, sensible of being in the rear of those of the continent, and ascribing the cause much to their too long-continued preference of the geometrical over the analytical methods,

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which the French have so much cultivated and improved, have now adopted the latter; and that they have also given up the fluxionary, for the differential calculus. To confine a school, therefore, to the obsolete work of Cavallo, is to shut out all advances in the physical sciences which have been so great in latter times.—To PATRICK K. RODGERS. vii, 327. (M., 1824.)

7733. SCIENCE, Encouragement of.—I am for the encouraging the progress of science in all its branches; and not for raising a hue and cry against the sacred name of philosophy; for awing the human mind by stories of raw-head and bloody bones to a distrust of its own vision, and to repose implicitly on that of others; to go backward instead of forward to look for improvement; to believe that government, religion, morality, and every other science were in the highest perfection in the ages of the darkest ignorance, and that nothing can ever be devised more perfect than what was established by our forefathers.—To ELBRIDGE GERRY. iv, 269. FORD ED., vii, 328. (Pa., 1799.)

7734. SCIENCE, Mother of freedom.—Freedom, the first-born daughter of science.—To M. D'IVERNOIS. iv, 113. FORD ED., vii, 3. (M., Feb. 1795.)

7735. SCIENCE, Objects of.—The main objects of all science are the freedom and happiness of man.—To GENERAL KOSCIUSKO. v, 500. (M., 1810.) *Polish American Freedom Fighter*

7736. SCIENCE, Pursuit of.—On the revival of letters, learning became the universal favorite [pursuit]. And with reason, because there was not enough of it existing to manage the affairs of a nation to the best advantage, nor to advance its individuals to the happiness of which they were susceptible, by improvements in their minds, their morals, their health, and in those conveniences which contribute to the comfort and embellishment of life. All the efforts of the society, therefore, were directed to the increase of learning, and the inducements of respect, ease, and profit were held up for its encouragement. Even the charities of the nation forgot that misery was their object, and spent themselves in founding schools to transfer to science the hardy sons of the plow. To these incitements were added the powerful fascinations of great cities. These circumstances have long since produced an overcharge in the class of competitors for learned occupation, and great distress among the supernumerary candidates; and the more, as their habits of life have disqualified them for reentering into the laborious class. The evil cannot be suddenly, nor perhaps ever entirely cured: nor should I presume to say by what means it may be cured. Doubtless there are many engines which the nation might bring to bear on this object. Public opinion, and public encouragement are among these.—To DAVID WILLIAMS. iv, 513. (W., 1803.)

7737. SCIENCE, Republican government and.—Science is more important in a republican than in any other government.—To ———. vii, 221. (M., 1821.)

7738. ———. Science is important to the preservation of our republican government and it is also essential to its protection against foreign power.—To ———. vii, 222. (M., 1821.)

7739. SCIENCES, Distribution of the.—I have received the copy of your System of Universal Science. * * * It will be a monument of the learning of the author and of the

analyzing powers of his mind. * * * These analytical views indeed must always be ramified according to their object. Yours is on the great scale of a methodical encyclopedia of all human sciences, taking for the basis of their distribution, matter, mind, and the union of both. Lord Bacon founded his first great division on the faculties of the mind which have cognizance of these sciences. It does not seem to have been observed by any one that the origination of this division was not with him. It had been proposed by Charron, more than twenty years before, in his book de la Sagesse. B. i. c. 14, and an imperfect ascription of the sciences to these respective faculties was there attempted. This excellent moral work was published in 1600. Lord Bacon is said not to have entered on his great work until his retirement from public office in 1621. Where sciences are to be arranged in accommodation to the schools of an university, they will be grouped to coincide with the kindred qualifications of professors in ordinary. For a library, which was my object, their divisions and subdivisions will be made such as to throw convenient masses of books under each separate head. Thus, in the library of a physician, the books of that science, of which he has many, will be subdivided under many heads; and those of law, of which he has few, will be placed under a single one. The lawyer, again, will distribute his law books under many subdivisions, his medical under a single one. Your idea of making the subject matter of the sciences the basis of their distribution, is certainly more reasonable than that of the faculties to which they are addressed. * * *

Were I to re-compose my tabular view of the sciences, I should certainly transpose a certain branch. The naturalists, you know, distribute the history of nature into three kingdoms or departments: zoology, botany, mineralogy. Ideology, or mind, however, occupies so much space in the field of science, that we might perhaps erect it into a fourth kingdom or department. But, inasmuch as it makes a part of the animal construction only, it would be more proper to subdivide zoology into physical and moral. The latter including ideology, ethics, and mental science generally, in my catalogue, considering ethics, as well as religion, as supplements to law in the government of man. I had them in that sequence. But certainly the faculty of thought belongs to animal history, is an important portion of it, and should there find its place.—To MR. WOODWARD. vii, 338. (M., 1824.)

— **SCIENTIFIC SOCIETIES.**—See SOCIETIES, SCIENTIFIC.

— **SCIPIO.**—See ORATORY.

— **SCREW PROPELLER.**—See INVENTIONS.

7740. SCULPTURE, Style.—As to the style or costume [for a statue of General Washington], I am sure the artist, and every person of taste in Europe, would be for the Roman. * * * Our boots and regimentals have a very puny effect.—To NATHANIEL MACON. vi, 535. (M., 1816.)

7741. SEAMEN, American.—The seamen which our navigation raises had better be of our own. It is neither our wish nor our interest ever to employ [those of England].—To WILLIAM SHORT. vi, 128. (M., June 1813.)

7742. SEAMEN, Distressed.—Another circumstance which claims attention, as directly affecting the very source of our navigation, is

Think of the thousands of specialized developments that have gone on to benefit us all, shifting between military and civilian applications. Think of the first radar, bouncing signals from ship to shore just before the Second World War -- we use it today in traffic management and lifesaving rescue operations. And during World War II, the results of nationwide medical research were used directly on the battlefields -- think of the great debt we owe to those pioneers in shock and burn treatment. Think of the stir caused by the revolutionary laser and its almost boundless uses today -- in eye surgery, in holographic images, in compact disc sound... and particularly in guiding many of the bombs whose outstanding performance ((or: "accuracy")) helped us achieve our objectives in the Gulf air war.

SEEKING
— *and Finding* —
SCIENCE TALENT

*A 50-Year History of the
Westinghouse Science Talent Search*



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A 50-Year History of the Westinghouse Science Talent Search

By Tom K. Phares

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PREFACE

The 50th Westinghouse Science Talent Search began in 1990. This unique competition was started in 1942 and it has gained in effectiveness and prestige until today it is recognized as the premier program of its kind.

To celebrate and record a half century of seeking out and encouraging the scientists of the future, this history has been written.

It is dedicated to the thousands of young people who have participated. Whether they reached the ranks of the 2,000 winners or not, all have won new knowledge, greater confidence and invaluable experience. We dedicate this also to their enthusiastic and selfless teachers and supportive parents without whom young people can lose their way, no matter how talented.

1 THE BEGINNING

Fifty years ago, the achievements of scientists who had opened the path for the industrial revolution — Thomas Edison, Alexander Graham Bell, Samuel Morse, the Wright brothers, Marie Curie, Louis Pasteur, Wilhelm Roentgen, George Washington Carver, Guglielmo Marconi, George Westinghouse, Nikola Tesla and many other men and women of genius — had gone into the history books.

Their discoveries and inventions, by early in the 20th century, had produced a new understanding of the universe, better health than mankind had ever known and material wealth and comfort never before possible.

“Everything’s up to date in Kansas City,” went the popular song. “They’ve gone about as far as they can go.”

But a new generation of scientists who dreamed of “going a lot farther” was in the wings awaiting its turn. And the minds of young Americans were eager to uncover new knowledge that again would revolutionize our lives.

How could these young minds best be stimulated and directed? How could the education and scientific communities recruit the talent that was out there?

Davis and Pendray's Idea

These questions concerned two men in particular in the late 1930s. Fortunately, these two possessed the intellect, the drive and the resources to do something about them.

Strangely enough, neither was a professional scientist, but both answered a calling to science journalism. One — Watson Davis — was a civil engineer who became a science writer, was the first science radio newscaster and for 33 years was director of Science Service. The other — G. Edward Pendray — was a journalist and a science editor who had moved from journalism to become a corporate communications executive.

They shared a strong interest in fostering better public understanding of science, and in finding and stimulating young people whose scientific talents might otherwise be lost to society.

Watson Davis of Science Service autographs the 1942 programs of the first two STS winners—Paul Teschan of Shorewood, Wisconsin, and Marina Prajmovsky of Farmingdale, New York.



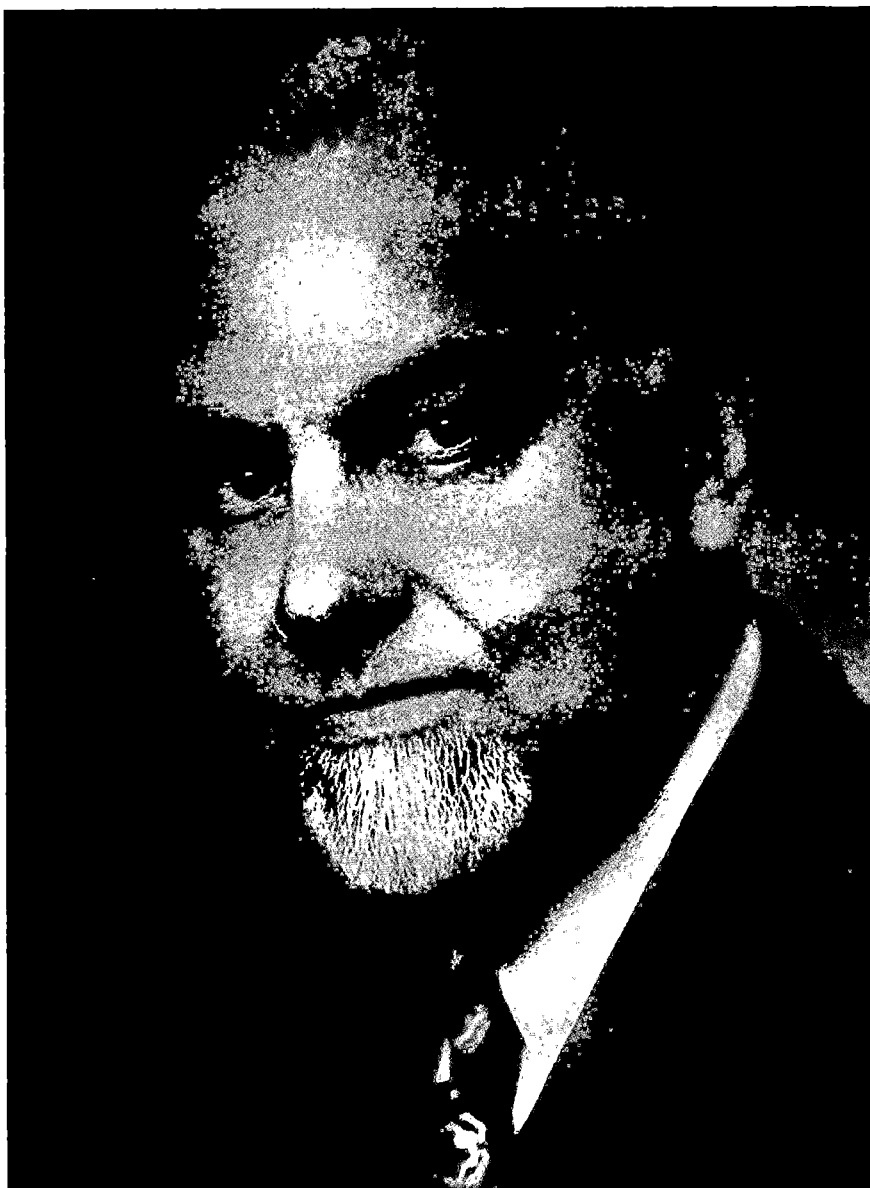
At Science Service, Davis had under his direction a unique institution. This nonprofit organization had been founded in 1921 by E.W. Scripps, of the Scripps-Howard newspapers. For years, Scripps had worried about the chasm between actual scientific achievement and the public knowledge and understanding of it. In those days a scientist often was characterized in the press as a funny little man with a beard spending a life among test tubes doing work no one else could possibly understand. Intrigued by the challenge to accurately interpret science to the public, Watson Davis joined Science Service in 1922 and became its director in 1933.

Ed Pendray was a reporter and science editor for the New York Herald Tribune from 1925 to 1932, then science editor of the Literary Digest magazine before joining Westinghouse in 1936 as assistant to the president in charge of advertising and public relations. Known for his writings on the possibilities of rocket power and space flight, he had founded the American Rocket Society, which later became incorporated into the American Institute of Aeronautics and Astronautics.

In a 1931 interview Pendray declared: "If shooting rockets across the Atlantic is feasible, there is no obstacle to shooting them to another planet with the moon as a beginner."

Creates STS Forerunner

Soon after moving to Pittsburgh, Pendray lost no time in addressing the need he perceived to seek out young people of scientific and engineering talent. In 1938, he established a national Westing-



G. Edward Pendray of Westinghouse, who shared with Watson Davis the dream of finding and encouraging young scientists of the future.

(Photo courtesy of The New York Times)

house competition to identify 10 leading high school seniors who were awarded tuition, room and board to attend Carnegie Institute of Technology (now Carnegie Mellon University) in the Westinghouse hometown of Pittsburgh. The eight surviving members of that first group celebrated their 50th anniversary at a Pittsburgh dinner in September 1988.

But Pendray saw this as only a beginning. While science editor of the New York Herald Tribune, he had become a member of the American Institute of the City of New York. The Institute held an annual Science Fair under the direction of Margaret Patterson — an event that was stimulating interest in science among the New York City high schools. Aware that the Institute needed more funding, Pendray obtained from Westinghouse a series of annual grants to help support it. The support included one new feature — a season-long exhibition of the Institute's Science Fair in the Westinghouse building at the New York World's Fair in 1939.

Science "Too Important to Neglect"

It was during the World's Fair that Pendray and Davis first met and began discussing ways and means of expanding this youth science work nationwide. They learned that of the 25,000 U.S. high schools then in existence, fewer than 1,000 had trained science teachers or even rudimentary science courses. In many places, teaching "science" was the responsibility of an athletic coach.

"Watson and I agreed," said Pendray years later, "that science was too important for the nation and the coming generation to be

neglected in the high schools. We perceived that the American Institute youth activity offered a practical way of calling nationwide attention to the need, as well as for stirring the enthusiasm of young people for science careers.

“The American Institute, being limited to New York City, could not do the national job, so Science Service, which was admirably suited to the task, agreed in 1940 to undertake it, with financial support from Westinghouse.

“Needed, however,” Pendray continued, “was some sort of a promotional program for widely dramatizing the Science Clubs and calling national attention to them. In a series of luncheon meetings in Washington and New York, Watson and I addressed ourselves to this problem, and out of these discussions grew the idea of the Science Talent Search.”

By the spring of 1941, Pendray and Davis developed their plan to the point where they could make cost estimates. Then Pendray wrote a proposal and presented it to Andrew W. Robertson, then Westinghouse chairman and chief executive officer.

“Mr. Robertson, a most unusual and farsighted man, was enthusiastic about the proposal and backed it,” said Pendray. “A grant for the first year was forthcoming.”

E. G. Sherburne, Jr., president, Science Service, Dorothy Schriver, assistant director and Carol Luszcz who succeeded Mrs. Schriver as STS program director. Dorothy Schriver retired in 1989.

That first year's grant to cover scholarships and administrative costs was for \$25,000. It started something. In 50 years, the Westinghouse Educational Foundation has provided more than \$2.5 million in scholarships and cash awards to 2,000 students.

The Patterson and Schriver Stewardship

To launch the first Westinghouse Science Talent Search, Davis lost no time in recruiting the American Institute's Margaret Patterson to be the "housemother" of the program. In that role, "this remarkably able young woman," as Pendray later described her, directed the program for 17 years.

Also involved from the beginning was a talented young secretary and assistant to Davis — Dorothy Reynolds. This dedicated, personable woman, Dorothy Reynolds Schriver, was to take over full





Paul E. Lego, president (left) and John C. Marous, chairman of Westinghouse, pose in 1989 with fourth place winner Stacy Benjamin (second from left) of Cambria Heights, N.Y., and first place winner Christopher Skinner of Little Rock, Ark.

direction of the program in 1958 and continue in that key responsibility for the next 28 years. She worked closely with E. G. Sherburne, Jr., who succeeded Watson Davis as Director of Science Service shortly before Davis died in 1967. In 1986, Dorothy Schriver turned direction of the Search over to Carol Luszcz. Mrs. Schriver continued, however, as Assistant Director of Science Service and Program Director of the International Science and Engineering Fair until her retirement in 1989.

Davis and Pendray asked Dr. Harold A. Edgerton, a noted psychologist then at Ohio State University, to serve as chairman of the program's first Board of Judges.

As the longest-running program of its kind in the nation's history, financial support for the Science Talent Search has withstood the inevitable pressures of corporate existence. Said Pendray two decades ago:

“Establishment of the Westinghouse Educational Foundation, without which the STS and a number of other Westinghouse educational projects probably would not have survived the economic ups and downs of the intervening years, came three or four years after the Science Talent Search. The Educational Foundation has provided continuing support to numerous other Westinghouse educational activities, including professorships, graduate fellowships, university scholarships and other Westinghouse sponsored projects such as the AAAS-Westinghouse Science Writing Awards.”

Today the Westinghouse Foundation continues to provide the money for the scholarships and administration of the program. The top scholarship in the first Search in 1942 was \$2,400. The top scholarship as the 50th Search began was \$20,000. That \$20,000 award was the largest non-restricted — “no strings attached” — scholarship available to any high school senior in America.

2 THE WINNERS

Very early in the morning of Oct. 15, 1979, Dr. Sheldon Glashow's telephone rang in Brookline, Mass.

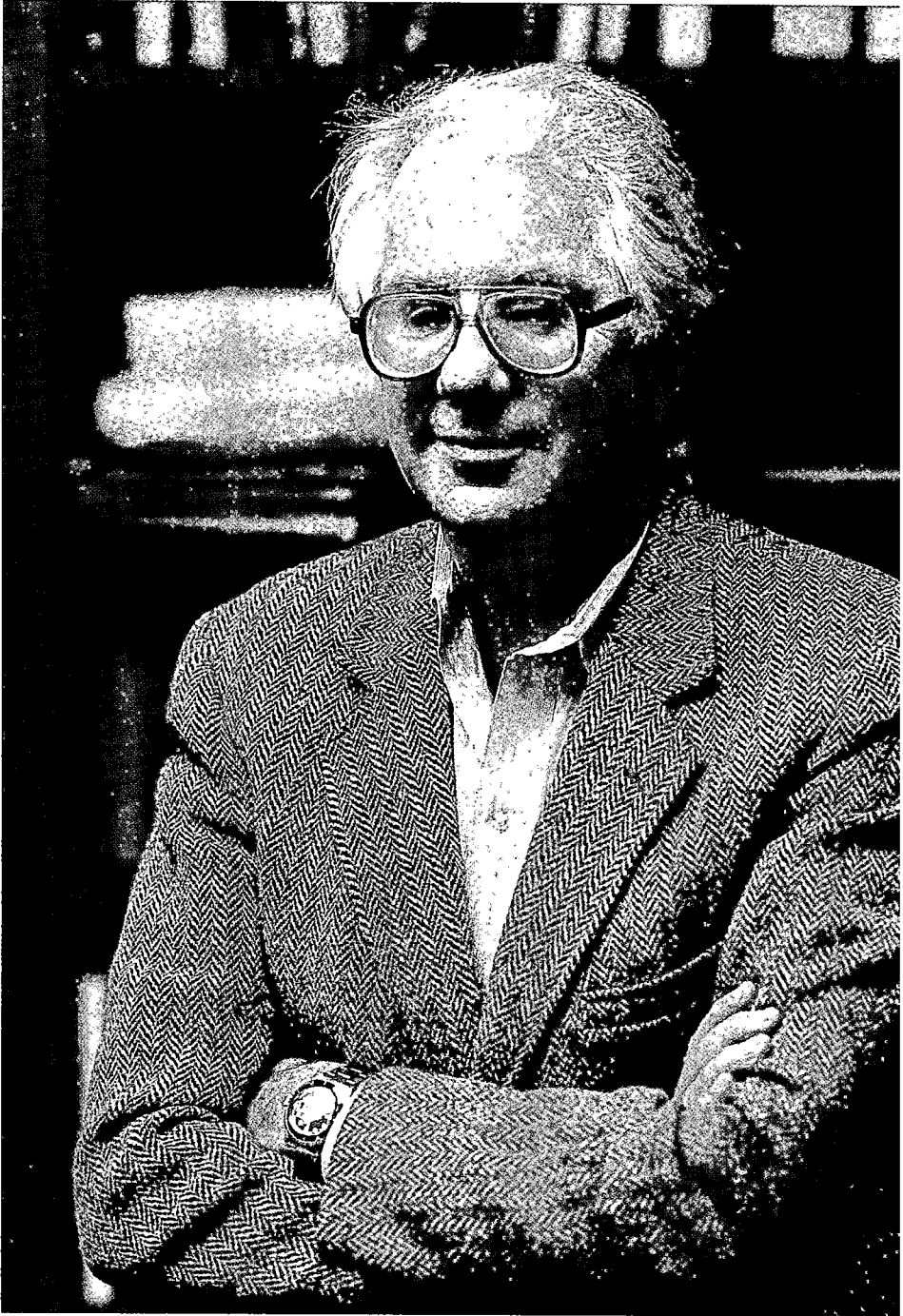
"Someone wanted to know if I would let the listeners of radio station WEEI know how I felt about winning the Nobel Prize," he relates. "Thinking, could this be true? I mumbled, 'I feel sleepy' and hung up."

But the phone rang again. It was true. He and another Harvard colleague, along with a noted Pakistani physicist, had been awarded the Nobel Prize for Physics.

