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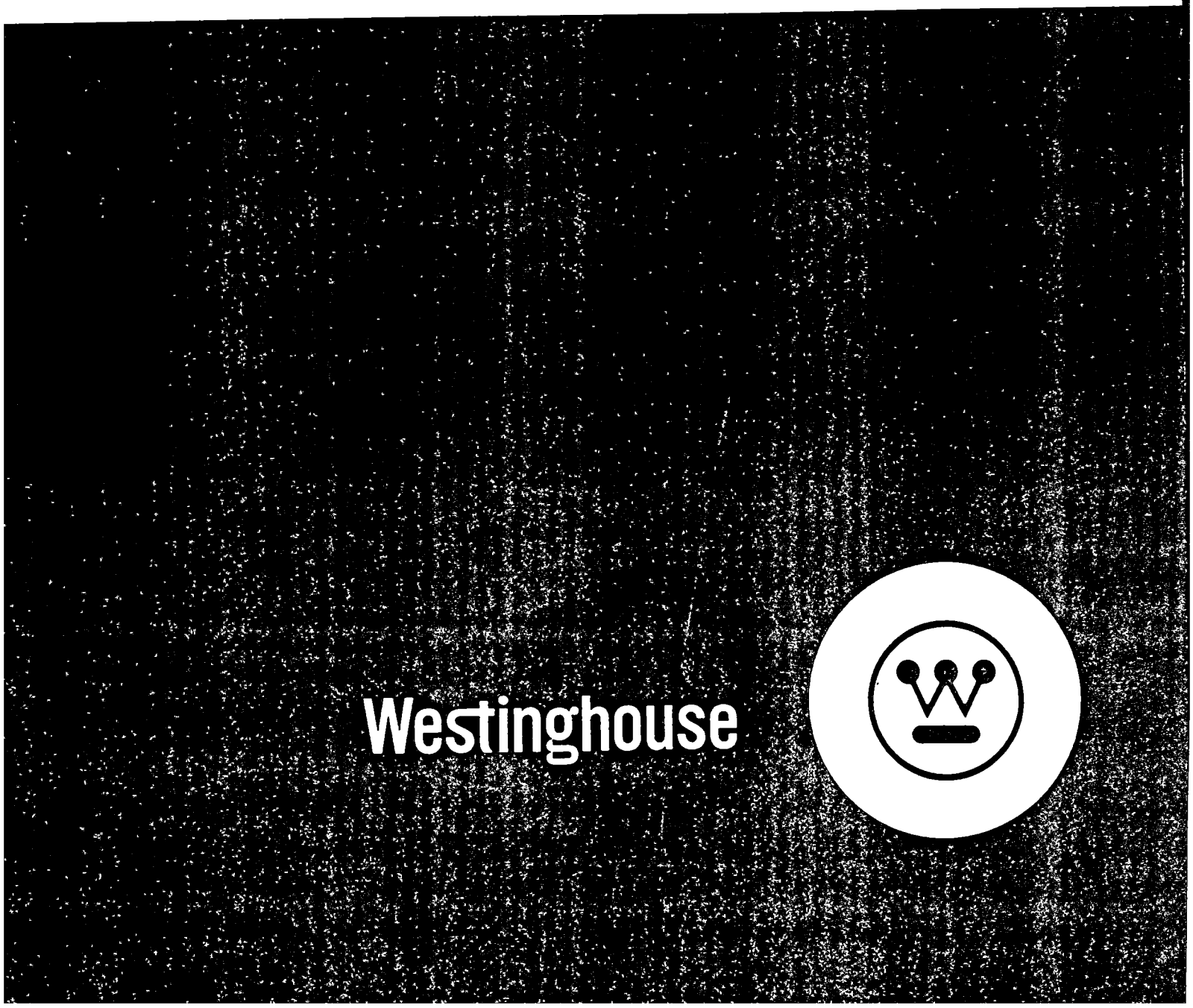
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Westinghouse Science Awards Banquet 3/4/91 [O A 6856] [4]

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Westinghouse

REPRINTED FROM:

Science for the Fun of It

A Guide to Informal Science Education

edited by Marvin Druger

National Science Teachers Association
1742 Connecticut Avenue, NW
Washington, DC 20009
1988

14

Westinghouse Science Talent Search

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Science Service
Washington, D.C.

Now in its 48th year, the Westinghouse Science Talent Search (STS) is unusual among scholarship competitions. Administered by Science Service and supported by Westinghouse, the competition places primary emphasis on the student's report of an independent research project in some area of science, engineering, or mathematics, and only secondary emphasis on academic achievement.

In short, the evaluation is based on the student's ability to "do" science in a way that is analogous to, though less sophisticated than, what a professional scientist does. To use a sports analogy, one does not test ability to play tennis by giving a paper-and-pencil test. One observes performance on the tennis court. We do not mean that academic ability is unimportant. But as Robert J. Sternberg (1985) comments in his book *Beyond IQ—A Triarchic Theory of Human Intelligence*, "Possession of knowledge does not guaran-

tee the creative use of that knowledge." A high-quality independent research project could indicate creativity, as well as motivation, initiative, persistence, and other attributes that contribute to scientific performance.

To enter the Science Talent Search, a secondary school student does an independent research project and describes the research in a paper of about 1,000 words. The student also answers questions on a Personal Data Blank, which has open-ended questions designed to elicit evidence of the student's interest and creativity in science. These two items constitute an entry. The entry must arrive at Science Service by midnight, December 15. Any entries arriving late are automatically disqualified.

Scientists, engineers, and mathematicians from such institutions as Johns Hopkins, the National Institutes of Health, Princeton, and Berkeley work as judges. Entries are placed in categories by discipline and evaluated by at least two judges who are specialists in the relevant discipline. After evaluating all the entries, the judges rank the entries and designate the top 300 as honorable mentions.

The Admissions office of every four-year college in the country receives the names and addresses of the students, printed in a booklet that is sent with letters of recommendation. Because of the impressive undergraduate track record of previous honorable mention winners and the reputation of the STS program, the colleges approach many of the students with admission and scholarship offers.

The judges then study the honorable mentions, and from these, select 40 winners to compete for scholarships totaling $140,000—one $20,000 first, two $15,000 seconds, three $10,000 thirds, and four $7,500 fourths. The remaining 30 students receive scholarships of $1,000 each. STS awards scholarships without regard to financial need.

The 40 winners receive an all-expense-paid trip to Washington, where the judges interview the students. The students also visit scientific laboratories and talk with scientists about their work, see their members of Congress, attend the theatre (usually the Kennedy Center), and talk to the scientific public when their projects are exhibited in the Great Hall of the National Academy of Sciences. The scholarships are announced at a formal banquet on the last evening of the students' visit—the largest scientific dinner party of the year in Washington.

Many of the other entrants have yet another opportunity for recognition through the 35 State Science Talent Searches. Science Service duplicates the entries and sends them to the Directors of the State Science Talent Searches. The state STS's then conduct their own competitions, many of which have numerous awards, including scholarships.

Scientific Versus Academic Performance

Richard S. Mansfield and Thomas V. Busse (