This was this same Sheldon Glashow who, at age 17, had been one of the 40 winners of the Westinghouse Science Talent Search in 1950. His Harvard colleague who shared the Nobel Prize was Steven Weinberg. Both young men were graduates of the same high school in New York City — Bronx High School of Science.

Dr. Glashow, Higgins Professor of Physics at Harvard, is one of five Science Talent Search winners who have won the Nobel Prize. Two others have won the Fields Medal, highest honor in the field of mathematics which, by happenstance, Alfred Nobel did not provide for in his will.

Equally remarkable, eight STS alumni have won MacArthur Foundation Fellowships, the so-called "genius awards" that grant



Dr. Sheldon L. Glashow, STS '50, is one of five former winners to become a Nobel Laureate. He is the Higgins Professor of Physics at Harvard and won the Nobel Prize for Physics in 1979.

large sums for unrestricted use by the recipient. Fifty-one have been named Sloan Research Fellows and 28 have been elected to the National Academy of Sciences.

Of the 2,000 finalists in the half century of Science Talent Searches, 7 out of 10 who are old enough have earned a Ph.D. or M.D. Virtually all have carved out successful careers.

Who are these remarkable people and where did they come from?

Crème de la Crème

They represent the cream of more than 100,000 high school seniors who have entered the Westinghouse competition since 1942. They are selected this way:

Each student submits a report on an independent research project along with other entry data that include grades, test scores and teacher recommendations. These entries — about 1,400 are received each year — are reviewed by a panel of evaluators and the Board of Judges.

Then a process of elimination begins. The top 300 entrants are selected for the semifinalist, or “honors” group. All of these students are recommended to colleges and universities for admission and financial assistance.

From these 300 honorable mentions are selected the 40 national winners who receive a five-day trip to Washington, D.C., where they are recognized as the nation’s most promising young scientists. During these five days, the Board of Judges conducts a series of interviews and 10 top scholarship winners are selected.

Provided by the Westinghouse Foundation, the scholarships and awards begin with a \$20,000 scholarship for the top winner. Second- and third-place winners each receive \$15,000 scholarships. The next three win \$10,000 and four receive \$7,500. The other 30 finalists are awarded \$1,000 scholarships, in addition to their Washington trip.

Over the years the winners have represented a changing cross-section of intelligent and motivated teenagers.

Roald Hoffmann, STS '55

From this unique group of achievers, Roald Hoffmann was one of the most remarkable. He was just six years old when his father smuggled him and his mother out of a Nazi labor camp in Poland and hid them in a school house attic until they were freed in June 1944. The father was killed by the Nazis a year before liberation came. Most of his family suffered a similar fate.

Roald and his mother moved from Poland to Czechoslovakia in 1946, then to displaced persons' camps in Austria and Germany. They finally arrived in the United States on Washington's birthday, 1949. At this point, 11-year-old Roald learned English, his sixth language. After finishing grade school in Brooklyn, he attended what he describes as "the great Stuyvesant High School."

"In my day," he says, "most of the students (at Stuyvesant) were Jewish immigrants, first or second generation. They were an incredible group of young people. In fact, that run-down building held the largest concentration of intellectual talent I ever experienced,

including college at Columbia or graduate school at Harvard.”

Hoffmann recently revisited his old high school.

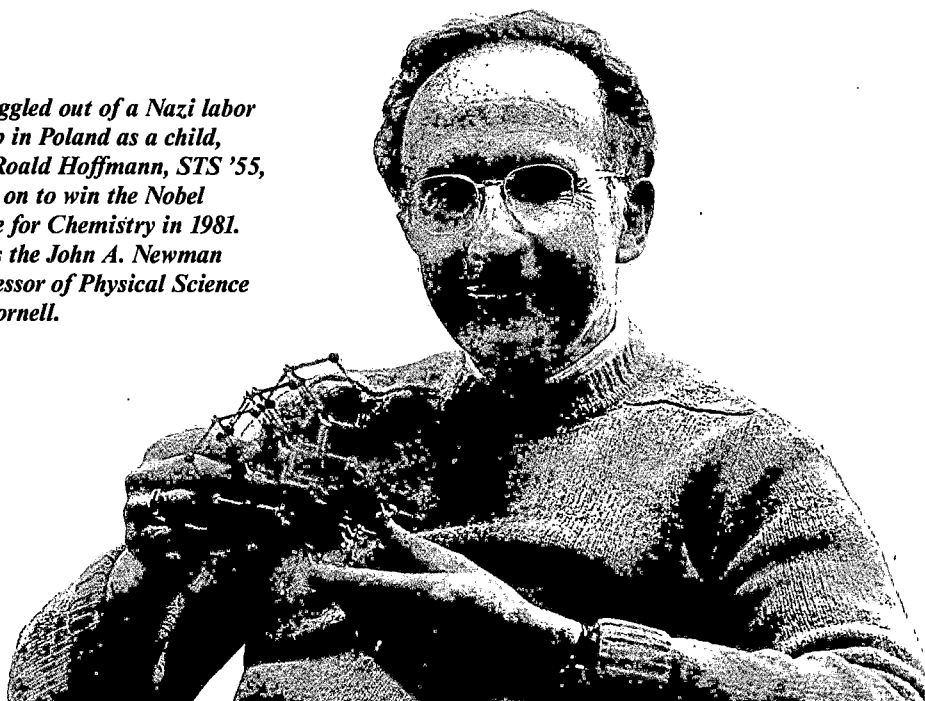
“There was a different bunch of kids,” he says. “Now nearly half seemed to be Asian-Americans. And just as bright.

“I’ll tell you, when someone asks what America should do to keep up the flow of scientists for industry and universities, the answer is obvious . . . liberalize the immigration laws. If we open our doors, we will never have trouble getting scientists and doctors.”

Hoffmann was a winner in the Science Talent Search in 1955. Through the Search, he relates, he got his first job in science — a summer job at the National Bureau of Standards. He went on to Columbia University as a pre-med student and Harvard graduate school where he earned his doctorate in chemistry.

In 1981, the Polish lad who escaped from the Nazis and came to America won the Nobel Prize for Chemistry, sharing it with a

Smuggled out of a Nazi labor camp in Poland as a child, Dr. Roald Hoffmann, STS '55, went on to win the Nobel Prize for Chemistry in 1981. He is the John A. Newman Professor of Physical Science at Cornell.



Japanese scientist in Kyoto. Since 1965 he has held an honored chair on the faculty at Cornell as the John A. Newman Professor of Physical Science.

When asked what he considers to be his major contribution, this brilliant Nobel Laureate replies:

“I am a teacher, and I am proud of it.”

Sheldon Glashow, STS '50

How are young people first attracted to science? Sheldon L. Glashow's interest stemmed from the science fiction books he found so fascinating as a lad during World War II and from a chemistry set his father gave him.

His father, Lev Glukhovsky, had left Czarist Russia in 1905 at the age of 16, a refugee from the pogrom-ridden town of Bobruisk, seeking new opportunity in a new land. Renamed Lewis Glashow by an anonymous immigration official, he sent for his family a few years later — among many others, his father, sister, five of seven brothers and his “kissing cousin” Bella. Bella later became his wife and Sheldon's mother.

That kind and supportive father, a plumber by trade, also agreed to build for Sheldon his own small chemistry lab by converting a basement closet in their house on Payson Avenue in New York's Inwood section in uptown Manhattan. Through his two brothers — a doctor and a dentist — Sheldon was able to obtain the test tubes, beakers and other tools of the laboratory — and above all, the chemicals.

From the New York Public Library, young Glashow copied out procedures for exotic chemical syntheses from old textbooks and attempted to carry them out in his basement lab. It was his experimenting with powdered selenium metal that eventually led to his winning entry in the Westinghouse Science Talent Search. He grew tomato seedlings in a hydroponic solution in his back yard, feeding some of the plants selenium to see if they would take it instead of sulfur in the growth process. Students at the Bronx High School of Science then, as now, were encouraged to enter “the Westinghouse,” which accounts for the large number of STS winners from that school over the years.

“We had a wonderful week in Washington,” Glashow recalls of his STS experience. “We shook hands with Harry S Truman and met a lot of big-shot scientists. I was not selected for one of the big-money prizes and came away with a mere \$100 scholarship award. Nevertheless, becoming an ‘STSer’ was a tremendous ego boost.

“The main thing is to stimulate interest and excitement about science, as the many science fairs also aim to do. But the Science Talent Search is the science fair of all science fairs.”

Glashow’s two close friends, Gerald Feinberg and Steven Weinberg, also entered “the Westinghouse” at the Bronx school. Feinberg won a place in the final 40 and later became a distinguished author and professor of physics at Columbia University. Weinberg, who shared the Nobel Prize with Glashow, became Josey Professor of Physics at the University of Texas in Austin.

Both Glashow and Weinberg applied for admission and were

accepted by Princeton, Cornell and MIT. They finally chose Cornell for a variety of largely unscientific reasons. Glashow was rejected only by Harvard — where he later became a distinguished faculty member.

His outstanding career in theoretical physics, in search of the basic elements and secrets of the “stuff the world is made of,” won him the Nobel Prize and many other honors. He told his personal story and the story of particle physics in a well-received book titled *Interactions*, which was published in 1988 by Warner Books.

Walter Gilbert, STS '49

Dr. Walter Gilbert, another Nobelist from the STS ranks, offers a contrasting background to Hoffmann and Glashow. His parents were born in the U.S. and young Walter was given his early education at home by his mother, who was a child psychologist. The family moved from the Boston area to Washington, D.C., in 1939 where his economist father joined the New Deal “brain trust” under Franklin D. Roosevelt’s close personal friend, the economist Harry Hopkins.

Walter’s interest in science surfaced early. He had a chemistry set by age 6 and was a collector of minerals and butterflies. A few years later, members of the Mineralogical Society of Washington were startled to learn that their newest member was only 11 years old.

During his high school years as a student at Sidwell Friends School in northwest Washington, young Walter describes his relationship with the school as “distant.”



“I spent most of my time playing hooky so I could read at the Library of Congress,” he admits. There he pored over science books that were unavailable to him elsewhere, attending class often enough to pass the tests. He was graduated from Sidwell Friends School with straight A’s.

He did a project in chemistry for his winning entry in the 1949 Westinghouse Science Talent Search. It concerned a one-step separation of zirconium and hafnium — metals important to the new field of nuclear energy. But, for exhibit purposes, he pursued another of his interests — astronomy — and built a small telescope.

Gilbert studied both chemistry and physics at Harvard and at Cambridge University in England. Gradually his interest in chemistry was overtaken by a fascination with physics. He taught theoretical physics at Harvard as an assistant professor until he again shifted gears and moved into biology research, starting in 1960.

His success in biophysics, biochemistry and molecular biology firmly established him in the biology field, and it was for his work in genetic engineering — DNA sequencing and handling techniques — that he won the Nobel Prize for Chemistry in 1980. He shared the prize with an English scientist at Cambridge University and another American at Stanford.

Dr. Walter Gilbert, STS '49, is the American Cancer Society Professor of Molecular Biology at Harvard. He won the Nobel Prize for Chemistry in 1980.

Mottelson, STS '44 and Cooper, STS '47

The first two Westinghouse Science Talent Search winners to capture the Nobel Prize were Ben Mottelson, STS 1944, and Leon Cooper, STS 1947.

A graduate of Lyons Township High School in La Grange, Ill., Mottelson was a young telescope maker when he won a place among the 40 STS winners. He went on to Purdue University to earn his bachelor's in physics, then continued at Harvard for his master's and doctor's degrees.

After receiving his Ph.D. from Harvard in 1950, he joined the faculty of the Institute of Theoretical Physics at the University of Copenhagen, Denmark.

Dr. Mottelson's work in nuclear physics in Copenhagen won him his Nobel Prize in 1975. He shared the award with a Danish scientist and another American from Columbia University.

Leon Cooper is a native New Yorker and another product of the Bronx High School of Science. He captured a place in the Science Talent Search winner's circle with research on bacterial resistance to penicillin. Dr. Cooper points out that this is an area of scientific effort that has brought, since that time, "incredible dividends." However, he did not pursue it after high school, turning instead to the study of physics.

Dr. Ben R. Mottelson, STS '44, won the Nobel Prize for Physics in 1975. He is on the faculty of the Institute of Theoretical Physics at the University of Copenhagen, Denmark.





Following this interest, he earned a Ph.D. from Columbia University in 1954. After several years on the faculty at the University of Illinois, then Ohio State, he moved to Brown University in 1958.

Dr. Cooper won the Nobel Prize for Physics in 1972 for his studies on the theory of superconductivity, completed while still in his 20s. In 1974, he was appointed the Thomas J. Watson, Sr., Professor of Science at Brown. His early years of research in nuclear physics and superconductivity were followed by investigations into neural networks and the biological basis of learning, working toward an understanding of memory and other brain functions.

The Girls Come Forward

With the all-star lineup of Science Talent Search alumni, what about the alumnae?

Early in its history, the Search made allowance for the fact that fewer girls were going into the sciences by judging their entries apart from those of the boys. In each of the first six years, a separate girl winner was named.

Then, as America's high schools began to produce more girls interested in science, the separate classification was dropped. Beginning with the STS of 1948, all entries competed on an equal footing — male and female.

***First Science Talent Search winner
to become a Nobel Laureate was
Dr. Leon N Cooper, STS '47, who won
the Nobel Prize for Physics in 1972.
He is the Thomas J. Watson, Sr.
Professor of Science at Brown.***

It wasn't until 1972, however, that a girl won the first place scholarship competing against all comers. Since then, five more have captured first prize. The girls have asserted their presence in the top ranks of science.

Nina Tabachnik (Schor), STS '72

They couldn't have had a better champion than the first one — Nina Tabachnik of Little Neck, New York. This talented 16-year-old, who had visions of a career in medical research, won top honors in the Science Talent Search with a project that determined the effects of certain kinds of air pollutant chemicals on plants that live in water.

Daughter of parents who “took me on long weekends visiting museums, libraries and attending concerts,” Nina discovered intellectual and cultural things “as a game,” long before she encountered them in any school curriculum.

She attended New York's Benjamin Cardozo High School, which, while not a specialized school, offered advanced placement courses and especially a two-year program in biological research that required a research report from each student. Nina's report on a study of aldehydes as an environmental hazard to plant life won her a place as one of the 40 finalists in the Science Talent Search.

In addition to her fascination with science, Nina loved music and literature. She became proficient on the piano and learned to play six other instruments. She composes music as well.

Her love of poetry led her to write and have printed several anthologies of poems.

After her triumph in Washington, Nina entered Yale. She found that university unique in that it offered a major that combined biology and chemistry. Also important to the young musician, it had a good music school.

She earned her bachelor of science degree in molecular biophysics and biochemistry, then pursued simultaneously a Ph.D. in medical biochemistry at Rockefeller University and an M.D. at Cornell University's medical college.

The first girl to win top honors in the Science Talent Search competing against "all comers" was Nina Tabachnik (Schor), STS '72. She and her husband are research scientists in Pittsburgh, Pa.



It was here that Nina met, and several years later married, Dr. Robert Schor, who had earned his Ph.D. in physiology at Rockefeller. Both Drs. Schor became research scientists in Pittsburgh, Nina doing research in pediatric neurology at Children's Hospital.

In the 1981-87 period, five young women won top honors in the Search — Lisa Joy Randall of Stuyvesant High School; Amy Sue Reichel of New York's Hunter College High School; Reena Beth Gordon of Midwood High School, Brooklyn; Wendy Kay Chung of Miami Killian Senior High School and Louise Chia Chang of the University of Chicago Laboratory Schools High School.

The Asian Wave

Just as Jewish refugees' children were in the forefront of the Science Talent Search winners in its early history, the children of Asian birth or parentage began crowding the list in the '80s.

In the decade 1979-88, 88 boys and girls born in Asia or of Asian parents were among the STS winners, including six first-place champions.

Actually, the first Asian-born student to win top STS honors was Arvind Srivastava in 1973. Born in Lucknow, India, Arvind came to this country with his father in 1959 at age three. His father was a professor at Colorado State University and Arvind became an STS winner at Poudre High School in Fort Collins with a mathematics project examining the possibility that the universe is finite rather than infinite.

After winning first prize in Washington, Arvind went on to Har-

vard and Indiana University where he earned two degrees in physics. He went on to study medicine at the University of California in San Francisco.

Riding the crest of the Asian wave as the first native Oriental to win the Science Talent Search top scholarship was Paul Chih Ning in 1983. Born in Taipei, Taiwan, in 1966, Paul was a math whiz at New York's Bronx High School of Science. Both of his parents had earned college degrees in sociology in Taiwan before the family came to the United States.

Paul discovered early a secret to success. In his Science Talent Search personal data blank, he wrote:

*First native Oriental to win
top prize in the STS was
Paul Chih Ning in 1983.
He was born in Taiwan.*



“I discovered, not to my surprise, that the only way to solve a problem is to sit down and concentrate on it for extended periods of time.”

Uninterrupted by TV, he could have added.

Paul went on to the Massachusetts Institute of Technology.

One of these Asian winners, Anh Tuan Nguyen-Huynh, lived a modern odyssey.

Anh was one of the Vietnam “boat people.” His father had been killed in the Vietnam War and the family fled their native Vietnam in 1981 to escape to Thailand. While living for a year in refugee camps, Anh studied English so he would be ready for life in America, if the family could get there.

They succeeded and settled in Chagrin Falls, Ohio, a Cleveland suburb. There Anh got his chance to study science in the laboratory at Cleveland Metropolitan General Hospital. His original research project on how magnesium and vitamin C interact with anti-psychotic drugs in the human brain and nervous system won him a place in the STS top 40. When the results of the judging were announced at the awards banquet in Washington in March 1986, Anh won a fifth place \$10,000 scholarship. He used it to enroll at Harvard and he is on his way to a career in biochemistry.

That same year, 1986, two young people tied for the top honors in the Westinghouse competition. Two \$20,000 scholarships were awarded. They went to Wei-Jing Zhu, who was born in Canton, China, and to Wendy Chung of Miami, Florida, whose father was Chinese and mother American.

That year, for the first time in the history of the Science Talent Search, the top five places went to students of Asian birth or parentage. The first-place winner in 1987 was Louise Chia Chang of Chicago, previously mentioned, and in 1988 it was Chetan Nayak of New York, whose parents came from India. Runner-up to Chetan was his classmate at New York's Stuyvesant High School, Janet Tseng, who was born in Taiwan.

Why the Asia trend? Observers discount the possibility of genetic advantages and point to other factors. These include a cultural emphasis on education and the hunger of this new wave of immigrants to win a place in the American dream through intellectual achievement with an emphasis on science.

The top five scholarships in 1986 went to students born in Asia or of Asian parentage. Left to right: Anh Tuan Nguyen-Huynh (5th) of Chagrin Falls, Ohio, Yoriko Saito (3rd) of Homewood, Ala., Wei-Jing Zhu (tie 1st) of Brooklyn, Wendy Kay Chung (tie 1st) of Miami, George Jer-Chi Juang (4th) of Queens, N.Y.



Fields Medal Winners

In the field of mathematics, the equivalent to a Nobel prize is the Fields Medal.

Legend has it that when the Swedish scientist and inventor Alfred Nobel drew up his will that established the five annual Nobel Prizes in physics, chemistry, physiology or medicine, literature, plus one for fostering peace among nations, he intended to provide one also in mathematics. But, it is said, he held a personal dislike for a prominent mathematician of his day. He worried that some day this man might win the prize. So, no Nobel prize in mathematics.

Two Science Talent Search winners have received its equivalent, the Fields Medal, highest honor in math. They are David B. Mumford, STS '53 and Paul J. Cohen, STS '50. Mumford also is one of eight STS alumni who have been awarded the highly coveted MacArthur Fellowships.

David Mumford, STS '53

Born in Sussex, England, of an English father and American mother, Mumford came to the U.S. at the age of 3. His maternal grandfather was an astronomy enthusiast, the other grandfather was a physician and his paternal grandmother majored in mathematics at Cambridge, where she was the first woman to earn a “double first” — highest honors in both her major and a minor subject. So interest in the sciences rubbed off on David at an early age.

He attended Phillips Exeter Academy in New Hampshire where, in the spring of 1951 a visiting lecturer described the elements of

an electronic computer. The seed was planted and the next fall David set to work designing and building a computer of his own.

His project won him a place in the STS top 40 and while in Washington he met Dr. Harlow Shapley, noted Harvard astronomer, who was one of the STS judges.

“He was a most impressive man, the first real scientist I had met, and that was very stimulating,” Mumford says.



Dr. David B. Mumford, STS '53, won the Fields Medal in Mathematics in 1974 and a MacArthur Fellowship in 1987. Relaxing here at his summer place on the coast of Maine, he is professor of mathematics at Harvard.

For two summers after his senior year at Exeter, the young man worked at the Westinghouse Atomic Power Division in Pittsburgh under Dr. Raymond R. Schiff, STS '43. He entered Harvard after the summer of 1953.

“At Harvard my role model was Professor George Mackey, who lived and breathed mathematics . . . completely dedicated,” says Dr. Mumford. Following that lead, he earned his Ph.D. in mathematics. Dr. Mumford became professor of mathematics at Harvard and has played a central role in the field of algebraic geometry for the past quarter century.

He won the Fields Medal in 1974 and a MacArthur Fellowship in 1987. And he remains dedicated to pursuing the mysteries and future of artificial intelligence.

“I’d like very much to understand more about the brain and the computations that underlie intelligent behavior,” he explains. “There are many secrets here about which we still have only the vaguest glimmerings. It’s an exciting area with tremendous opportunities for dramatic progress.”

Dr. Paul Cohen, the other STS winner to receive the Fields Medal, became professor of mathematics at Stanford University.

Robert Axelrod, STS '61

While the great majority of STS winners go on to pursue careers in the physical sciences, medicine or mathematics, some found their way into other fields through the application of mathematics. Dr. Robert Axelrod was one such individual.

He won his place as an STS winner in 1961 with a computer simulation of evolution as his research project. A strong interest in mathematics led him to earn his bachelor's degree in math at the University of Chicago, his hometown.

"Then, because I did not want to be an abstract mathematician, I looked around for a field in which to use my math," he explains. "I chose political science and I have been doing political model-building ever since.

"As a matter of fact, in the last few years, I have returned to evolutionary models. I'm still doing a few simulations of evolution — my STS project come full circle."

Robert Axelrod's mother was born in Warsaw, Poland, and came to the U.S. at age three. His father was born in America. Young Robert received his early schooling in Chicago, but the family moved to Evanston so their two sons could have the outstanding advantages of Evanston Township High School. Its science department regularly encouraged participation in the Westinghouse Science Talent Search, using it as a teaching tool.

"My success in the Search gave me confidence that I could do scientific work," he points out. "It showed me that I could define a project and carry it out. And the sense of early recognition and accomplishment was very valuable. During my career I have tackled some ambitious things that required confidence born of that early recognition."

Dr. Axelrod changed from a math major to political science and earned a Ph.D. in political science with distinction from Yale in



1966. He took his first teaching position at the University of California in Berkeley. Six years later, he was appointed associate professor of political science at the University of Michigan and also a research associate in the University's Institute of Public Policy Studies. He holds joint appointments in the University's political science department and the Institute of Public Policy Studies. His best-known book *The Evolution of Cooperation* has been translated into half a dozen languages.

Can the scientific method be used to solve social and political problems? Dr. Axelrod believes so.

He has applied scientific principles in three main areas of research — avoiding nuclear war, evolutionary biology and artificial intelligence.

Dr. Axelrod won one of the coveted MacArthur Fellowships in 1987. These awards by the MacArthur Foundation provide significant sums without restriction on their use to encourage outstanding people to pursue their goals in any direction.

"I will use much of the money to buy release time from teaching," he says, "so I can do more research in the next few years."

Dr. Robert Axelrod, STS '61, won a MacArthur Fellowship in 1987. He is the Arthur W. Bromage Professor of Political Science and Public Policy in the University of Michigan's Department of Political Science and Institute of Public Policy Studies.

The First No. 1

The first young man to win the top prize in the Science Talent Search was Paul E. Teschan of Shorewood — a suburb of Milwaukee. He was the first top winner among the boys in the first competition in 1942.

“I had a chemistry teacher my junior year of high school named Harold Wierks who encouraged me to enter. We were required to take a special exam and write an essay. There was no research project in that first Search. My essay was titled ‘How science can help win the war.’”

This turned out to be a timely subject and presaged his eventual career in the Army Medical Service.

“Winning the Westinghouse Scholarship made all the difference in my life,” said Dr. Teschan. “Our family had very little money and this made it possible for me to go to Carleton College without having to spend so much of my time working to pay my way.

“Even more important, however, winning gave me an absolutely tremendous sense that it was possible for me to achieve success in science. It was fine to get high marks and do well in high school, but the idea that I could compete successfully in a field of top students from all over the United States provided an assurance and affirmation that I was on the right track.

“It told me: ‘Go for it, kid!’”

And go for it he did.

He entered a pre-med curriculum at Carleton, where he won Phi Beta Kappa; then on to the University of Minnesota, where he



First top scholarship winner was Dr. Paul B. Teschan, STS '42. Following a 21-year Army medical career, during which this photo was taken, he joined the faculty of the Vanderbilt University School of Medicine where he has continued kidney research.

received a bachelor of science degree in 1946, followed by an M.S. in physiology and M.D. in 1948.

Convinced that the ringing down of the Iron Curtain by the Soviets threatened world peace, the young doctor accepted a commission in the Army Medical Service and began a 21-year Army medical career.

The opportunity and incentive to pursue a career in kidney research came in the form of a fellowship for the study of kidney failure at Peter Bent Brigham Hospital (now Brigham and Women's Hospital) in Boston in 1950. Operating the new artificial kidney machine was an important element of this program.

Dr. Teschan went to Korea for nine months in 1952-53 to run the kidney center there, using the artificial kidney in combat casualty cases where kidney failure developed from wounds. Soldiers' lives were saved.

"This Korean War experience established the questions to be asked and the future challenges that set my course in kidney research for years thereafter," he says.

Retiring from the Army in 1969, Dr. Teschan joined the faculty of the Vanderbilt University School of Medicine, where he has continued his kidney research.

"It gets more exciting all the time," he declares, adding this personal message to the young people of today:

"Finding out things by intellectual approaches is more exciting than any sporting event I know of, and it has enormous payoff for people who can think and are curious."

Standing beside Paul Teschan at the initial 1942 STS awards banquet — when the girls were judged separately — was the young lady winning female top honors — Marina Prajmovsky of Farmingdale, N.Y.

Marina went on to Radcliffe College and Yale Medical School where she received her M.D. in 1950. Marina Prajmovsky Meyers was a practicing ophthalmologist in Glen Cove, N.Y., when she died of a heart attack in 1974 at age 46.

3 BEHIND THE WINNERS

It is almost an axiom that behind every STS winner is a dedicated teacher or supportive parents — frequently both. Perhaps the teacher has the best opportunity to be a catalyst for the inquiring mind of the teen-age science student.

It may be one of many teachers in the well-equipped science department of a large city high school, or it may be an individual instructor working with the limited resources of a small town school.

A perfect example of the latter is Sister Mary Laretta Bishop.

Her effectiveness as a teacher first came to the attention of the Science Talent Search judges in the mid-1950s. To their surprise, a small school in semi-rural Marshfield, Wis., began producing a steady flow of honors winners and finalists in the competition. From 1955 to 1962, Columbus High School in this mid-state town produced winners in seven of eight years.

Did Columbus High School have a big science department? Hardly. Sister Mary Laretta was the school's first and only science teacher. She had gone to Marshfield in 1952 from a school in Milwaukee where she taught chemistry and physics.

In Milwaukee, she had encouraged many of her students to enter state science fairs, but she had never had a Westinghouse winner.



A perfect example of the dedicated teacher at a smaller school, Sister Mary Laurretta Bishop produced STS winners in seven of eight years at Columbus High School in semi-rural Marshfield, Wis.

“We weren’t ready for it,” she explains. “But when I got to Marshfield, I tried again. And I certainly was blessed with some wonderful students.”

“Originality, Hard Work, Encouragement”

The secret to their success, she believes, was a combination of originality, hard work and encouragement.

“Any student who wanted to do extra work in science could come

to the laboratory every afternoon from 3 to 5 p.m. They would work by themselves, but I was always available. And I had to do extra work, too. I had to learn how to use a microscope, for example. And I had to learn more about grains, so I worked with people in the brewing industry where grains are used.”

Sister Mary Lauretta found that encouragement was a principal ingredient needed by her students.

In 1960, for example, Virginia Perner was “such a nice worker but a lone worker” who didn’t ever ask for much help. “So I left her pretty much alone,” said Sister Mary, “until one day she came to me and said:

“Sister, I think I’m going to give up the project.” “Why?”

“Because you’re never around.”

“Is that what you need?” asked the teacher. “Yes,” said Virginia. “I can’t work without someone showing interest in what I’m doing.”

“All right, I’ll be there every day from now on,” said Sister Mary.

“And from then on,” she says, “I made it a point to show my face every day. And that’s what she needed. Virginia went on to be one of the Westinghouse finalists that year.”

“Students Need More Personal Attention.”

“I feel sorry for the students of today,” said Sister Mary Lauretta, looking back on her career at age 87. “They need more personal attention, and too often they aren’t getting it. They need approbation and approval. They don’t want to be alone. And that’s where the teacher can be an inspiration.

“Students today have too many questionable interests — drugs, drink, bad associations. It is up to teachers and parents to show interest and provide guidance.”

While she was running her one-woman science department at Columbus High School, Sister Mary reports that more than 95 percent of the students who worked in her lab after regular school hours continued in some field of science.

After 17 years in Marshfield, this dedicated teacher was transferred to Burlington, Wis., then retired at the age of 77. She took up residence at the Notre Dame Infirmary in Elm Grove, Wis., where she continues to get letters frequently from her former student scientists.

New York's Subway Scholars

In sharp contrast to the one-teacher effort of Sister Mary Lauretta are two of New York City's “specialized” high schools that have produced Science Talent Search winners in almost unbelievable numbers.

Uptown at 205th Street, on a large and attractive plot of land, stands the imposing Bronx High School of Science. Established in 1938, the school moved into its modern building 20 years later.

Downtown, a 30-minute subway ride away, stands ancient Stuyvesant High School, built on East 15th Street in 1904. One can almost imagine Peter Stuyvesant himself climbing its worn stone steps for a Parents Association meeting.

These two widely contrasting edifices, each housing some 2,700 students, attract the top rank of science students throughout the New York City area. From the classrooms and laboratories of Bronx High School of Science have emerged 118 STS national winners and 949 honorable mentions. From the halls of Stuyvesant have come 70 national winners and 449 honors winners.

What lies behind such success?

Competitive Admissions

First, the admissions policy. These schools can be attended by pupils from any part of the city. Acceptance is competitive and, by state law, the applicants must take the same entrance examination. The result is a student body in both schools of well above average academic ability.

Second, the curricula. Both schools emphasize mathematics and science, but also offer a wide range of other subjects and extra-curricular activities.

Third, the schools see “the Westinghouse” as “subtle motivation,” as well as an excellent opportunity for their students to practice doing scientific research. They urge participation.

Fourth, in these classrooms are perhaps the most highly motivated and diverse student bodies of any two U.S. high schools.

The principal’s office in both schools overflows with the trophies won by students in everything from science to chess to dramatics, you name it.

Says Milton Kopelman, Bronx High principal: "We have a P.A. system by which I can talk to the whole school, but I don't like to interrupt classes, so I only use it two or three times a year. One of those times is to announce when our students win Westinghouse Science Talent Search awards."

Six Nobel Winners

Four times Kopelman also has had occasion to announce to his students that alumni of their school have won the Nobel Prize in physics or chemistry.

The office of Milton Kopelman, principal of Bronx High School of Science in New York, is crowded with trophies won by his students for a great variety of accomplishments. Bronx Science leads all U.S. high schools in number of Westinghouse Science Talent Search winners.



Abraham Baumel, Stuyvesant principal, can point to two Nobel-ists, and he looks to his more recent and current crop of students with enthusiasm. Two Stuyvesant seniors — Chetan Nayak and Janet Tseng — finished one, two in the 1988 Science Talent Search. It was only the second time the same school had won the two top prizes.

The histories of both of these New York schools have parallels as well as differences. Stuyvesant was started as a manual training school for boys, and it still retains an interest in shop, technical training and engineering preparation, although it has swung to heavier emphasis on science in recent years.

Bronx High School of Science started much later, also as a boys' school. Its concept originated from its founding principal, Morris Meister, who was a science teacher and author of science textbooks. The City gave Meister a former elementary school building to start with and he developed a curriculum and entrance examination. In 1945, a limited number of young women were permitted to enter. Several years later the doors were opened equally to the girls.

The Impact of Immigration

Both Stuyvesant and "Bronx Science" have seen two waves of immigration — from Eastern Europe in the '30s and '40s, and from Asia in the '70s and '80s. Each wave broke on our shores with a tremendous impact.

"For many years," explains Kopelman, "our school was essentially first-generation children of parents from Eastern Europe who

settled in this area. From the '30s to the early '60s, our youngsters were mainly white, lower middle class or poor Jewish children who lived in the Bronx.

“But as we moved into the '60s, the demographics of the city began to change. Many of the earlier people had achieved middle-class status and were moving to the suburbs. This left a partial vacuum that began to fill with other first-generation children. Coupled with that was a new state law that established an entrance procedure for Bronx Science and the other specialized schools. It specified one examination and entrance in rank order — except for a provision allowing us to take up to 10 percent of our students from the disadvantaged. Incidentally, several years ago, two of those ‘disadvantaged’ children won Westinghouse awards.”

The effect of immigration on New York demographics was similarly felt downtown at Stuyvesant.

“We have always been a school for the immigrant,” says Baumel, whose own family came to the U.S. from Poland when he was age three. Coincidentally, he was born in Zloczow, Stuyvesant Nobelist Roald Hoffmann’s birthplace.

“These children of immigrants are the strivers. They stimulate one another. It’s absolutely awesome to watch. The intellectual climate they experience here and at ‘Science’ they will never experience again in their lives . . . even at the finest colleges in America.”

44 Percent Asian

“At the turn of the century, the Stuyvesant student body was essentially Jewish, Italian and Irish,” explains Baumel. “Today about 44 percent of our student body is Asian. But no one nationality group has more than 20 percent of our population. Name an ethnic group and we’ve got ’em . . . Koreans, Pakistanis, Chinese, Cambodians. We even had one kid from American Samoa. I don’t believe we’ve had any Eskimos, but that may be the only group we’ve missed. The president of our study body is Chinese and the vice president is of Danish background.”

Principal Abraham Baumel of Stuyvesant High School in lower Manhattan can point to 70 Westinghouse Science Talent Search winners and two Nobel Laureates. The new Stuyvesant now being built will have 12 science labs, 16 shops.



Kopelman reports similar diversity at Bronx Science:

“We have economic and ethnic diversity. We have about 15 percent black, 10 percent Hispanic, 31 percent Asian, plus large groups of Greek, Irish, Italian and Jewish children . . . they’re all here.

“The interesting thing is that this diverse population of students is very supportive and accepting of one another. They network and form lifelong friendships. They are motivated and want to succeed. Ninety-nine percent of our graduates go on to college and about 60 percent go into science or a science-related field.”

Distance No Barrier

While many students come by subway or bus from relatively nearby to attend both Bronx Science and Stuyvesant, some must travel a long way. Stuyvesant has 150 students who live on Staten Island and require two hours by train or bus and ferry to get to the old school in lower Manhattan.

So distance doesn’t stop them. Neither does it stop their parents, who provide amazing support.

“We have one of the largest Parents Associations in the country,” says Baumel. “Every year they run a phonathon; the last one collected \$80,000 for the school.”

When first-place winner Kirk Shinsky, STS '70, arrived back home in Allentown, Pa., more than 500 students from his high school jammed the airport to welcome him. One sign read: “Happiness is finding out you’re not so dumb after all.”

(Photo courtesy of The Allentown Morning Call)

A bright future exists for both Stuyvesant and Bronx Science, according to their principals.

For Stuyvesant it includes a \$140 million building being constructed on the Battery Park development at the foot of Manhattan. The picture window of the school library will look down the length of a main thoroughfare at the Statue of Liberty in the distance. Built to house 3,000 students, the new Stuyvesant High School will include 12 laboratories for the sciences and 16 shops. Completion is scheduled for September 1991.

There's No Monopoly on Enthusiasm

New York City has no monopoly on enthusiasm and school/community support for its science students.



When Kirk Shinsky of Allentown, Pa., won the first-place scholarship (then \$10,000) in the 1970 STS, more than 500 students from Louis E. Dieruff High School jammed the Allentown-Bethlehem-Easton Airport to welcome him home in triumph.

Led by the Allentown mayor, the school superintendent and members of the school board, the group carried banners and wore “Shinsky Fan Club” badges. One of the banners read:

“Happiness is finding out you’re not so dumb after all.”

Another read: “Welcome to the richest guy in the choir.”

As Kirk stepped off the plane, an impromptu band struck up the school fight song. Kirk was handed congratulatory messages from Pennsylvania Senator Hugh Scott and other dignitaries as his parents, brother and sister embraced him.

Kirk credited his father — a pipefitter — for helping him develop an interest in science. The young man devised his own equipment for studying colliding beams of high energy protons. Kirk attended Cornell, then Princeton where he received his doctorate in physics. He was professor of physics at the University of California, Berkeley, when he died in 1983 at the age of 31.

Other Outstanding Schools

Over the years, other New York area high schools have established superior records for producing Science Talent Search winners. Among them are Forest Hills High School with 42 winners, Erasmus Hall High School with 31 winners, Benjamin Cardozo High School with 25 and Midwood High School with 24.

Physics teacher Robert Horton of Evanston Township High School explains a physics concept using a bicycle wheel. This school has produced 27 Westinghouse winners.

(Photo courtesy of The Pioneer Press, Wilmette, Ill.)





Evanston Township High School chemistry teacher Mephie Ngoi demonstrates a chemical reaction to a group of students who say: "These teachers get you going and convince you to stay with it."

(Photo courtesy of The Pioneer Press, Wilmette, Ill.)

Standing high on the list of schools outside the New York area is Evanston Township High School in Illinois, the school that Dr. Robert Axelrod attended. From Evanston Township have come 27 STS winners and 158 honorable mentions.

Central High School in Philadelphia has had 11 winners and 46 honorable mentions. Lyons Township High School in La Grange, Ill., has nine winners and 66 honors winners to its credit. Coral Gables Senior High School in Florida has had nine national winners and 58 honors winners. Also with nine winners and 55 honors awards is North Phoenix High School in Arizona.

4 JUDGING AND EVALUATION

One of the reasons the appeal and effectiveness of the Westinghouse Science Talent Search has endured so long may be the way the winners are selected and judged.

Milton Kopelman at Bronx Science puts it this way:

“My students sometimes ask me why I announce the Westinghouse winners over our public address system but don’t do the same thing for other awards. And I tell them that the Westinghouse program is unique in this respect.

“A young person has to involve himself for a prolonged period in a piece of work and then do a *research paper* on it. Then the work is judged by *research people*. That’s very special.”

This does indeed describe how the 300 honors winners and the 40 national winners are selected. First, they are put through a research process not unlike that which they will have to perform if and when they go into science professionally — planning, organizing and carrying out a research project and reporting on it. And that report is evaluated by professional scientists.

Then comes the second phase of the process, judging which of these 40 national winners will receive the top 10 scholarships. For that decision, the judging process assumes a new dimension.

The Interview Process

Dr. David Axelrod, Commissioner of Health for the State of New York, headed the Board of Judges from 1971 to 1986. He describes the final judging this way:

“The top 40 are judged through an interview process which usually has nothing to do with the student’s research project. Here we focus on the intellectual process . . . on the creativity in responding to a question. The creativity of the response is more important than the response. Thus the student from a small school in Mississippi is not at a disadvantage to the student from Bronx Science.

“We are looking not at how much the student knows, but at how the individual reaches conclusions, even if he or she lacks technical information on the subject. It is not important if the answer is right or wrong — in many instances wrong answers are more interesting to us because they lead us to additional questions defining the process by which the person reached a wrong conclusion. And that may show more creativity than the right answer from someone who has a fund of information.

“Many times we ask questions for which there are no answers or on which there is no scientific consensus.”

Explains Dr. Glenn T. Seaborg, Nobel Laureate, educator, chairman of the Science Service trustees and, since 1963, an STS judge:

“We are looking for the person’s potential as a scientist. I look for the ability to think: a certain minimal amount of knowledge, of course, but more important, creativity, if I can discern it. Their ability to solve problems, in other words, to think.”

Unique in Science/Education

This process which requires the student to do an independent research project that is evaluated by research scientists, and then to undergo a series of interviews by a diversified Board of Judges — also scientists — constitutes something unique in the field of science and education.

The 40 students who complete the process at the annual Science Talent Institute in Washington each year in late February or early March have run a gamut designed to uncover the best young scientists of the future.

They must complete their research project and write it up in a report to be submitted with the other entry material by early December of their senior year in high school. This collection of some 1,400 papers then is read carefully by a group of some 14 “evaluators,” representing a wide range of disciplines. Two evaluators read and score each entry. If there is significant variation in these two scores, the chairman of the Board of Judges takes a look at the case and decides on the score. This screening selects the best 300 entries whose authors are named honors winners.

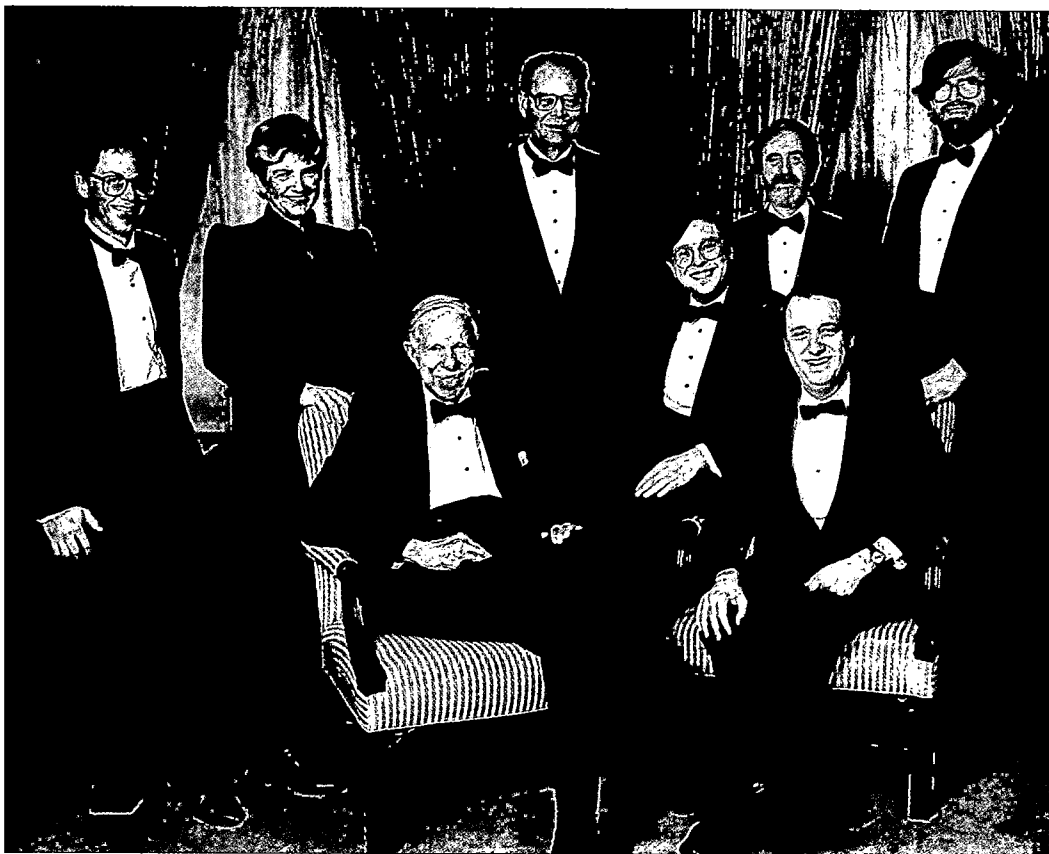
The chairman since 1986 is Dr. J. Richard Gott III of Princeton University, himself a second-place STS scholarship winner from Louisville, Ky., in 1965. He now reviews the 300 and selects the best 120 to place before the Board of Judges. From this group, the final selection of the top 40 national winners is made.

Board of Judges

The Board of Judges includes a chairman and seven other scientists.

In 1990, the judges and their areas of expertise were:

- **Chairman**—Dr. J. Richard Gott III, *Professor, Astrophysical Sciences, Princeton University. (Astrophysics)*
- Dr. Gilbert Castellan, *Professor of Chemistry, University of Maryland. (Physical Chemistry)*
- Dr. Stuart T. Hauser, *Associate Professor of Psychiatry, Harvard Medical School. (Psychiatry)*
- Dr. Brigid G. Leventhal, *Head, Pediatric Oncology, The Johns Hopkins Oncology Center. (Medicine/Chemimmunology/Pediatrics)*
- Dr. Charles Schwartz, *Associate Professor of Civil Engineering, University of Maryland. (Engineering, Electronics)*
- Dr. Glenn T. Seaborg, *Nobel Laureate, University Professor of Chemistry, Associate Director, Lawrence Berkeley Laboratory and Chairman, Lawrence Hall of Science, University of California, Berkeley. (Chemistry)*
- Dr. William Thurston, *Fields Medalist, Professor, Department of Mathematics, Princeton University. (Mathematics)*
- Dr. Andrew M. Yeager, *Associate Professor of Oncology, Pediatrics and Neurology, The Johns Hopkins Oncology Center. (Hematology/Medicine/Cell Biology)*



Eight eminent scientists comprise the Board of Judges. The 1990 Board is shown here. Seated left to right: Dr. Glenn T. Seaborg, Dr. J. Richard Gott, chairman. Back row: Dr. Charles Schwartz, Dr. Brigid G. Leventhal, Dr. Gilbert Castellan, Dr. Andrew Yeager, Dr. Stuart T. Hauser, Dr. William Thurston.

Climax of the Science Talent Institute in Washington is the annual awards banquet at which the 10 top scholarship winners are announced by the chairman of the Board of Judges. Leaders of the Washington scientific community are in attendance.



The Science Talent Institute in Washington

The climax of the Science Talent Search is reached when the top 40 winners are invited to Washington, D.C., for the five-day “Science Talent Institute.”

This is a time that former winners say they never will forget. Meeting 39 other science-minded young people like themselves from around the nation always has proved to be a highlight of the trip, with lasting friendships being formed.

Then there’s Washington. The winners dine at some of Washington’s favorite restaurants. They attend the theater — usually Kennedy Center — and they also get intellectual nourishment.

Each winner selects the individual scientist or other personage in the Washington area whom he or she would most like to visit during a specially arranged “prime time” meeting. Some go to government or university laboratories and institutions during this prime time day. On other days, many winners get the opportunity to visit with their Congressmen. The group also attends a dinner at the National Academy of Sciences, after which the winners have heard noted scientists speak on current activities in their fields.

Most presidents of the United States have personally greeted the 40 winners over the years at the White House. One year the exuberant group decided to include President Lincoln on this list. Thus, late one evening, several chosen representatives endeavored to climb on his lap at the Lincoln Memorial. Washington’s park police put a stop to this spirited initiative, however.



President Harry S Truman greets the 40 Science Talent Search winners in 1952. Most presidents have personally welcomed the winners during their stay in Washington. First ladies have included Eleanor Roosevelt.



The principal business of this Science Talent Institute period is the judging to determine which 10 of the 40 will receive top scholarships at the awards banquet the last evening. Judging now becomes a matter of personal interviews.

Each winner is interviewed by every member of the eight-person Board of Judges, usually in sessions that include several judges at a time. Sometimes one or two individual judges will conduct one-on-one interviews with individual students.

How well does this series of interviews enable the judges to predict future success in science on the part of these young people?

“The record shows that virtually all of the winners go on to college and a very large proportion to graduate school,” says Dr. Seaborg. “And I feel rather good about the fact that, after all the judges have completed the interviews, we come together with more or less the same top people in mind. There is a large measure of agreement on the first cut. However, we do not have as good a record on predicting the future Nobelists. That’s a degree of fine-tuning we have not yet achieved.”

Dr. Axelrod adds this thought:

“It isn’t necessarily true that the people we identify will have careers in science and become Nobel Laureates. But I think it is true that, by and large, we select creative individuals by virtue of the interview process.

Since 1942, each group of finalists has been photographed on the steps of the nation's Capitol. These are the 1989 winners.





Each winner brings to Washington an exhibit of his or her work, which may or may not be connected with the STS project. These exhibits are displayed to the public and explained by the winners at the Great Hall of the National Academy of Sciences.

WESTINGHOUSE S.T.S. SCIENCE TALENT FOR TOMORROW'S AMERICA



President George Bush greeted the winners in 1989. Adults in front center are, left to right: Westinghouse President Paul Lego, Dr. Frank Press, President of the National Academy of Sciences, President Bush, Westinghouse Chairman John Marous, Dr. Glenn T. Seaborg.

“Students often complain about the unpredictability of the questions which are asked, but that is intentional, not an accident. Hypothetical questions often are asked so the student will have to be creative and not just apply a fund of knowledge, but rather apply an intellectual process.”

Evidence shows that innovative, creative thinking is the hallmark of a Westinghouse Science Talent Search winner.

5 A DEAN OF ADMISSIONS LOOKS AT THE STS

How does the Westinghouse Science Talent Search influence a student's chance for admission to the college of his or her choice?

Dr. William R. Fitzsimmons, Harvard's Dean of Admissions and Financial Aid, pondered this question in his office at Byerly Hall on Harvard Square:

"Often the list of Westinghouse honors winners and the final 40 is very useful supplementary evidence for us in looking beyond the test scores and grades of Harvard applicants. Westinghouse participation certainly shows a good deal more interest and intellectual curiosity than normal. Just to take part in this competition and spend the amount of time required is a good piece of evidence that this person has a genuine commitment to the sciences, and to academic enterprise in general.

"When considering an applicant who is academically unusual, as part of our normal process we look to see if he or she is on the Westinghouse list. In addition, we rely on our own faculty to review

Dr. William R. Fitzsimmons, Harvard's Dean of Admissions and Financial Aid, and Director of Admissions Marlyn McGrath Lewis find the list of 300 Westinghouse honors winners "useful supplementary evidence" in evaluating applicants each year.



applications and assess the kind of research project that has been done. The Westinghouse Science Talent Search is a signal that some very good things have been happening — particularly if the individual has done well in it.”

How Harvard Analyzes an Application

“We look at applications in three general dimensions,” says Dr. Fitzsimmons, “academically, extra-curricularly and personally. They all count. For a very good candidate, ‘the Westinghouse’ might provide that further evidence or ‘tip factor’ that we look for.”

Are high school seniors coming to Harvard better prepared than they were a few years ago?

“We are extremely pleased with the students we are admitting these days,” Dean Fitzsimmons responds. “More than 500 of the 1,600 students entering each year over the past several years have been eligible for sophomore standing, based on advanced placement tests and other results. And about 45 percent of the incoming classes in recent years have been interested in majoring in the sciences. So we’re seeing a great deal of interest and accomplishment there.

“On the other hand, I think there is a good deal of concern that there are many high schools in the country that are still at sea on how to prepare for careers in science. One encouraging thing is that the college board advanced placement program has been expanding in the last several years. But there is still a lot of work to be done in the secondary school world.

STS Offers 'Reward Structure'

“Whether an individual is in the top 300 or not, participation in the Science Talent Search is one measure of whether the youngster is really interested. It indicates something extra, something special in energy level and commitment.

“There’s another wonderful thing about the program,” Dr. Fitzsimmons adds. “Not only does it encourage the people who actually decide to go ahead and give it a try, but it also shows to others the reward structure for those interested in science and in things academic. There is a great deal of recognition for athletes and others, but this is wonderful recognition for people who want to do something academically very significant.

“We feel that the sciences are more important than ever to the future of the country and our national competitiveness. And they will become even more important. For Harvard to play a leadership role in the country, it’s going to be necessary for us to continue to be strong in the sciences.

“I look at ‘the Westinghouse’ as a grass roots signal to some of the most talented secondary school students in the country that the study of science is important — that it will lead them somewhere and is worthy of strong commitment.

“It’s important to the country and to us to get those people here.”

CONCLUSION

There's Much to be Done

Many Science Talent Search winners echo Harvard Dean Fitzsimons' concern over the work that remains to be done by the nation's secondary schools in preparing young people for careers in science.

The Educational Testing Service in its annual "science report card" in 1988 concluded that the science achievement level of American 17-year-old students is significantly lower than it was in 1969. Only seven percent of the students that age were prepared for college-level science education, the report said.

Why is this? Opinions are many and varied.

"Speaking as an American citizen, rather than a scientist," says **Dr. Mumford**, STS '53, "what is disastrous are the salaries that are paid to our high school teachers. They get almost no respect, terrible salaries, and very few really brilliant individuals will go into this anymore.

"I was very lucky at Exeter when, in the old tradition, it was a very respectable life to dedicate yourself to high school teaching. Now math and science in so many of our high schools are an absolute disaster, and I don't see any possibility of changing it until salaries are increased something like 50 percent. That will require

Mumford . . . “terrible salaries.”



a real structural change.

“I think we are heading for a disaster in our educational system that will shake the whole thing up enough to make people realize that a major change has to be made.”

Dr. Mumford urges not only better teaching but also enrichment of the curriculum at the high school level.

Improvement Not General

Dr. Nina Schor, STS '72, who attended Benjamin Cardozo High School in New York, sees evidence of good progress in such schools as that, but worries that similar improvement is not occurring across the country.

“I teach medical students at the University of Pittsburgh and I have a dichotomous feeling. I know that the high schools like the one I went to and like Bronx High and Stuyvesant are still doing what they did, and, if anything, they are doing it better. More of their graduates are going on to good colleges in the sciences and engineering. But it isn't at all clear to me from what I see at my level that the same thing is going on across the country.



Schor . . . "Math worries me the most."

"I think that some of the deficiencies we are seeing in students at medical school are the result of poor groundwork in basic areas of science. Mathematics worries me the most. Most of the students who have made it all the way to medical school still do not have a firm grasp of mathematics. And to understand the basic concepts of pharmacology, for example, somewhere along the line you have to sit through a calculus course. I got that in high school."

Teaching Too Compartmentalized

Dr. Glashow, STS '50, thinks science teaching begins too late in the educational process and is too compartmentalized.

"The science we first expose our students to at seventh or eighth grade is pathetically weak," he says. "At best, it's walking around identifying trees.

"And we compartmentalize our teaching too much. I would prefer that science and history be linked to one another. We should teach the intellectual history of people rather than offer separate classes in the two disciplines. So much of history — the emperors, kings and politicians — is very often in the long run far less impor-

Glashow . . . “We compartmentalize teaching too much . . . Great advantage to concentration of excellence.”



tant than the technological advances. Look at the effects of sanitation, gunpowder and printing. There always has been a link between science and culture but it is lost the way science is taught today.”

Math also should be linked with science, he declares:

“Mathematics is taught as rote performance of algebraic procedures. They never considered that you might have to multiply polynomials in science. Mathematics, like history, is put in its own pigeonhole. At the university level, we have to put back together the knowledge that schools had senselessly rended apart.”

Dr. Glashow sees great advantage to a concentration of excellence — one good student learns by communicating with and competing with another.

“I feel strongly about the value of concentration of science students. Is this elitist? Yes, but elitist things are necessary. You would not try to form a symphony orchestra from the middle half of the music class.”

The Westinghouse Science Talent Search, he points out, provides this sort of focus for youngsters.



Karplus . . . "Science should be taught earlier."

"The act of competition is significant and beneficial," he says. "The system is not perfect but that doesn't matter. The main thing is to get interested and excited about science."

It's Hard to Compete Alone

"It's nice to have a Westinghouse program that encourages students to compete, but if you're in a school where you're the only one competing, it's tough. One of the big virtues of the Bronx High School of Science or Stuyvesant, or any elite school, is the concentration of people with common interests. It makes for an atmosphere of real intellectual growth. That's what's often lacking."

Dr. Martin Karplus, first place winner in the 1947 STS and professor of chemistry at Harvard, agrees with Dr. Glashow that science should be taught earlier in the educational process.

"It's very important to learn math and science early," he declares. "A difficulty with our society is that although science plays a very important role in everyday life, most people don't know any science. Legislators who vote on all kinds of scientific problems often have no idea what they're all about."

Axelrod . . . "A national disgrace."



"The only way we can get people to know something about science is to start very early. Just as you are able to learn foreign languages when you are very young, so can you learn the principles of scientific thought when you are very young. There are many good science courses now in high schools, but the difficulty is that they start too late. They should be given in grade school by teachers who understand science. One of the major difficulties is that, although the children can understand basic scientific concepts, their teachers often cannot and so are unable to teach real science."

"A National Disgrace"

Dr. Robert Axelrod, STS '61, calls the problem of quality education in our secondary schools "a national disgrace."

"International comparative studies done here (University of Michigan) and elsewhere show that our average high school student is very far behind the students in other industrial countries.

"The problem is much broader than just science education," he says. "It's the quality, discipline, motivation and resources that society puts into the educational system.

“What’s needed is some sense of responsibility for the next generation that should be borne by this generation. In America, it has been accepted that parents take care of the education of their children. That kind of individualistic approach has resulted in the individual school system falling on very hard times and not being supported as much as it should by the population.

“Along with that is the idea that every locality should pay for its own schools — which sounds good, except that the poorer locality winds up with fewer resources. I don’t think there have to be equal resources per student everywhere, but there has to be a very high floor, and we haven’t done that.”

Dr. Axelrod doubts that he would have won a Westinghouse scholarship had he not gone to Evanston Township High School, where he had a challenging atmosphere and “two exceptional teachers” — Robert Anspaugh in physics and Robert Salisbury in biology. The latter organized a science seminar designed around the Westinghouse competition schedule.

Taught Self-Reliance

“The first semester his students made presentations on research they had read about, and the second semester they presented their own research projects,” Dr. Axelrod explains. “On the first day of class, the teacher explained the course format. From then on, he left us alone. After the first day, he was never in the classroom, but he was available at his desk in the adjoining room.

“He insisted that we organize ourselves and criticize each other.

Gilbert . . . “Interest shifting from science to business and finance.”



This gave all of us a very strong sense of self-reliance. He used ‘the Westinghouse’ as an opportunity to teach science projects and to learn how to organize science.”

Although Evanston Township High School was not a “specialized” school for top students only, Dr. Axelrod explains, the students were divided into five or six levels in major subjects.

“If you were in the top level, you were with really high-quality students,” he says. In other words, concentration of excellence was practiced here also.

Dr. Gilbert, STS ’49, says the stakes are high on rebuilding an interest in science. He sees a great shift of interest among our youth from science to business and finance.

“Science and engineering is becoming an Asian field,” he warns. “In 10 years, it may be entirely Asian. There is a growing scarcity of Americans in engineering. The move is to a service economy, and in America that means fast food stores, Wall Street, banking. It doesn’t mean making, inventing and changing the world.”

President Bush has set the goal to make U.S. students number one in science and math by the year 2000.

There is much to be done.

APPENDIX

- MAJOR HONORS RECIPIENTS
- NATIONAL ACADEMY OF SCIENCES MEMBERS
- NATIONAL ACADEMY OF ENGINEERING MEMBERS
- TOP SCHOLARSHIP WINNERS
- TOP HIGH SCHOOLS
- FINALISTS IN SCIENCE TALENT SEARCH 1942-1990

SCIENCE TALENT SEARCH

MAJOR HONORS RECIPIENTS

Honor	Date Awarded	Name	STS Year
Nobel Prize (Physics)	1972	Leon N Cooper	1947
Nobel Prize (Physics)	1975	Ben R. Mottelson	1944
Nobel Prize (Physics)	1979	Sheldon L. Glashow	1950
Nobel Prize (Chemistry)	1980	Walter Gilbert	1949
Nobel Prize (Chemistry)	1981	Roald Hoffmann	1955
Fields Medal (Mathematics)	1966	Paul J. Cohen	1950
Fields Medal (Mathematics)	1974	David B. Mumford	1953
MacArthur Fellowship	1982	Frank Wilczek	1967
MacArthur Fellowship	1983	Richard Stephen Berry	1948
MacArthur Fellowship	1984	Arthur T. Winfree	1960
MacArthur Fellowship	1985	Jane Shelby Richardson	1958
MacArthur Fellowship	1987	Robert Axelrod	1961
MacArthur Fellowship	1987	Robert Coleman	1972
MacArthur Fellowship	1987	Eric Lander	1974
MacArthur Fellowship	1987	David B. Mumford	1953
National Medal of Science	1967	Paul J. Cohen	1950
National Medal of Science	1983	Roald Hoffmann	1955
Albert Lasker Basic Medical Research Award	1979	Walter Gilbert	1949
Albert Lasker Basic Medical Research Award	1987	Leroy E. Hood	1956

THE NATIONAL ACADEMY OF SCIENCES MEMBERS

Name	Affiliation	STS Year
Adler, Stephen L.	Institute for Advanced Study, Princeton, NJ	1957
Axelrod, Robert	University of Michigan, Ann Arbor, MI	1961
Berry, R. Stephen	University of Chicago, Chicago, IL	1948
Breslow, Ronald	Columbia University, New York, NY	1948
Chilton, Mary Dell	CIBA-GEIGY Corp., Research Triangle Park, NC	1956
Clark, George W.	MIT, Cambridge, MA	1945
Cohen, Paul J.	Stanford University, Stanford, CA	1950
Cooper, Leon N	Brown University, Providence, RI	1947
Crothers, Donald M.	Yale University, New Haven, CT	1954
Davidson, Eric H.	California Institute of Technology, Pasadena, CA	1954
Felsenfeld, Gary	National Institutes of Health, Bethesda, MD	1947
Gilbert, Walter	Harvard University, Cambridge, MA	1949
Glashow, Sheldon Lee	Harvard University, Cambridge, MA	1950
Halperin, Bertrand I.	Harvard University, Cambridge, MA	1958
Hoffmann, Roald	Cornell University, Ithaca, NY	1955
Hood, Leroy	California Institute of Technology, Pasadena, CA	1956
Karplus, Martin	Harvard University, Cambridge, MA	1947
Martin, Paul C.	Harvard University, Cambridge, MA	1948
Mather, John N.	Princeton University, Princeton, NJ	1960
Mumford, David B.	Harvard University, Cambridge, MA	1953
Richards, Paul L.	University of California, Berkeley, CA	1952

Name	Affiliation	STS Year
Rosenblatt, Murray	University of California, San Diego, LaJolla, CA	1943
Sessler, Andrew M.	University of California, Berkeley, CA	1945
Solovay, Robert M.	University of California, Berkeley, CA	1956
Sternberg, Saul	AT&T Bell Laboratories, Murray Hill, NJ	1950
Streitwieser, Jr., Andrew	University of California, Berkeley, CA	1945
Tinkham, Michael	Harvard University, Cambridge, MA	1945
Wilczck, Frank Anthony	Institute for Advanced Study, Princeton, NJ	1967

THE NATIONAL ACADEMY OF ENGINEERING MEMBERS

Name	Affiliation	STS Year
Armstrong, John A.	IBM Corporation, NY	1952
Goldman, Alan J.	Johns Hopkins University, Baltimore, MD	1949
Rechtin, Eberhardt	Aerospace Corporation, Los Angeles, CA	1943

28 STS Winners are members of the National Academy of Sciences
 3 STS Winners are members of the National Academy of Engineering
 51 STS Winners are Sloan Research Fellows

SCIENCE TALENT SEARCH

TOP SCHOLARSHIP WINNERS

Year	Name	High School and Location
1942	Paul Teschan Marina Prajmovsky	Shorewood H.S., Shorewood, WI Farmingdale H.S., Farmingdale, NY
1943	Gloria Lauer Ray Schiff	Ames H.S., Ames, IA New Rochelle H.S., New Rochelle, NY
1944	Anne Hagopian A. Charles Davidson	The Brearly School, New York, NY Lyman H.S., Lyman, WY
1945	Marion Joswick Edward Kosower	Manual Training H.S., Brooklyn, NY Stuyvesant H.S., New York, NY
1946	Jules A. Kernen E. Marilyn Rohrer	Southwest H.S., St. Louis, MO Elizabethtown H.S., Elizabethtown, PA
1947	Martin Karplus Vera Demerec	Newton H.S., Newtonville, MA Huntington H.S., Huntington, NY
1948	Andrew S. Kende Barbara Wolff	Evanston Twp. H.S., Evanston, IL Forest Hills H.S., Forest Hills, NY
1949	Dwight Taylor	Webb School of California, Claremont, CA
1950	Saul Sternberg	H.S. of Music and Art, New York, NY
1951	Robert J. Kolenkow	Niagara Falls H.S., Niagara Falls, NY
1952	Karl Muench	Evanston Twp. H.S., Evanston, IL
1953	Edward A. Phillips	Weston H.S., Weston, MA
1954	Alan Haught	Bethesda-Chevy Chase H.S., Bethesda, MD
1955	Frederick Paul Greenleaf	Allentown H.S., Allentown, PA
1956	Robert T. Moore	Montgomery Blair H.S., Silver Spring, MD
1957	Brett Nordgren	Central H.S., South Bend, IN
1958	Reinier Beeuwkes III	Newton H.S., Newtonville, MA
1959	John Letcher	The Baylor School, Chattanooga, TN

Year	Name	High School and Location
1960	Jerome Spitzner	St. James H.S., St. James, MN
1961	Joshua Wallman	Bronx H.S. of Science, New York, NY
1962	Christopher Cherniak	Melbourne H.S., Melbourne, FL
1963	Sylvain Cappell	Bronx H.S. of Science, New York, NY
1964	Robert F. Sproull	Phillips Exeter Academy, Exeter, NH
1965	Larry Howard	William H. Taft H.S., Los Angeles, CA
1966	Henry Wagner, Jr.	Wissahickon H.S., Ambler, PA
1967	Nevin Summers, Jr.	Terry Parker Sr. H.S., Jacksonville, FL
1968	Roger Tsien	Livingston H.S., Livingston, NJ
1969	Lane P. Hughston	Hillcrest H.S., Dallas, TX
1970	Kirk Shinsky	Louis E. Dieruff H.S., Allentown, PA
1971	James Van Aken	Lyons Twp. H.S., La Grange, IL
1972	Nina Tabachnik	Benjamin N. Cardozo H.S., Bayside, NY
1973	Arvind Srivastava	Poudre H.S., Fort Collins, CO
1974	Eric S. Lander	Stuyvesant H.S., New York, NY
1975	Paul A. Zeitz	Stuyvesant H.S., New York, NY
1976	Edward Sterl Phinney III	Amherst Reg. H.S., Amherst, MA
1977	Richard C. Schirato	Skyline H.S., Dallas, TX
1978	Michael S. Briggs	High Point H.S., Beltsville, MD
1979	Ron K. Unz	North Hollywood H.S., North Hollywood, CA

Year	Name	High School and Location
1980	John M. Andersland Lisa Joy Randall	East Lansing H.S., East Lansing, MI. Stuyvesant H.S., New York, NY
1981	Amy Sue Reichel	Hunter College H.S., New York, NY
1982	Reena Beth Gordon	Midwood H.S., Brooklyn, NY
1983	Paul Chih Ning	Bronx H.S. of Science, New York, NY
1984	Christopher Roland Montanaro	Oxford Hills H.S., South Paris, ME
1985	Alan John Hu	La Jolla H.S., La Jolla, CA
1986	Wendy Kay Chung Wei-Jing Zhu	Miami Killian Senior H.S., Miami, FL Brooklyn Technical H.S., Brooklyn, NY
1987	Louise Chia Chang	Univ. of Chicago Lab. Schools H.S., Chicago, IL
1988	Chetan Nayak	Stuyvesant H.S., New York, NY
1989	Christopher McLean Skinner	Hall H.S., Little Rock, AR
1990	Matthew Peter Headrick	Univ. of Chicago Lab. Schools H.S., Chicago, IL

SCIENCE TALENT SEARCH

TOP HIGH SCHOOLS: 1942-1990

School and Location	Winners	Honors	Scholarships/ Awards
Bronx High School of Science New York, NY	118	949	\$260,200
Stuyvesant High School New York, NY	70	449	\$199,450
Forest Hills High School Forest Hills, NY	42	217	\$ 70,950
Erasmus Hall High School Brooklyn, NY	31	180	\$ 9,600
Evanston Township High School Evanston, IL	27	158	\$ 25,000
Benjamin N. Cardozo High School Bayside, NY	25	145	\$ 44,250
Midwood High School Brooklyn, NY	24	142	\$ 35,850
Jamaica High School Jamaica, NY	19	206	\$ 13,750
Martin Van Buren High School Queens Village, NY	16	102	\$ 14,850
Brooklyn Technical High School Brooklyn, NY	14	115	\$ 27,050
Central High School Philadelphia, PA	11	46	\$ 16,400
Abraham Lincoln High School Brooklyn, NY	11	80	\$ 1,850
Hunter College High School New York, NY	9	37	\$ 21,050
Lyons Township High School La Grange, IL	9	66	\$ 11,700

School and Location	Winners	Honors	Scholarships/ Awards
New Rochelle High School New Rochelle, NY	9	108	\$ 8,550
Coral Gables Senior High School Coral Gables, FL	9	58	\$ 6,250
North Phoenix High School Phoenix, AZ	9	55	\$ 1,500
The Phillips Exeter Academy Exeter, NH	8	15	\$ 9,550
Melbourne High School Melbourne, FL	7	35	\$ 28,250
Newton High School Newtonville, MA	7	10	\$ 16,600
Ramaz School New York, NY	7	39	\$ 10,850
Niles Township High School-West Skokie, IL	7	27	\$ 7,500
Columbus High School Marshfield, WI	7	8	\$ 3,500
Stephen Austin High School Austin, TX	7	31	\$ 2,050
Woodrow Wilson High School Washington, DC	6	28	\$ 9,850
Wakefield High School Arlington, VA	6	16	\$ 7,400
Princeton High School Princeton, NJ	6	15	\$ 6,000
Nova High School Fort Lauderdale, FL	6	41	\$ 5,250

School and Location	Winners	Honors	Scholarships/ Awards
James Madison Memorial High School Madison, WI	6	24	\$ 3,500
Alhambra High School Alhambra, CA	6	40	\$ 3,000
McLean High School McLean, VA	6	44	\$ 1,750
Eugene High School Eugene, OR	6	8	\$ 900

SCIENCE TALENT SEARCH

FINALISTS: 1942–1990 *(Based on available information)*

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
55	Aandahl, Vaughan Allan*	66	Anderson, Floyd Owen, M.D.
88	Abella, Benjamin S.	56	Anderson, Gary Bertel
87	Abramson, Scott Lawrence	65	Anderson, Michael Peter
57	Adams, David Bachrach, Ph.D.	90	Anderson, S. Kareem
65	Ader, Patricia Lynn	57	Anderson, Sonia, Ph.D.
61	Adkins, William M.	61	Andrews, Jr., Thomas G.
57	Adler, Robert William	49	Angistein, Robert
57	Adler, Stephen Louis, Ph.D.	59	Anglim, Mary Terese
72	Agosti, Jan Marie, M.D.	45	Anson, John Hahn*
90	Agrawala, Maneesh	70	Ansour, M. Michael, Ph.D.
88	Alaie, Ali Reza	76	Apfeldorf, William Jay
75	Albe, Kathy Reese, Ph.D.	60	Appelbaum, Richard A.*
61	Alben, Richard Samuel, Ph.D.	52	Armstrong, John Allan, Ph.D.
88	Albrecht, Meredith Ann	46	Arnold, Stephen R., M.D.
57	Albro, Phillip William, Ph.D.	68	Arthur, John Steven, M.D.
48	Alexeff, Igor, Ph.D.	90	Ascenzi, Laura Andrea
85	Alfonso Sosa, Edwin	87	Ashcom, Genevieve Susanne
88	Ali, Mohamad Shahan	68	Ashmead III, John
79	Allen, Wesley David, Ph.D.	74	Ashworth, Michael D.
59	Allen, Wilson Edwin	90	Asnis, Peter David
84	Altura, Rachel Allison	84	Assimakopoulos, Eva Lana
84	Amato, Carmela Cristina	76	Augen, Jeffrey Curtis
85	Ambroziak, Jeffrey Russell	75	Aupperle, Kenneth Robert
85	Amdur, Rachel Lee	76	Ausubel, Lawrence Marc
85	Ames, Sheryl Lynn	42	Avallone, Eugene A.
70	Amey, Ronald Lee, Ph.D.	89	Avestruz, Al Thaddeus
66	Amrine (Loynachan), Louise, P.T.	61	Axelrod, Robert M., Ph.D.
80	Andersland, John Michael	79	Babcock, Loren Edward
76	Anderson, David Sterling	49	Bach, Michael Klaus, Ph.D.
65	Anderson, Eric A.	55	Bachrach, David*

Year	Last Name (Maiden Name)
67	Back, Allen Henry
65	Bagnuolo, William G., Ph.D.
76	Bailey, Mark Edward
46	Baird, Douglas Page
72	Baird, Richard William
60	Baker, Dennis Graham Dr.
67	Baker, Louis, Ph.D.
57	Balderree, Jr., Willis W. Dr.
71	Baldo, Jonathan
59	Bamberg, Paul Gustav, D.Phil.
74	Banwell, Thomas C.
48	Baraff, Gene Allen, Ph.D.
74	Barany, Francis, Ph.D.
56	Bardeen, James Maxwell, Ph.D.
61	Barisas, B. George, Ph.D.
65	Barker, William Thomas, J.D.
62	Barnes, Richard Allen
54	Barnes (Lee), Susan H.
53	Barnes II, Virgil Everett, Ph.D.
64	Barnhart, Robert Joel Dr.
69	Baron, Barbara Ann Dr.
49	Baron (Zalutsky), Rosalyn
49	Barr, Jr., Thomas C., Ph.D.
87	Barrett, Jennifer Genevieve
55	Barth, Rolf Frederick, M.D.
42	Barthel, Romard Brother, Ph.D.
74	Barton, Mark D., Ph.D.
67	Bass, Emily
42	Bauer (Pike), Carol
87	Bauer, Julie Ann

Year	Last Name (Maiden Name)
54	Baum, Paul Frank Dr.
49	Bauman, Norman, M.D.
88	Beaulieu, Stacey Ellen
50	Beaver, William T., M.D.
73	Bechtold, Jill E.
74	Beckman, Robert A., M.D.
58	Beeuwkes III, Reiner, Ph.D.
70	Begelman, Mitchell C., Ph.D.
75	Behar, Kevin Lee
64	Bell, Jr., Joseph William
52	Bell (Capp), Ruth H., M.D.
76	Belli, Julia Lynn
79	Bellingham, James Gladen, Ph.D.
77	Belliveau, John William, Ph.D.
71	Benart, Kimberlee June
85	Bencze, William Joseph
78	Bender, Judith Lee
89	Benjamin, Stacy Elisabeth
60	Bennett, Charles Henry, Ph.D.
90	Ben-Zvi, David D.
76	Berger, Michael Alan
78	Bergman, Lawrence Russell
51	Berkelman, Karl, Ph.D.
79	Berkson, Mitchell Harris
59	Berman, Kenneth Murray*
52	Berne, Joel Edward, M.D.
69	Berner, Bret, Ph.D.
90	Bernold, Justin Yale
87	Bernstein, Daniel Julius
61	Bernstein, Herbert J., Ph.D.

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
54	Berry, George B.	71	Bockenstedt, Paula L., M.D.
48	Berry, Richard Stephen, Ph.D.	80	Bohnert, Tony James
68	Biba, Kenneth Jerome	49	Bohrer, Vorsila L., Ph.D.
52	Bideaux, Richard A.	86	Boklan, Jessica Louise
64	Bidlingmeyer (DeVonis), Ursula Ann	49	Boldt, Elihu A., Ph.D.
47	Bieber, Herman Dr., D. Engin. Sci.	45	Bonagura (Joswick), Marion
81	Biehle, Garrett Trent	43	Boop, Wayne Ellsworth
86	Bies, William Edward	76	Boothby, David Jonathan
65	Bigelow, Ann Marie	42	Borgeson, Warren
72	Billets, Barry D.	72	Borish, Lawrence C.
80	Bina, Craig Richard	85	Boroson, Bram Seth
67	Binder, Steven Ross	79	Bose, Arani
81	Binderow, Bruce David	70	Bowden, Charles Howard
66	Binns, Kevin R.	64	Bowen, Robert Rufus Dr.*
72	Bird, Wendell Raleigh, J.D.	77	Bowie, James Ulrich
72	Birdsall, Holly Hyde Dr.	78	Boyanowski (Dennis), Sarah Elizabeth
76	Black, James Edward	83	Boyd, James Marion
45	Blackman, Jerome, Ph.D.	43	Boyd, William Lelievre
52	Blanchard, Byron E.	52	Braden, Robert T.
49	Blattner, Robert James, Ph.D.	80	Brady III, Eugene Giles
77	Blau, Daniel David	71	Brady, Robert Andrew
70	Blifeld, Cindy	67	Brame, Joseph Bailey
54	Bloom (Burlant), Marguerite	57	Brand, Warren Louis
90	Blum, Elissa Michele	67	Braus, Robin Jay
69	Blumberg (Yates), Andrea Jane, Ph.D.	56	Braverman, Paul Maxim
64	Blumberg, William A.	49	Bray, Richard Arthur
73	Boccio, Dona V., Ph.D.	53	Brayton, Paul Richard
74	Bockenstedt, Linda K., M.D.	71	Brenner, Donald
		73	Brentrup, Robert J.

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
48	Breslow, Ronald C., Ph.D.	57	Burnham, David C., Ph.D.
49	Brett, Jack Samuel, D.Sc.	58	Burns, Stephen Kent Dr.
44	Briehl (Miles), Ruth	75	Busch, Richard Munroe Dr.
81	Briggs, Daniel Shenon	46	Bush, Leon R.
78	Briggs, Michael Stephen	53	Bush (Mitchell), Merle A.
55	Briggs, Thomas S., Ph.D.	44	Butler, Charles W.
75	Brignac, Donald Veron, M.D.	51	Butler, James N., Ph.D.
49	Brilliant, Martin B. Dr.	77	Cahill, Paul Augustine, Ph.D.
73	Brittenham, Steven L.	42	Calhoun, William D.
65	Brock, Robert J.	69	Calonica, Lynne Diane
66	Brogdon, William Gail Dr.	48	Camamis, George
74	Brooten (Reeves), Cheryl D.	63	Campbell, Alan S.
84	Brothers, Maxwell James	56	Campbell, John Howland, Ph.D.
56	Brower, Edmond	81	Candan, Michael Richard
42	Brown, Barton	72	Canfield, Denise M.
60	Brown, David Raoul	58	Cantrell, Cyrus Duncan, Ph.D.
44	Brown (Springer), Eleanor, Ph.D.	63	Cappell, Sylvain Edward, Ph.D.
68	Brown, James Allen	56	Card (Och), Rosemary
71	Brown, Laura Jane, Ph.D., M.D.	77	Carlberg, Beth
80	Brownlee, Kenneth Gainsford	74	Carlberg, Philip J.
54	Brumer, Armand, Ph.D.	54	Carragan, William
51	Brush, Stephen George, D.Phil.	56	Carroll, Robert Lynn, Ph.D.
55	Buccino, Robert A., M.D.	78	Carroll, Russell William
76	Budak, Stephen Joseph	74	Carson, Milinda R.
70	Buff, Joseph Jonathan	55	Cartwright (Hawkins), Carol
86	Bullock, Christopher Allen	53	Cassidy, Jr., Harry J.
54	Bumby, Richard T., Ph.D.	89	Castle, Steven Lane
80	Bunyak, Jenae Rose	62	Catlin, Jack Steven*
58	Burger, Richard M., Ph.D.	69	Cava, Robert Joseph, Ph.D.
44	Burgess (Bond), Mary*	45	Cavanagh (Wingert), Ann

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
51	Chambers, Derrell Lynn, Ph.D.	56	Chilton (Matchett), Mary-Dell, Ph.D.
46	Champeny, John C.	75	Ching, Wendell Tuk Wing, M.D.
85	Chan, Paul	71	Chinoy, Ira
89	Chander, Divya	81	Chitwood, William Shelton
79	Chang, Eileen	65	Choate, Albert George
87	Chang, Louise Chia	53	Choi (Itokawa), Etsuyo
82	Chang, Richard Ke-Jen	88	Choi, Mina
80	Chang, Robin Chu Hsin	72	Cholst, David Jacob
84	Chang, Sandy	76	Chow, Alice
88	Chang, Shu-Ming Joe	90	Choy, Angela Wai-Yuah
81	Chang, William I-Wei	89	Christie, Richard Hawkins
57	Chaniot, Jr., George E.	57	Chronister (Beach), Rochelle
62	Chapman, Clark Russell, Ph.D.	81	Chu, Joan Inyul
51	Charnley (Janousek), Lucille Dr.	88	Chumbes, Eduardo Martin
63	Chase, Deborah	83	Chung, Wayne
88	Checinska, Aurika Wanda	86	Chung, Wendy Kay
78	Chedester, Richard Charles	85	Ciabarra, Anthony Mario
56	Ch'en, Daniel Dr.	79	Clark, Christy Dawn
90	Chen, Esther	53	Clark, Dennis R.
83	Chen, Ling Ping	45	Clark, George Whipple, Ph.D.
88	Chen, Meivile	56	Clark, John Bell, Ph.D.
90	Cheng, Corey	75	Claudson, Robert Mark
62	Cherniak, Christopher George	53	Clayton, Richard N. Dr.
50	Chesley (McKinney), Alice	73	Climan, Sanford R.
61	Chessen, Douglas H., M.D.	47	Cloke, Paul LeRoy Dr.
51	Chester, Conrad Vences, Ph.D.	49	Clough, Garrett Conde Dr.
90	Cheung, Put	48	Coe, Elmon Lee Dr.
84	Chew, Albert Fook Ming	89	Cohen, Brian Frederick
80	Chiang, David	69	Cohen, Leslie Robert, M.D.
83	Chiang, William		

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
50	Cohen, Paul J. Dr.	51	Cowan III, James J., Ph.D.
76	Cohen, Scott T.	64	Coy, Stephen Lawrence, Ph.D.
63	Cole, Douglas Reese, M.D.	75	Craig, Julia Ann
47	Cole, Howard Irwin	42	Cranefield, Jr., Paul F., Ph.D., M.D.
61	Coleman (Wilson), Mary, Ph.D.	66	Cripe, Jerry Dale, Ph.D.
72	Coleman, Robert F. Dr.	65	Cross, Jr., John W., Ph.D.
71	Collins, Tucker Otis Dr.	54	Crothers, Donald M., Ph.D.
78	Collins, William Harry	60	Cruce, William L. R., Ph.D.
52	Colman, Robert Wolf, M.D.	46	Cudaback, David D., Ph.D.
55	Colman (Fishman), Roberta Jane, Ph.D.	86	Cuffey, Clifford Andrew
83	Colón, Marcelo	88	Cuffey, Kurt Marshall
79	Conklin, George Walter	57	Cuffey, Roger James, Ph.D.
49	Conner, Jr., Pierre E. Dr.	67	Cullen, Mark Richard, M.D.
62	Connery, Colin Alder	46	Cumming, James Burton, Ph.D.
88	Conrad, Brian David	47	Cummings (Self), Cecilia
45	Conroy, Harold, Ph.D.	51	Cummisford, Patricia Diane
73	Conroy, Renee J.	70	Cunneff (Billingsley), Sue A.
68	Constanten, Carl Philip	46	Curran (Rohrer), E. Marilyn Dr.
62	Cook, Barry Paul, Ph.D.	57	Curry, John L., Ph.D., M.D.
88	Cooke, David Aaron	48	Curtis (Blumenheim), Ursel
51	Cooper (Gingrich), Cynthia	54	Cyprus, Joel Howard, Ph.D.
47	Cooper, Leon N, Ph.D.	70	Czeisler, Charles A., Ph.D., M.D.
54	Cooper III, William S., Ph.D.	87	Czerniawski, Deborah Ann
79	Corazza, Susani Marie	54	Dade, Everett Clarence, Ph.D.
59	Corneil, Paul H., Ph.D.	74	Dagi (Rabinowitz), Linda C. Dr.
44	Corr, Royal Marden	63	Dainer (Simpson), Joan Eve
82	Cosentino (Abel), Vicki	79	Dale, Gregory Allen
66	Cosgrove, Ann M., Ph.D., M.D.	44	Daniels, Gilbert Samuel, Ph.D.
47	Coulson (Hersey), Anne	74	Dargan, Richard A.

<u>Year</u>	<u>Last Name (Maiden Name)</u>	<u>Year</u>	<u>Last Name (Maiden Name)</u>
57	Daugherty (Iknayan), Susan	52	Dietrich, Charles W.
60	David, John Dewood, Ph.D.	63	Doherty (Gregory), Alina
44	Davidson, A. Charles	63	Doherty, Edward John
54	Davidson, Eric Harris, Ph.D.	52	Dolen, Richard Dr.
84	Davis, Ann Renee	82	Dollries, Karen Bernadette
42	Davis, Homer F.*	70	Dolson, William R.
44	Davis (Slaven), Nancy	43	Domike (Ronder), Joan, J.D.
67	Dawson, Dennis Wade	67	Donabedian, Haig Dr.
57	Deamer, Jr., David W., Ph.D.	66	Donatto, Brenda Marie
48	Decker, Charlotte E.	90	Doney, Renee Lynette
50	DeCoursey (Jackson), Patricia, Ph.D.	71	Dong, Mitchell Lang
83	DeFreitas, Michael Francis	78	Dougherty, Joseph Paul
42	Dehnkamp, Gilbert C.	81	Dowling, Michael Morgan
88	Deibler, Elizabeth Ann	51	Drauglis, Edmund, Ph.D.
44	Deiters, Julia Mary Sister, S.C.	78	Drela, Mark
49	Dell, George Fritz, Ph.D.	77	Driscoll, James Richard
85	Dell, Kristi Ann	89	Druz, Tamir Alexandrovich
73	Demer, Joseph L., Ph.D., M.D.	89	Du, Rose
51	Demkovich, John J. Reverend	70	Dubin, Alan Jay
51	Dennison, John Manley, Ph.D.	75	Dubin, Joel Ira
68	Denniston-Thompson, Katherine Jean Dr.	85	Duderstadt, Katharine Anne
71	Derstler, Kraig L., Ph.D.	66	Duggan, James
50	Detenbeck, Robert W., Ph.D.	78	Duncan, Robert Vance
58	Devine, Jr., Paul Joseph	88	Duncan, Todd Lucas
56	Diamondis, Peter John	46	Durell, Jack, M.D.
48	Dibble, William Edwin, Ph.D.	79	Durig, Douglas Tybor
43	Dickinson, Hillman, Ph.D.	50	Durkee (Taylor), Lenore, Ph.D.
45	Diebel, Robert Norman	45	Dwight, Jr., Kirby
		61	Dworkin, Barry Ronald, Ph.D.
		59	Dwyer (Burghorn), Susan

<u>Year</u>	<u>Last Name (Maiden Name)</u>	<u>Year</u>	<u>Last Name (Maiden Name)</u>
72	Dyer, Michael Lewis	50	Elliott, Noel Penney
44	Dyett, Jr., Edmond G.	45	Ellis, Russell Ray
58	Dyroff, David Ray, Ph.D.	71	Elmegreen (Meloy), Debra Anne, M.D.
47	Dyson-Hudson (Demerec), V. Rada, Ph.D.	82	Elshami, Ashraf Ahmed, M.D.
44	Earle, Albert Porter	77	Embree, Paul Michael
51	Earle, William Edward	62	Emmel, John Frederick Dr.
70	Eastaugh, Steven R.	59	Emmel, Thomas C. Dr.
42	Eastman, William Byron	47	Emrick, Donald Day, Ph.D.
77	Ebright, Richard High	65	Ephraim, Robert M.
74	Eckert, Susie Bramlett	52	Epstein, Eugene E., Ph.D.
66	Edelstein, William	80	Epstein, Pamela Lynne
67	Edgar, Gerald Arthur, Ph.D.	68	Epstein, Rochelle Lory, M.D.
44	Edmonds (Durant), Nancy, M.D.	87	Erlebacher, Jonah Daedalus
56	Edmunds, Jr., Leland N., Ph.D.	51	Ernst, Frederick J., Ph.D.
77	Egan, Kenneth William	61	Essenberg (Kottke), Margaret, Ph.D.
54	Egger, M. David, Ph.D.	74	Evanoff, Emmett
56	Egnitz, Ronald M.	83	Evans, William Joseph
57	Ehn, Dennis Clifford	73	Everds, Nancy E., D.V.M.
58	Ehrenfeld, Elvera R., Ph.D.	83	Ewalt, Celeste Aline
55	Eichman, Charles Jetter	62	Eyer, Joseph
57	Eikenberry, Eric F.	60	Eystone, Robert Bruce, Ph.D.
47	Eisenberg, Jerome M.	74	Eyster, Kenneth M.
63	Elgin (Roberts), Sarah, Ph.D.	76	Fajans, Joel, Ph.D.
63	Elias, Laurence	68	Fajans, Peter Stefan, M.D.
67	Eliopoulos, George Miltiades, M.D.	73	Fallon, Irving W. E.
82	Elkies, Noam David	63	Falwell, Richard Lee, J.D.
89	Ellenberg, Jordan S.	74	Fang, Meika A., M.D.
47	Ellerman (Briggs), Marilyn	67	Farkas, Daniel Reuben Dr.

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
55	Fassnacht, Robert Earl*	50	Fisher (Jackson), Cynthia, Ph.D.
72	Fast, Bruce Alan	56	Fisher, Hersha Sue
71	Fegley, Jr., M. Bruce, Ph.D.	78	Fisher, Ronald Anthony
86	Feig, Andrew Lawrence	66	Fishman, Norman Dr.
50	Feinberg, Gerald, Ph.D.	64	Fisk, Stephen Thomas, Ph.D.
55	Feinleib (Harman), Mary Ella, Ph.D.	72	Fitzpatrick, Colleen M.
78	Feinstein, Jonathan Seth	67	Fitzwater, Mary Ann Helen Dr.
62	Feit, Carl Dr.	64	Fizer, Henry Burnett Reverend
71	Feldman, Gary A.	55	Fleishhacker, David
80	Feldman, Paul Neil	63	Flicker, Michele R. Dr.
51	Feldstein, Robert Schmidt	81	Fliegel, Jonathan Eric
61	Fell, Harriet Jane, Ph.D.	71	Fly, Thomas H.
89	Felsch, Jason Scott	75	Foch, Richard James
47	Felsenfeld, Gary, Ph.D.	73	Fogel, Eric M.
86	Felton, Virginia Angelica	43	Folger, Robert L., Ph.D.
65	Fering, Nancy	68	Fong, George
59	Fetell, Arnold Jay	56	Ford, Edwin Foster Dr.
44	Fickett, Wildon, Ph.D.	44	Ford, Kenneth William, Ph.D.
54	Fiddler, Richard W.	52	Forman, Paul Frederick
70	Fifer, Michael Alan, M.D.	55	Foster, Edward John
52	Finch III, Hardy Rundell	83	Fox, David
50	Finegan, Joel Dean Dr.	61	Fox, Donald Jensen*
81	Finkelstein, Seth Steven	63	Fox, John Frederick Dr.
69	Finn, Marilyn Ann	43	Fox, Joseph Milton
80	Finn, Michael Vincent	64	Fox (Keller), Rhea Louise
74	First, Michael B., M.D.	74	Frank, Edward H.
67	Firstenberg, Arthur Robert	79	Frank, Geoffrey Campbell
60	Fischer (Perner), Virginia V.	66	Frank, Richard Alan
90	Fischman, Joshua Bailey	65	Frankel, Arthur Edward, M.D.
		69	Freeman, Gordon James

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
54	French, Bevan Meredith, Ph.D.	59	Ganz, Edward, M.D.
53	French, Thayer Carlton Dr.	81	Garcia, Eduardo Antonio
77	Freund, Jeremy Maimon, M.D.	75	Garcia, Philip
62	Fried, Herbert I.	59	Garland, Stephen Jay, Ph.D.
55	Fried, Michael Martin	67	Gartrell, Jr., Jack Eugene
70	Friedland, Peter E., Ph.D.	74	Garvin, Vicki L., Ph.D.
80	Friedman, Joel	45	Gates (Hodgson), Joan
85	Friedman, Michael	59	Gates, Ronald E., Ph.D.
63	Friedman, Norman Ebbe	64	Geisler, Carol Joy, Ph.D.
60	Friedman, Samuel R. Dr.	85	Gelfand, Boris Y.
60	Friis, Jr., Robert R.	75	Geller, Alan Stuart
70	Fritz, Lawrence C., Ph.D.	48	Geller, David Melville, Ph.D.
51	Frolen, Lois Jean Dr.	70	Gelwan, Eliot Marc, M.D.
68	Frostick, Jr., Bruce L.	51	Gendzier (Mendoza), Rhea, Ph.D.
84	Frucht, Steven Joel	58	Gentle, Kenneth W., Ph.D.
63	Fruchter, Jonathan S., Ph.D.	81	George, Edward
62	Fruitstone, Mitchell J.	49	George, M. Don, M.D.
76	Frumer, Sheri Lynn	81	Geppert, John Marion
50	Fuchs, Ronald, Ph.D.	89	Gerber, Andrew James
69	Fusilier, Lane Allen	72	Gershenson, Jonathan, Ph.D.
52	Gabbay (Laufer), Wilma	44	Gerstenhaber, Murray, Ph.D., J.D.
58	Gaidis, James Michael, Ph.D.	85	Gesner, Michael W.
58	Gaidis (Wallace), Lynda	82	Getto, Helen Elaine
85	Gaidos, Eric James	74	Getzel, Walter A.
46	Gaines, Jr., George L., Ph.D.	83	Ghogawala, Zoher, M.D.
84	Galarus, Douglas Edward	78	Gibbons, Anne Marie
80	Galbi, David Elmer	46	Gibson, James B.
46	Gall, Walter George, Ph.D.	87	Giese, Scott Clayton
80	Gamez, Lourdes	66	Gilberg, Andrew Nicholas
69	Ganong III, William Francis, Ph.D.	66	Gilbert, Joy Diane

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
88	Gilbert, Michele	56	Goodman, John Mott, Ph.D.
49	Gilbert, Walter, Ph.D.	67	Goodman, Martin Harris
43	Gill, John Ellis*	84	Gordon, Ian Robert
57	Gilmartin, Michael Cooper*	50	Gordon, Malcolm S., Ph.D.
59	Gitlin, Todd Alan, Ph.D.	47	Gordon, Milton Paul, Ph.D.
64	Gittes, Frederick M., J.D.	82	Gordon, Reena Beth
50	Glashow, Sheldon Lee, Ph.D.	61	Gordon, Robert Jay, Ph.D.
70	Glass (Ellman), Rhonda L.	62	Gordy, Leonard Howard
68	Glauser, Jonathan M., M.D.	57	Gorman, Richard Dr.
64	Glazer, Steven Ira	56	Gorn, Robert Aaron, M.D.
80	Gleba, David Thomas	72	Gortych, Regina Marię, D.D.S.
62	Glendinning, Jane-Carol	77	Gotlib, Louis Jeffrey
57	Glogower, Jonathan D.	65	Gott III, J. Richard, Ph.D.
66	Goad, Larry Edward	76	Gottlieb, Roberta Anne
59	Goguen, Jr., Joseph Amandee Dr.	75	Gover, Keith Bowen
71	Gold, Richard Bracey, Ph.D.	43	Grace (Lauer), Gloria Dr.
73	Goldberg, David A.	62	Grafstein, Roger P. E.
67	Goldberg, Paul Bernard Dr.	68	Graham, Stephen Alan, Ph.D.
49	Goldman, Alan Joseph Dr.	87	Grannis, Alexander Wharton
82	Goldman, John Douglas	77	Grant, David Ross, Ph.D.
68	Goldsmith, John Anton, Ph.D.	53	Grant, Michael Peter, Ph.D.
51	Goldsmith (Martin), Mary Helen, Ph.D.	63	Grassian, Stuart Edwin
85	Goldstein, Allan Moises	56	Gray, Charles Augustus, Ph.D.
52	Goldstein, David A., M.D.	85	Graziano, Michael Steven
57	Goldstein, Robert E., M.D.	88	Green, Aileen Louise
83	Gomez, Caroline Maria	43	Green, Joseph M., Ph.D.
68	Gomori, John, M.D.	53	Green (Spangehl), Karen
84	Gong (Meng), Margaret Van-Yu	44	Green, Leon William, Ph.D.
63	Goodbread, Joseph H. Dr.	80	Greene, Brain Randolph
		73	Greene, Glenn J., Ph.D.

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
59	Greenhouse, Jeffrey A., Ph.D.	78	Gurnis, Michael Christopher
55	Greenleaf, Frederick P., Ph.D.	43	Gursky (Cassidy), Judith
57	Greenlee, Donald Ray	68	Guth, Robert Wayne, Ph.D.
71	Greenspan, Neil S., Ph.D., M.D.	74	Haber, Stuart A., Ph.D.
71	Greenwald, Glenn M.	62	Haberly, Lewis Binoth, Ph.D.
65	Greer, Helen Anita	68	Haden, Keith Wightman Dr.
47	Gregory, Jr., Clarence L.	43	Haftel, Howard W., L.L.M.
42	Greiff, Robert	89	Haile, David Lawrence
68	Greis, Neol Peyton, Ph.D.	84	Haimowitz, Ira Joseph
72	Grenadir, Alan Stuart	42	Halberstadt, N. Herbert
86	Griffith, Traci Ann	45	Hall, Robert L., Ph.D.
87	Griffy, Charla Cristal	58	Halperin, Bertrand I., Ph.D.
59	Grimm, Frank Wayne	56	Halpern, Martin Brent, Ph.D.
62	Grinell, Sheila Lynne	47	Halverson, Phillip C.
82	Griner, Jr., Gary Merle	71	Hamaker, H. Christopher, Ph.D.
67	Grisham, Larry Richard, Ph.D.	84	Hamburg, Mark Christopher
52	Griswold, Ralph Edward, Ph.D.	78	Hamburger, Robert Owen
56	Groder, Martin G., M.D.	43	Hammerle, William G., Ph.D.*
78	Groisser, Daniel Stuart, M.D.	74	Hammond (Anderson), Carol J.
53	Gross, Charles Gordon, Ph.D.	45	Handschumacher, Robert, Ph.D.
87	Gross, David Lawrence	69	Hankison (Markwood), Jill
81	Gross, Mara Mae	68	Hanni, Richard Squier Dr.
66	Grossman, Jerrold Wayne, Ph.D.	57	Hanor, Jeffrey S., Ph.D.
71	Grottola (Jernazian), Marie	76	Hansen, Craig Cornell
71	Gruber, Samson David*	78	Hansen, Frank Charles
76	Gubrud, Mark Avrum	86	Hansotte, Eric James
65	Gudaitis (Barrett), Joyce Ann	65	Harabin, Joseph A.
71	Gunter (Westbrook), Anne	79	Hardas, Billy Roy
50	Gunter, Jr., William Dayle	44	Hardy, George Fiske, Ph.D.
82	Gurel, Ogan	61	Harkins, Anna Marie Dr.

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
62	Harnage, Philip Lee	75	Heller, Howard Hamilton
44	Harrell (Marrison), Joyce	89	Heller, Kevin Nelson
55	Harriman, John Edward Dr.	81	Henderson, Bryan Douglas
58	Harris (Londak), Bernadette, Ph.D.	59	Henkel, Dennis Phil
43	Harris, Jr., Donald R., Ph.D.	46	Herbert, Jr., Donald E.
70	Harris, Elizabeth	72	Herko, Robert John
78	Harrison (Pickrell), Donna Joan, M.D.	58	Herschkopf, Sybil
53	Harte, Kenneth J. Dr.	44	Hershenson, Lee Morton, M.D.
55	Hartley, Alice K.	49	Herzenberg (Littlejohn), Caroline, Ph.D.
52	Hartmann, Harry Rodney, M.D.	60	Heyworth, Geoffrey D.
84	Harvey, Tamara Maureen	59	Higgins, Robert B.
84	Harwitz, Jonathan Michael	73	Higuchi, Darryl A.
65	Hassid, Edwin Joseph Dr.	73	Hilde (Hsu), Leilin
47	Haugh, Eugene F., Ph.D.	45	Hill, David Allen Dr.
54	Haught, Alan F., Ph.D.	62	Hills, Jack Gilbert, Ph.D.
55	Havey, Jr., James H. Col.	50	Hinds (Franchere), Julie
52	Hay (Schmir), Louise, Ph.D.*	44	Hinkle, Richard G.
81	Hayden, Randall Todd	78	Hirano, Michio, M.D.
47	Hayes, John Richard, Ph.D.	82	Hirschhorn, Joel N.
47	Haymes (Semiat), Paula, M.D.	57	Hnilica (Schlatter), Violette, M.D.
54	Hayward, Gary G.	90	Ho, Peter Yee Cheung
84	Hayward, Roger Charles	52	Hobbie, Russell Klyver, Ph.D.
90	Headrick, Matthew Peter	60	Hochster, Melvin, Ph.D.
87	Heafitz, Andrew Mark	82	Hochwald, Steven Norbert
60	Hearn, David R., Ph.D.	54	Hoff, Jr., Marcian E. Dr.
71	Heath, Jr., Lenwood S., Ph.D.	66	Hoffenberg, Leslie Irwin
85	Heavner, Thomas Patrick	61	Hoffman, Donald R., Ph.D.
60	Heckman (Ash), Barbara A.	55	Hoffmann, Roald, Ph.D.
		42	Hollander, Lester, M.D.

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
56	Hood, Leroy E. Dr.	46	Hummel, James A., Ph.D.
88	Hooker, Brian Casey	59	Humphreys, D. Russell, Ph.D.
67	Hooker, Jr., John Norman, M.D.	88	Huynh, Hong B.
52	Hooker, William Weston Dr.*	83	Hyman, Michael Irvin
42	Hoover, Richard M.	68	Hymes, Robert Paul
70	Hopenwasser, Karen Dr.	85	Hyndman, David William
46	Hopkins IV, John T.*	70	Inagaki, Tsutomu
85	Horiuchi, Junjiro	86	Ingling, Allen Wallis
82	Horowitz, David Andrew	47	Inman, Charles Gordon
72	Horowitz, Tony G.	44	Irving, Ellen M.
61	Hosford, J. Michael, M.D.	69	Isenberg, James A., Ph.D.
87	Hoshen, Gur	53	Isles, David F.
71	Hoskins, Edward Joseph Dr.	90	Iwasaka, Ryan Mamoru
44	Houck, Theodore Edwin Dr.*	54	Izzarelli, Jr., Anthony W.
47	House, Herbert Otis, Ph.D.	89	Jackson, Andrew William
75	Howard, Christopher G.	69	Jackson III, J. Edward Dr.
65	Howard, Larry D.	62	Jackson (Barron), Mary
75	Howe, Tom Brent	85	Jacobs, Kimberley Anne
48	Howett, Gerald Leonard, Ph.D.	66	Jacobs, Stephen Alan, Ph.D.
44	Howlett, Eric Mayorga	87	Jacobson, Jessica Lynn
56	Hoxie, Dwight Thomas	75	Jacobson, Terry Allen, M.D.
60	Hoyle, Jr., Samuel Pettus	44	Jaffee, Lionel F., Ph.D.
69	Hsu, Jason, Ph.D.	64	Jaffin, Henry Michael
88	Hsu, Leonardo	48	Jamieson, Jr., J. Burgess
85	Hu, Alan John	76	Janda, David Hubert, M.D.
70	Hu, Esther Ming, Ph.D.	85	Janne, Pasi Antero
61	Hubbell, Wayne L. Dr.	69	Jasny (Rosenberg), Barbara
83	Huckabee, Laura Leigh		Jean, Ph.D.
69	Hughston, Lane P., Ph.D.	84	Jayatileke, Hiran
80	Hull, Melissa Willene	66	Jefferson, David Randolph, Ph.D.

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
67	Jeffery, Diane Louise Dr.	68	Kanof, Philip David
44	Jenkins, Rodman	62	Kanter (Hersfeld), Miriam
64	Jennings (O'Brien), Eileen, M.D.	82	Kantor, Ronald Marc
58	Jensen, Richard Joseph Dr.	85	Kantrowitz, Mark
58	Jerina, Donald Michael, Ph.D.	79	Kaplan, Ira Mitchell
80	Jerome, Karen Lisa	78	Kaplan, Jonathan Todd
59	Jessup, David M.	81	Kaplowitz, Lori Ellen, M.D.
73	Jobe, Patrick G.	58	Kapuler, Alan Mitchell, Ph.D.
56	Johnson, Dennis Lee	74	Kare, Jordin T., Ph.D.
51	Johnson, Donald Bruce Dr.*	79	Karis, John Proud
49	Johnson, L. Audrey	90	Karlin, Joseph Howard
78	Johnson, Lance Gordon, J.D.	63	Karney (Martin), Alice M.
65	Johnson, Randy Allan, Ph.D.	42	Karo, Wolf, Ph.D.
46	Johnson, Jr., Russell D., Ph.D.	47	Karplus, Martin, Ph.D.
48	Johnston, Alan R., Ph.D.	86	Katopis, Chris John
44	Johnston (Dunkel), Patricia	62	Katz, Charles Noel
42	Jones, Betty Jane	45	Kauer, James Charles, Ph.D.
61	Jones, Edward Charles	63	Kauffman, Peter Carr
55	Jones (Tollman), Janet	49	Kaufman, John David*
69	Jordan, Joseph Bell	61	Kaufman, Laura Sue Dr.
56	Jordan (Thorson), Margaret Ann, Ph.D.	80	Kauvar (Bienenstock), Arielle, M.D.
61	Josephson, Paul Douglas	73	Kawahara, Rodney S., Ph.D.
86	Juang, George Jer-Chi	72	Kawamoto, Alan Harumi
58	Juneau (Karau), Jane	64	Kay, Joseph Andrew
64	Kagan, Norman Eli Dr.	56	Kayser, Boris Jules, Ph.D.
55	Kalnajs, Agris Janis, Ph.D.	56	Kayser (Zimet), Susan, Ph.D.
61	Kane, Jr., Daniel F. Dr.	69	Kearney, Michael A.
76	Kanfer, Michael David	45	Kegleman, Matthew R. Dr.
62	Kanner (Jaime), Judith	52	Kehoe (Beck), Alice, Ph.D.

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77 Keller, Andrew David
48 Kende, Andrew Steven, Ph.D.
71 Kenigsberg, David R.
46 Kernan, Jules Alfred, M.D.
57 Kettman (Similia), Marjorie Kay*
75 Kharasch, Evan David, Ph.D.,
M.D.
77 Kieper, David Glenn
75 Kikuchi, Derrick Thomas
79 Kilberg, Steven Marc
82 Kim, Saechin
88 Kim, Sally Joanne
90 Kim, Tae Hoon
49 Kimball, John Ward, Ph.D.
46 Kindig, Neal Bert, Ph.D.*
78 King, Philip George
76 Kirchner (Schwebs), Ursula
58 Kirk, Rodney Carlos
79 Kirkpatrick (Duhe), Nanda
Victorine
53 Kirtley, Mary Elizabeth Dr.
71 Klapholz, Sue, Ph.D., M.D.
89 Klarreich, Erica Gail
79 Klein, Jeffrey David
82 Klein, Marc Alexander
74 Klein, Robert W.
61 Kleinman, Daniel E.
78 Klerer, Robert Jason
52 Klevay, Leslie M., M.D.
60 Klickman, Nancy

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86 Kliewer, Bryan Albert
43 Kline (March), Virginia, Ph.D.
59 Kloss, Kenneth E.
66 Klyde, Barry J. Dr.
65 Knight, Jr., Thomas F., Ph.D.
46 Knutsen (Jones), Elaine C., M.D.
81 Ko, William
70 Kochanski, Thaddeus P. Dr.
48 Koehler, George Edgar, Ph.D.
42 Kofahl, Robert E., Ph.D.
43 Kohl, Henry H.
48 Kohn, Kurt William, Ph.D., M.D.
46 Kohnen, Mary Leana Sister
83 Koide, Eric Akira
51 Kolenkow, Robert J.
47 Kopple, Kenneth David, Ph.D.
50 Korenman, Stanley G., M.D.
42 Korn, Jr., Hugo
45 Kosower, Edward M., Ph.D.
44 Kraichnan, Robert H., Ph.D.
76 Kramer, Diane Robin
45 Kravetz, Saul Dr.*
54 Kreek, Mary Jeanne, M.D.
49 Kriegsman, William E.
55 Kripke, Bernard Robert Dr.
58 Kripke, Saul Aaron
47 Krivanek (Cooley), Robin
83 Kroeger, Alexandra
78 Kroening, Mary Elizabeth
64 Krone, Anton Mark, M.D.

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50 Krongelb, Sol, Ph.D.
74 Kroo, Ilan M.
90 Kuga, Shinpei
63 Kugelmass, Joel N.
58 Kukla, Andy Dr.
87 Kuo, David Feng-Ming
85 Kuo, John Shu-Shin
86 Kuo, Mark Huan-Fu
80 Kupferberg, Sarah Julia
43 Kurfuerst, Leonard C.
76 Kurth-Pearson, Rebecca Ann,
Ph.D.
65 Kurzweil, Raymond C.
58 Kuzmack, Arnold Mark, Ph.D.
63 Kyte, Jack Ernst, Ph.D.
80 Laberge, Anthony Charles
67 Lagarias, Jeffrey Clark Dr.
73 Laiterman, Lee H.
49 Landau, Henry Jacob, Ph.D.
67 Landau, Steven Edward Dr.
72 Landau, Susan Eva, Ph.D.
75 Lander, Arthur Douglas Dr.
74 Lander, Eric S.
86 Landesberg, Leonard John
54 Landisman, Laurel S.
57 Landman, Maurice Alan
49 LaPerch (Jaburg), Erika
42 Larimore, Wayne H.
67 Larner (Egel), Carol S., M.D.
66 Larson, Arden L.

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46 Larson, Daniel H.
51 Larson, David Clarence*
53 Larson, James Daniel, Ph.D.
66 Laska (Briggs), Sharon
77 Laske, Douglas Walter, M.D.
77 Laster, David Scott
43 Lauenstein, Milton C.
46 Laufer, Elizabeth U.
69 Laurence, Jeffrey C., M.D.
71 Lavey, Warren Gary
86 Lazoff, David M.
83 Lazoff, Howard Allen
59 Leavitt, Jonathan D. Dr.
65 Lechowicz, Martin John, Ph.D.
69 Lederman, Howard Mark, Ph.D.,
M.D.
87 Lee, Chen-Wei A.
86 Lee, Daniel Dongyuel
72 Lee, Dora Yuen-Kie
84 Lee, Fred Ock-Horn
74 Lee, Ho-Jin
56 Lee (Riendl), Ida
81 Lee, Jin-Moo
85 Lee, Leonard Tze-Yung
79 Lee, Myung-Moo
66 Lee, Jr., Robert Emile
83 Lee, Steve
88 LeGrand, Richard Mark
76 Leighton, Jr., David Trent
74 Leighton, Frank T., Ph.D.

<u>Year</u>	<u>Last Name (Maiden Name)</u>	<u>Year</u>	<u>Last Name (Maiden Name)</u>
72	Lempert, Norbert	75	Light, Robert Allan
83	Leonard, Silva Kristine	81	Lim, Stephen Wong
80	Leonhardt (Dick), Heather Lynn	82	Lim, Wendell Alan
79	LePoire, David John	89	Lin, Jenny Jen-Yi
61	Lepowsky, James Ivan, Ph.D.	86	Lin, Jung-Pu
43	LeRoy (Wojciechowski), Wanda Clare	84	Lin, Ken Chang
48	LeSchack, Alan Richard	84	Lin, Michael Tai-Ju
61	Lesk, Michael Edward Dr.	42	Linder, Seymour, Ph.D.
63	Leslie, Bruce Robert, M.D.	90	Lines, Andrew Matthew
63	Lester, Henry Allen, Ph.D.	71	Ling, Wensor
59	Letcher, John S., Ph.D.	64	Linke, Richard A. Dr.
83	Leung, Jr., Arthur Tung Tak	53	Linn (Wright), Eleanor
81	Leventhal, Ezekiel Michael	64	Linsker, Ralph, Ph.D., M.D.
88	Levine, Dana Susan	73	Lipshutz, Robert J.
70	Levine, Robert A., M.D.	81	Lisanti, Michael Phillip
55	Levine, Stephen S.	79	Little, Julia Elizabeth, M.D.
65	Levinson, Jerrold, Ph.D.	70	Litton, James Robert, Ph.D.
66	Levintow, Michael Harvey	90	Liu, David Ruchien
83	Levy, Gina Rosalind	79	Liu, Ken
45	Levy, Madeline L. Dr.	43	Lizardi (Ens), Catherine
54	Levy, Richard J.	77	Lo, Andrew Wen-Chuan
67	Lewis, Trevor Rand	71	Lo, Cecilia Wen-Ya
46	Lewontin, Richard C., Ph.D.	83	Lo, Jeannie Pui Ching
88	Liao, Hsin-Chao Phil	71	Lo, Martin Wen-Yu
90	Liao, James Chien-Hsun	64	Locker, Joseph D. Dr.
56	Lichtenbaum, Stephen, Ph.D.	89	Lockwood, Rowan
72	Lichtman (Seitman), Gwen Riva	65	Loewenstein, John I. Dr.
52	Lieberman, Philip, Ph.D.	67	Loh, Elwyn Yuan, Ph.D., M.D.
64	Liebman (Weiss), Susan, Ph.D.	77	Lohmann, Kenneth John, Ph.D.
		77	Lohse, Christopher Martin

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69	Lorang (Cardwell), Bonnie Gale	77	Maddon, Paul Jay
60	Loveman III, David B.	68	Maddy (Parsons), Penelope Jo, Ph.D.
64	Lovins, Amory Bloch, D.D.S.	60	Madey, John M. J. Dr.
69	Lowenhaupt, Ann T.	59	Madrid (Davis), Marion
66	Lozar-McDonald, Robert Carl	65	Magid (Jenny), Linda, Ph.D.
50	Lubell, David	62	Magley, Paul Stanford
53	Lubin, Jonathan D., Ph.D.	89	Mahl, David Armin
48	Lubin, Michael D., Ph.D.	64	Maiorana, James A. Dr.
50	Lubkin, Elihu, Ph.D.	54	Maioriello (Oberly), Lorraine
74	Lucas, Bruce D., Ph.D.	89	Maitland, Michael Lee
46	Ludwig, Gerald Wilbur, Ph.D.	89	Majumdar, Mahbub Alam
71	Ludwig, Howard William, Ph.D.	90	Malin, Sacha Alexis
57	Luehrs, Dean Carl, Ph.D.	82	Malinowski, John Robert
72	Luessen, Bonnie Jean	50	Malone, Dennis Philip, Ph.D.
52	Luhrmann, Jr., George W., M.D.	58	Malone, Jr., Jesse
77	Lui, Kinkuen	69	Maloney, Paul W.
78	Lung, Therese	61	Manak, Rita Carol Dr.
89	Lurie, Alexander Berman	81	Mancuso, Charles Curtiss
43	Lyle (Lean), Elizabeth	88	Mancuso, James Paul
42	Lynch, Robert Lee	60	Maraldo, John Charles, Ph.D.
59	Lyngholm, Carl Lewis	75	Marans, Jon Stephen
64	Lyons, Kenneth B., Ph.D.	75	Maranto, Anthony Rosario
89	Ma, Wai Ling	89	Marchal, Zoe Madeleine
66	MacCarry, Timothy James*	82	Marcus, Sharon
55	MacDonald, John L., Ph.D.	60	Mardis, James Vernon Capt.
74	MacGuire, John C.	68	Margolskee, Jeanne P.
62	Machtley, Michael Axel*	43	Mark, Robert B.
55	MacKay (Myers), Carol	50	Markoff, Nicholas G.
63	MacPhillamy, Douglas J., Ph.D.	59	Marks, Peter
43	Macy, Jr., Josiah Dr.*		

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75	Marshak, Daniel Robert	50	McCormick, Donald B., Ph.D.
55	Marshall, Winston S., Ph.D.	46	McCullough (Kingman), Alice
58	Martens, Charles Paul Dr.	59	McDonnell, Robert N.
50	Martin, Donn Robert	77	McFadden, Stephen Andrew
68	Martin, Neil Fred, M.D.	80	McGahan, Gary Eugene
48	Martin, Paul, Ph.D.	61	McGivern, Thomas John
49	Martin, Thomas Francis	90	McGuire, Sean Eric
58	Martz, Eric, Ph.D.	75	McKemie, Charles Edward
62	Marvin, Betty Joanne	47	McKenna, James, Ph.D.
69	Mason III, William Thomas, Ph.D.	47	McLeish, William Lee, Ph.D.
59	Massey, Jr., Leonard D. Dr.	70	McLeod, Dennis James, Ph.D.
60	Mather, John Norman	52	McLeod, Donald W., Ph.D.
61	Matsen III, Frederick A. Dr.	43	McLoughlin, James G.
88	Matthews, Keith David	78	McMahon, Ann Piening
78	Mattis, Michael Perelman	83	McMahon II, Elihu Hassell
47	Mattuck, Arthur Paul, Ph.D.	50	McPortland, Winifred
80	Maturi, John Alexander	57	McRae (Hollingshead), Dorothy
61	Mayer, Ann	84	Mead, Peter Augustus
82	Mayer, Niels Phinn	52	Meade (Dawson), Mary
47	Maynard, Donald M. Dr.*	77	Mechem, Charles Crawford
44	Mayper, Jr., Victor, Ph.D.	67	Meisel, Lawrence*
48	Mazo, Robert Marc, Ph.D.	61	Melson, Eloise Ann
82	McAleese, Kelly Ann	69	Mena, Jr., Demetrio
86	McAlwee, Gerald Steven	87	Meng, Maxwell V.
62	McBee (Foley), Carol	90	Meng, Raymond D.
74	McCabe, Thomas G.	53	Menhinick, Edward F., Ph.D.
64	McCahey (Goldman), Judith, M.D.	64	Menikoff, Arthur S., Ph.D.
85	McCastle, Victor Achilles	58	Menn (Waldman), Lise, Ph.D.
51	McColm, Douglas W. Dr.	77	Menon, Victor Paul
		54	Merchant, Carolyn, Ph.D.

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49	Merz, Jr., Edwin Henry, M.D.	58	Mitrovich, Dushan, Ph.D.
52	Messinger, Paul Hilton	47	Moe (Addleman), Mary
84	Metzger, Mark Robert	53	Moffet, Alan T., Ph.D.
72	Meyer, Herbert W.	48	Moldenhauer (Gilbert), Marjorie
86	Meyerand, Mary Elizabeth	72	Mondschein, Benjamin M., M.D.
42	Meyers (Prajmovsky), Marina, M.D.*	68	Monger, Teresa Grace
72	Michel, James Laurence Dr.	53	Monsky, Paul Henry Dr.
45	Michel, Maynard C. Dr.	84	Montanaro, Christopher Roland
42	Michener, John W., Ph.D.	56	Montgomery (Hansen), Carolyn
80	Middleton, Karen Laurel	45	Moore, John Fitzallen Dr.
76	Mier, Randall Mark	65	Moore, Polly Fletcher, Ph.D.
45	Milburn (Stafford), Nancy, Ph.D.	56	Moore, Robert Thorpe, Ph.D.
45	Milburn, Richard H., Ph.D.	88	Moore, Terry Kay
45	Miller (Dale), Alice Dr.	62	Morava, Jack Johnson
75	Miller, Craig Franklin	69	Morawetz, Lida Joan Dr.
74	Miller, Dale A., Ph.D.	70	Morell, Larry Joe
48	Miller, Jerry Blair Dr.*	83	Morgan, Douglas Stephen
56	Miller, John Charles, Ph.D.	59	Morrison (Leaver), Sherie, Ph.D.
63	Miller, Karl Henry	66	Morse, Larry Eugene, Ph.D.
81	Miller, Martin Bruce	78	Mosesson, Robert Elliott, M.D.
52	Miller (Boat), Mary, Ph.D.	68	Moss, Charles D.
65	Miller, Robert Desle	87	Mossey, Michael Paul
63	Miller, Zachary Ian, M.D.	44	Mottleson, Ben R., Ph.D.
60	Mills, Richard Pence, M.D.	82	Movsas (Zietchick), Tammy, M.D.
77	Milrod, Robert John	81	Movesian, Mark Lewis, J.D.
73	Minter, John R.	90	Mowshowitz, Jed Elijah
85	Minter, Todd Michael	79	Moy, Ernest Mingway, M.D.
84	Minyard, William Patrick	63	Muchnick, Steven S., Ph.D.
52	Mitchell, Dana D.	52	Muench, Karl Hugo, M.D.
		54	Muffler, L. J. Patrick, Ph.D.

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
72	Mullins, Cory Jon	85	New, Kent Christopher
53	Mumford, David Bryant, Ph.D.	90	Newbury, Jennifer Alice
73	Munfus (Miller), Laureen P.	44	Newcomb, William Adrean
79	Munshi, Ashfaq Abdulrehman	42	Newell, James
86	Muraidekh, Eli	46	Newkirk, Jr., Gordon A., Ph.D.*
90	Muroff, Jared Ian	61	Newlon, Michael Clarke, Ph.D.
80	Murray, Alan Glenn, Ph.D.	70	Ng, Jeffrey
83	Murray, Amy Miok	87	Ng, Mason
77	Murray, Annie Laurie	90	Ng, Tsz Wang
44	Murray (Baird), Joan, Ph.D.	81	Ngo, Tan Dinh
68	Murray, Mary Lad	86	Nguyen-Huynh, Anh Tuan
76	Murtagh, Jr., James John, M.D.	72	Nicholas, Mark H.
73	Musen, Mark A. Dr.	67	Nicholson, Sharon Elaine, Ph.D.
72	Nachman, Ronald J., Ph.D.	57	Nieman, George Carroll, Ph.D.
56	Nading, Lewis Karl*	84	Niewood, Eliahu Haym
75	Nagano, Christopher Dike	89	Nigrini, Peter Andrew Eric
84	Nahirny, James Jacob	83	Ning, Paul Chih
82	Nahmias, David Erich	58	Nininger, Neil Logan
66	Nardi, James Benjamin, Ph.D.	44	Noland, Wayland Evan, Ph.D.
85	Nash, Huw Michael	57	Nordgren, Brett Marcus
65	Nathanson, James Andrew, Ph.D., M.D.	51	Norris, Daniel Howard, Ph.D.
88	Nayak, Chetan	73	Noto, James V.
56	Nearing, James Carr Dr.	51	Novotny, Eva Dr.
63	Neisendorfer, Joseph A. Dr.	52	Noyes, Jr., Russell Dr.
82	Nelson, Janet Elizabeth	46	Oates (Lines), Joan, Ph.D.
71	Nelson, Nanette Marie	88	O'Brien, Lucy Erin
49	Nelson, Roger Hugh Dr.	56	O'Brien, Thomas W., Ph.D.
59	Nelson (Entine), Ruth	59	O'Connell, Richard J., Ph.D.
55	Nergaard, David Karl	83	Oei, Thomas Gie
		49	Oels, Helen C. Dr.

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
66	Offenbach, Howard A., M.D.	85	Passner, Jonathan Michael
53	Offenhartz (Hopf), Barbara, Ph.D.	69	Patrinely, Christopher Dean
64	Ofsowitz, Clare H.	77	Patterson (Rhodes), Lori Ellen, M.D.
71	Ogg, James George, Ph.D.	81	Patterson, Thomas Orren
86	Okasinski, Matthew Joseph	85	Paul, Louis Craig
58	Okun, Lawrence M., Ph.D.	89	Pavich, Ana Josefina
79	Olazabal, Bertha Margarita	48	Peacock, Norman, Ph.D.
86	Oloff, Andrew Henry	87	Pearl, Steven Howard
69	Orr, Jennie Marie, M.D.	53	Pearlmutter, Arthur E.
43	Ortenbruger, Jr., Arthur I., M.D.	79	Peck, Jeffrey Victor
84	Ott, Derek Alan	43	Pederson, Donald Dr.
87	Ouellette III, Edward J.	69	Pekary, Allan Dale
42	Ousley, Joseph L., M.D.	81	Penberthy, John Scott
86	Owens, Mark David	90	Peng, Royce Yung-Tze
70	Padesky, Christine A.	85	Penn, Anna Asher
66	Padilla (Silkworth), Mary, Ph.D., D.V.M.	55	Penney, David Emory, Ph.D.
43	Palombi, Robert E., M.D.	80	Penprase, Bryan Edward
83	Pan, Janet Lin	65	Pensak, David Alan, Ph.D.
78	Pan, Julie W.	80	Perdue, Craig Thomas
88	Pande, Vijay Satyanand	64	Perlman, Janet
52	Papadakis, Emmanuel P. Dr.	43	Perot, Jr., Charles P.
87	Pappas, John	58	Pestcoe, Allan Emanuel
86	Park, Carl Hyun-suk	61	Peters, Jr., Roger Paul, Ph.D.
87	Park, Hyoung Yoon	45	Petersen, Frederic, Ed.D.
88	Park, Sheeyun	67	Petersen, Janice Lynn Dr.
70	Parker, William P. Dr.	50	Peterson (Wyeth), Cynthia, Ph.D.
76	Partyka, Robert John	59	Peterson, Jr., Harold T.
61	Passero (Cecere), Mary Ann, M.D.	57	Phillips, Charles T.
		53	Phillips, E. Alan Dr.

<u>Year</u>	<u>Last Name (Maiden Name)</u>	<u>Year</u>	<u>Last Name (Maiden Name)</u>
79	Phillips, Michael Lee Capt.	89	Posey, Sharon Celeste
42	Phillips, Robert Edward, Ph.D.	89	Posmentier, Raoul
61	Phillips, Roger Morgan	50	Posner, Edward C., Ph.D.
54	Phillips, William, Ph.D.	55	Potter, James Emerson, Ph.D.
63	Phinizy (Birkhead), Jo Lynne	52	Potthoff, Robert E.
76	Phinney III, Edward Sterl, Ph.D.	72	Powell (Rounds), Donna Elaine
63	Pickard, Jr., William L.	66	Powers, Linda Sue, Ph.D.
58	Pickering (Marshall), Ruth	42	Presberg, Jack E., M.D.
68	Piechocka, Sylvia	80	Preston, Mark Paul, M.D.
81	Piehl, Forrest Lincoln	52	Prewitt (Shimansky), Judith Dr.
89	Pierpont, Christopher Edward	79	Pribyl, William Lee
86	Pierre, John Ma	75	Price (Rounds), Joyce Diane
47	Pike, John Nazarian, Ph.D.	77	Propp, James Gary
75	Pillus, Lorraine Alice	43	Quermann, Thomas R.
43	Piper, William W., Ph.D.	87	Racunas, Stephen Alexander
53	Pirone, Dominick J., Ph.D.	47	Radack, Herbert Brahm, M.D.
50	Piskule, Donald Frank	66	Rafsky, Lawrence Craig, Ph.D.
49	Plantz, Charles Arthur	69	Raifaizen, Claude*
60	Platt III, William Joshua	78	Rainbolt, John David
60	Podeseck, Frank A. Dr.	68	Ralson, Myron
83	Podlasek, Carol Ann	60	Ramstad, Linda M.
86	Poelman, Conrad James	70	Randall, Kent William
72	Poeppelman, Alan David	80	Randall, Lisa Joy
48	Poindexter, Edward, Ph.D.	48	Ransom (Sawyer), Millicent
44	Poirier, Jacques C., Ph.D.	61	Rappaport, Bernard S., M.D.
85	Pollen, David	71	Raps, Mitchell Steven, M.D.
53	Poller (Forman), Merle, Ph.D.	52	Raudsep, Ilmar
57	Pollock, Edward Jay Dr.	57	Rauscher, Warren C.
77	Poole, Glenn Curtis	47	Ray, Walter B. Dr.
68	Poplin, Elizabeth Ann, M.D.	73	Raymond, Anne L., Ph.D.

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
61	Raymond, Robert Lee	48	Rigal, R. Daniel Dr.
48	Rayna, Gerhard, Ph.D.	50	Rippon, John Willard, Ph.D.
43	Rechtin, Eberhardt, Ph.D.	84	Riskin, Jessica Gabrielle
45	Reed, Jr., Charles O.	84	Rivkin, Jan Winter
55	Reed, Jack D.	70	Robbins, Lee, M.D.
88	Reed, Jason Christopher	77	Roberts, Jonathan Seth
70	Reed, Sharon Lee, M.D.	43	Robertson, Jr., C. A. LTC (Ret.)
70	Rees, Douglas Charles, Ph.D.	59	Robinson, Robert William, Ph.D.
50	Reeves, Jr., William J. Dr.	45	Rochester (Boochever), Lois
81	Reichel, Amy Sue	54	Rodden, Robert James
78	Reichel, Elias	48	Rodemich, Eugene R.
57	Reichert, John D., Ph.D.	73	Rodriguez, Bradford J.
81	Reidy, Michael Frank	88	Rodriguez, Karl Andrew
49	Reinhardt, Nicholas	72	Rodriguez, Raymond
47	Relyea, Douglas I. Dr.	45	Roebber (Gurney), Jean Carolyn
47	Rennagel, William R.	46	Roemer, Elizabeth Dr.
47	Rescsanski (Nagy), Irene	74	Roger, Ignatius D.
53	Resnikoff, Howard L., Ph.D.	62	Rogers, C. Fred, Ph.D.
53	Reynolds, John Charles, Ph.D.	79	Rogers, Jeffrey Edward
73	Reynolds, Robert C., Ph.D.	77	Rojas, William Manuel
55	Rhodes (Hable), Kathleen Anne, M.D.	78	Rokhsar, Daniel Soleyman, Ph.D.
63	Ricard (Chang), Bernice W. S. Dr.	75	Rollins (Edelstein), Lisa
85	Ricci, Laura Joan	83	Romani, Victoria Gissele
58	Rice, Jerry Mercer, Ph.D.	56	Rony, Peter Roland, Ph.D.
45	Rich, Ronald Lee, Ph.D.	85	Rose, John Michael
52	Richards, Paul L., Ph.D.	63	Rosen, Barry, Ph.D.
48	Richardson, James W. Dr.	89	Rosen, J. David
58	Richardson (Shelby), Jane	55	Rosen, Michael Ira, Ph.D.
86	Rider, Todd Harrison	51	Rosen, Robert, Ph.D.
		50	Rosen, Jr., Victor J. Dr.

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
73	Rosenbaum, Thomas F., Ph.D.	62	Runkle (Gates), Katherine
68	Rosenberg, Jonathan M., Ph.D.	56	Runnels, Lynn Kelli, Ph.D.
43	Rosenblatt, Murray, Ph.D.	53	Russ, Joanna
65	Rosenblitt, Donald L., Ph.D.	48	Ruttenberg (Childress), Pat
51	Rosenthal (Botkin), Dorothy, Ed.D.	76	Ruyle, Susan, M.D.
59	Rosenthal (Dick), Miriam	57	Ryan, Philip Meade
50	Rosler, Lawrence, Ph.D.	90	Ryder, Jennifer Lynn
58	Rosner, Jonathan L., Ph.D.	88	Ryder, Scott William
75	Rosser (Erdmann), Debra Sue, Ph.D.	69	Rylander, Gary Ray, M.D.
65	Roth, Christopher M., Ph.D.	83	Rynne, Sean Frederick
48	Roth (Maurer), Laura, Ph.D.	90	Ryu, Soojin
80	Rothenberg, David Benjamin	60	Saal, Harry Jerome, Ph.D.
61	Rothman, William David	66	Saarni (Strandell), Elizabeth, M.D.
54	Rountree, Janet Caryl, Ph.D.	46	Sack, Seymour, Ph.D.
48	Rowe, Nancy Jean	52	Saffir (Allen), Patricia
65	Rowen, Louis Halle, Ph.D.	84	Sageev, Michah El-Yakim
60	Rowland, Jr., James Warren	86	Saito, Yoriko
67	Roy, Linda Jo	75	Sakson, Stephanie Lee
63	Royce, Ronald Richard	79	Sandborn, Patricia Marie
45	Royden, Jr., H. L., Ph.D.	78	Sandborn, Jr., Peter Alan
44	Rozian, Irving William	75	Sanderford, H. Britton
64	Rubenstein, Howard M. Dr.	75	Sanders, Charlene Gail, M.D.
73	Rubin, Joshua L.	54	Sandy, Frank, Ph.D.
72	Rubin, Scott Alvin, M.D.	81	Sanger, Terence David
53	Rubinstein, Robert L.	49	Santer (Victor), Ursula, Ph.D.
67	Ruckman, Richard John, M.D.	90	Santomasso, Bianca Denise
72	Rudman, David Albert, Ph.D.	87	Santosa, Claudia Mary
67	Ruggere, Mary Doris Rose Dr.	87	Saran, Dale Francis
		43	Sargent, Charles P. Dr.
		84	Sarkar, Atom

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
86	Savari, Serap Ayse	84	Schrag, Daniel Paul
60	Savio, Robert Richard	60	Schubert (Cuffey), Hazel Rita
43	Sawyer, Constance B., Ph.D.	74	Schumacher, Mark A.
86	Saxena, Manu Sanjay	59	Schwalbe, Carl H. Dr.
69	Scamahorn, James O., M.D.	82	Schwartz (Buchholz), Donna Joy
54	Scanlon, Edward P.	76	Schwartz, William Alan
48	Schaad, Lawrence J., Ph.D.	46	Schweid, Abraham I. Dr.
69	Schaffert, Justin Craig Dr.	65	Sdano, Caroline K.
65	Schaps (Kramer), Mary, Ph.D.	52	Seaman, John Robert
48	Scheider, Walter J. Dr.	48	Searle (Wolff), Barbara, Ph.D.
83	Scherb, Ekaterina	58	Seaton, Robert Kirk Dr.
54	Scherer, Jr., Kirby V. Dr.	87	Sebring, Page Elizabeth
89	Schiarnberg, Scott Raphael	46	Seely, Gilbert Randall, Ph.D.
72	Schiefele, Walter P.	54	Seltzer, James E., Ph.D.
43	Schiff, Raymond R., Ph.D.*	74	Senofsky, Gregory M., M.D.
83	Schiffer, Michelle Helene	68	Seremetis, Stephanie V., M.D.
68	Schiffes, Stephen A.	45	Sessler, Andrew M., Ph.D.
77	Schirato, Richard Coin	82	Seth, Raj Kamal
90	Schlondorff, Johannes Sebastian	79	Shaffer, Samuel
54	Schmidt, Victor A., Ph.D.	53	Shah (Duchane), Emma
76	Schmitt, Peter Harlan	90	Shah, Roopak J.
53	Schmoyer, Laurence F.	60	Shaner, John Wesley Dr.
56	Schneider, Carol Joyce, Ph.D.	84	Shapira, Nathan Andrew
73	Schneider, Donald P., Ph.D.	63	Shapiro, Arthur M., Ph.D.
51	Schneider, Peter B., M.D.	57	Shapiro, Howard M., M.D.
69	Schneider (Bromberg), Susan Irene	47	Shappirio, David G., Ph.D.
74	Schneider, Thomas D., Ph.D.	58	Shepard, Kenneth W.
72	Schor (Tabachnik), Nina Felice, Ph.D., M.D.	87	Shepard, Thomas Claude
		79	Sheppard, Brian Frederick
		89	Sherman, Daniel Allen

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
68	Sherman, Kathleen Ann, Ph.D.	65	Silverman, Stuart L., M.D.
57	Sherman (Margolish), Merry Dr.	47	Simmons, Gustavus J., Ph.D.
46	Shields, James W.	83	Simms, Judith Seline
89	Shigemitsu, Lucy	54	Simons, David Ralph*
69	Shih, Willy C., Ph.D.	81	Simons, Douglas Anthony
55	Shilling, A. Gary, Ph.D.	51	Simpson, Robert Edmund Dr.
49	Shiman, Paul Leonard, Ph.D.	45	Sinclair, Robert
70	Shinsky, Kirk Alfred, Ph.D.*	64	Sinclair, Stephen H., M.D.
88	Shirazi, Nabeel	75	Siu, Buron Bong, Ph.D.
48	Shlichta, Paul Joseph Dr.	79	Siu, Tina Marie, D.D.S.
46	Shombert, Donald J., Ph.D.	89	Skinner, Christopher McLean
53	Shore, Robert A.	73	Skodje, Rex T., Ph.D.
51	Shouby (Lyser), Katherine Dr.	45	Slater (Reichart), Ruth
42	Shriver (Meiowitz), B., Ph.D.	67	Slatt (Spakowski), Barbara J., Ph.D.
51	Shteir, Owen Aaron, M.D.	63	Smilowitz, Henry M. Dr.
49	Shugart, Howard Alan Dr.	65	Smith, Jr., Albert T., Ph.D.
90	Shull, David Michael	61	Smith, Jr., Dale Thorpe
78	Shutt, Barbara Clare	52	Smith, David Y.
79	Shykind, David Nathan, Ph.D.	62	Smith, Gerald Ralph, Ph.D.
51	Sibilia, John Talbot, Ph.D.	42	Smith, Harlan J., Ph.D.
46	Sicular, Arthur, M.D.	81	Smith, Jeffrey Roser
51	Sieffert, Paul Louis	58	Smith, Leslie Ewart, Ph.D.
65	Siegal, Michael Dr.	73	Smith, Michael A.
50	Siegel, Jerome, Ph.D.	47	Smith, Norman Harkey
88	Sieh, Weiva Yu	67	Smith (Schwarz), Sandra
64	Silk (Kuhn), Margaret, Ph.D.	71	Snipes, James C.
87	Silveira, Maria Jose	64	Snyder (Girton), Lee R. Dr.
57	Silver, Jack H. Dr.	82	Snyder, Lynne Page
66	Silverman, David Lee	76	Snyder, William Chapin
82	Silverman, Jared Adam		

<u>Year</u>	<u>Last Name (Maiden Name)</u>	<u>Year</u>	<u>Last Name (Maiden Name)</u>
87	Sobieski, Ian Patrick	50	Steiner, Lisa, M.D.
81	Sohn, Regina Lee	44	Stelzenmuller, Cyril V.
64	Solberg, Gordon	89	Stern, Michael Jared
81	Soll, Wendy Eileen	50	Sternberg, Saul, Ph.D.
72	Solomon, Donald J.	71	Stevens, Glenn H., Ph.D.
64	Solomon, Edward I., Ph.D.	66	Stevenson, John Alfred Dr.
56	Solovay, Robert Martin, Ph.D.	51	Stewart, James B.
55	Sommerfield, Martin D.	54	Stillman, Richard C. Dr.
76	Song, Chuan-Luan	75	Stipe, Gary Arthur
79	Sorkin, Gregory Bret	87	Stoffel, Christine Marie
53	Sosin, David Elliott Dr.	77	Stokes, Grant H., Ph.D.
46	Spalding (Jackson), Jean	55	Stone, John William
51	Spangler, Robert Alan Dr.	49	Stone (Harmon), Margaretta
64	Spear (Gloss), Mary Helen	49	Stout, George Hubert Dr.
82	Spears, Jene Marlene	60	Straley, Joseph Paul, Ph.D.
83	Spears, Jr., Larry Gene	67	Strasnick, Steven Lawrence, Ph.D.
68	Spence, William Leonard, Ph.D.	65	Strauchen, James A. Dr.
51	Spencer, Dana Royce	53	Strax, Norman
64	Spielman, Howard Aaron, Ph.D.	43	Strehler, Bernard L., Ph.D.
45	Spink, Walter Milton, Ph.D.	45	Streitwieser, Jr., Andrew, Ph.D.
60	Spitzberg, Jr., Irving J.	54	Stroebel, Charles F. Dr.
65	Spitze (Horowitz), Evalyn, M.D.	62	Strom, Robert Evan
60	Spitzner, Jerome G.*	54	Stull (Gansz), Carol
64	Sproull, Robert F., Ph.D.	71	Sturtz, Christine E.
90	Sragovich, Alexander	70	Sucher (Montwieler), Joyce H.
73	Srivastava, Arvind N.	76	Sulzinski, Michael Anthony, Ph.D.
78	Stallman, Jay Bennett, M.D.	67	Summers, Jr., Nevin Morris
83	Stanford, Terri Lynn	50	Sussman, Alan, Ph.D.
82	Stanford, Theron William	76	Suzuki, Daniel Thomas
57	Steen (Sprenk), Kullikki, M.D.		

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
85	Swain, Mark Raboin	85	Thompson, Marilyn Sue
53	Swarner, David R., M.D.	44	Thompson, Steadman*
42	Swartz, Clifford E., Ph.D.	51	Thomson, Richard M.
60	Swartz, JoAnne Marie	80	Thornburg, Scott Cameron
72	Swergold, Gary David Dr.	49	Thorp, Edward Oakley, Ph.D.
59	Swigert, Stevenson H.	77	Tick, Evan Michael
84	Szubin, Lisa Beth	50	Tifft, William Grant, Ph.D.
77	Takaki, Katherine Shigeko Dr.	71	Tilevitz, Orrin Eliot
81	Tan, Song, Ph.D.	43	Tilton (Foster), Elizabeth
53	Tangora, Martin C., Ph.D.	45	Tinkham, Michael, Ph.D.
43	Tanner (Kunkel), Joan, M.D.	50	Tombouliau (Warren), Alice
78	Tanzi, Joseph Peter	83	Topolski, Wieslaw Czeslaw
74	Taswell, Carl, M.D.	83	Torres, Anthony
55	Tate, Patricia, M.D.	42	Towle (Ross), Jean
61	Tate, William Charles	70	Traktman, Paula
73	Tatevossian, Leon H.	68	Trauger, Thomas Charles, J.D.
76	Taylor (Maximilian), Denise Anne	73	Treatman, David
49	Taylor, Dwight W. Dr.	84	Trester, Jeffrey J.
82	Taylor, Jonathan	74	Trommer, Richard H.
47	Taylor, Leonard S., Ph.D.	65	Truitt, Jr., James P., M.D.
80	Taylor, Naomi	85	Tsai, Bill Li-Chien
48	Teager, Herbert Martin Dr.	82	Tsai, Mitchell
54	Tech, Jack Laurence, Ph.D.	77	Tsang, Dorothy
57	Teger (Michael), Sandra	44	Tschudy, Donald Paul Dr.
89	Teichberg, Vladimir	88	Tseng, Janet
78	Terrell, Gregory Scott	68	Tsien, Roger Y., Ph.D.
42	Teschan, Paul E., M.D.	82	Tso, Li, M.D.
79	Thiele, Elizabeth Anne	88	Tsou, Christine Cha Ming
58	Thomae, Irving Herbert	87	Tu, Julie Yui
60	Thompson, Joyce Rev.	80	Turkel, Lee Diana

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
81	Turkel, Marc Adam	76	Victora, Randall Harry, Ph.D.
74	Turner, Danny L.	66	Videen, Tom Otis
46	Turner (Karasz), Ilonka	80	Vidic, John Ward
80	Turner, Mark William	66	Viita, Paul Sears
82	Tylaska, Timothy Thomas	63	Vince, Andrew Joseph
42	Tyner (Pease), Evelyn, Ph.D.	68	Vleck, David Joseph Alan Dr.
57	Ullrich, Felix T. Dr.	42	Voigt, Allan Earl, M.D.
83	Umlas, Shari-Lynn, M.D.	46	Von Hippel (Raskind), Josephine, M.D.
60	Underwood, William E., Ph.D.	68	Waddington, Bruce Alan
79	Unz, Ron Keeva	66	Wagner, Henry, M.D.
79	Urbahn, John Arthur, Ph.D.	58	Wagreich, Philip D., Ph.D.
79	Urciuoli, Michael	45	Wahlgren, John Howard
82	Uyeda, Lynn Diane	87	Waldman, Todd Alan
78	Vader, David Theodore, Ph.D.	45	Walker, Edward John
59	Vajk, J. Peter, Ph.D.	61	Wallman, Joshua, Ph.D.
76	Vale, Ronald David, Ph.D.	49	Walowitz (Wagman), Anne
71	Van Aken, James Hugh	70	Walters, Bradford B., Ph.D., M.D.
44	van Buren (Hagopian), Anne, Ph.D.	71	Walther, Delores E.
84	van de Sande, Brett David	62	Walton, Robert Lee
80	Van Nice, Faith Louise	82	Wang, Frank Yu-Heng
62	Vater (Felker), Ann	87	Wang, Joseph Chen-Yu
55	Vaughan, Jr., Maurice H. Dr.	86	Wang, Mariann Meier
63	Vaupel, James Walton	80	Wang, Philip Sung-En
73	Vayo, June A., Ph.D.	89	Wang, Ray Kuang
56	Venable, Jr., John H., Ph.D.	54	Ward, Harold Nathaniel, Ph.D.
67	Verbrugge, Martha Helen	75	Ward (Logan), Julie Ann
90	Victor, Jason W.	63	Warden (Ware), Anita Fay*
70	Victor, Jonathan D., Ph.D., M.D.	52	Ware (Eddings), Charlotte
87	Victor, Nicole Alexandra	76	Wargo, Natalie Kaye, Ph.D.

<u>Year</u>	<u>Last Name (Maiden Name)</u>	<u>Year</u>	<u>Last Name (Maiden Name)</u>
50	Wasserman, Edel Dr.	42	Wertz (Wien), Julia
78	Wasserman (Furlong), Patricia	46	West, Robert C., Ph.D.
60	Wassermann, Gordon S. Dr.	89	Westcott, Thomas Robert
59	Waterhouse, William C., Ph.D.	51	Wharton, Lennard, Ph.D.
44	Watson (Honour), Nan	61	Wheeler, John Craig, Ph.D.
50	Wawszkiewicz, Edward J., Ph.D.	51	Wheeler, Nicholas A., Ph.D.
77	Weatherford, Lawrence Robert	42	White, Donald R., Ph.D.
67	Weaver, Thomas Allan Dr.	68	White, Perrin Charles, M.D.
83	Webb, Michael Fritz	42	Whitmore (Jacobson), Janet Dr.*
55	Webb, Stephen Richard, Ph.D.	89	Whitney, Allene Marie
55	Webster III, Norman A.	69	Whittaker, John Douglas Dr.
73	Wedeen, Van J.	80	Wickliff, David Edmund
63	Wegner, Gary Alan, Ph.D.	86	Wickstrom, Erica Lorraine
74	Wehler, Daniel C.	46	Widing, Kenneth, Ph.D.
73	Weidman, David N.	51	Wiens (DeDecker), Carol
58	Weihofen, William H., Ph.D.	77	Wight, Virginia Joy, M.D.
81	Wein, Joel Martin	48	Wilcox, Jr., Charles F., Ph.D.
69	Weinberg, Richard Norman	67	Wilczek, Frank Anthony, Ph.D.
45	Weinberger, Hans F. Dr.	69	Wiley, Clarence L., M.D.
78	Weinberger, Samuel Aaron, Ph.D.	82	Wilfong, Blake Linton
82	Weindorf, Alan L.	85	Wilkinson, Anne Marie
80	Weinert, George Frank	43	Willcockson, Roy
73	Weinert, Michael T. A., Ph.D.	89	Willett, Kristine Lee
67	Weiss, Alan Louis, M.D.	47	Williams (Christensen), Dorothy, Ph.D.
52	Weiss, Bernard, M.D.	62	Williams, Harold A.
63	Weiss, Mark, Ph.D.	55	Williams, Lawrence E. Dr.
67	Weisser, Daniel Philip Dr.	42	Williams, Mary Ann, Ph.D.
82	Weisz, James Matthew	58	Williams, Jr., Robley C., Ph.D.
66	Weller, Nancy K. Dr.	62	Williams, Ronald James Dr.
49	Werntz, Carl Weber, Ph.D.		

Year	Last Name (Maiden Name)	Year	Last Name (Maiden Name)
53	Willis, John Steele, Ph.D.	42	Worthington, William D., M.D.
87	Wilmer, Elizabeth Lee	69	Wright, David A.
55	Wilson, Daniel Hughes	60	Yaconino (Snarr), Betty Lou
60	Wilson (Edlund), Gayle Ann	87	Yaeger, Jason Robert
71	Wilson, Mary Jo	59	Yager (Danies), Eileen, M.D.
47	Wilt, James William, Ph.D.*	66	Yaksh (Beech), Marilyn
60	Winfree, Arthur Taylor, Ph.D.	76	Yancopoulos, George Damis Dr.
66	Winikoff, Janet Dr.	84	Yang, Sun Hye
86	Winograd, Mark Arden	86	Yao, Kenneth Chuan-Tsing
70	Winslow, John W.	84	Yen, Terry
42	Winsor III, Paul	77	Yodh, Arjun Gaurang, Ph.D.
49	Winston, Herbert, M.D.	56	Yost, James Whitney
53	Winter, Jr., John Mack	70	Young (Rubin), Judith Sharn Dr.
64	Winternitz, Robert S.	82	Young (Telesetsky), Stephanie, M.D.
64	Winters, Stephen M.		
43	Wittrock (Killingbeck), Marguerite	48	Yphantis, David Andrew, Ph.D.
46	Wixom (McMillin), Patricia, Ph.D.	81	Yu, Daniel Y. D.
62	Wojcik, Michael M.	90	Yu, Mina Kim
72	Wolf, Rodney Alan	87	Yuen, Mai New
53	Wolfe, Jack Albert	75	Yuen (Fang), Meiling, M.D.
45	Wolfson (Kaufman), Renate	44	Zablow, Leonard
54	Wolk, Coleman Peter, Ph.D.	73	Zack, Esther L.
87	Wong, Albert Jun-Wei	62	Zahler, Raphael Dr.
86	Wong, Kelvin Lee	63	Zalkind, David L., Ph.D.
90	Wong, Mitchell	50	Zeidenberg, Phillip Dr.
59	Wood (Balmer), Nancy June	75	Zeitlin, Scott Olof
79	Wood-Ellis, Susan Karey	75	Zeitz, Paul Andrew
76	Wooden, Diane Holland	68	Zeldis, Jerome Bernard, Ph.D., M.D.
45	Woodruff (Parker), Edythe, Ph.D.		
69	Woodside, Jr., Jack R., M.D.	77	Zeleniak, Nancy Ellen

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Year Last Name (Maiden Name)

85	Zelicof, Audrey
84	Zell, Matthew Michael
47	Zemach, A. Charles, Ph.D.
70	Zeman, Robert Kenneth Dr.
86	Zhu, Wei-Jing
84	Zielke, David Michael
84	Zietchick, Bonnie Robin
86	Zigmond, Daniel John
59	Zika, Jeanne Alice
46	Zirin, Harold, Ph.D.
48	Zisk, Stanley Harris Dr.
64	Zisler, Randall Craig, Ph.D.
83	Zoch, Patricia Kay
62	Zohar, Danah
72	Zollars, Laurel Elise Dr.
86	Zoltewicz, Joanna Sue
62	Zucker, Robert Stephen, Ph.D.
88	Zucker, Scott David
89	Zuckerbraun, Simon Robert
88	Zuckerman, Brian Lee
62	Zuckerman, Ralph
73	Zupko, Karin G.
56	Zwillenberg, Melvin L., Ph.D.
73	Zygmunt, Deborah J., M.D.

ABOUT THE AUTHOR

Tom K. Phares spent his entire 42-year business career with Westinghouse in public relations before his retirement in 1983 as Director of Corporate Communications. He was associated with the Science Talent Search for nearly 20 years.

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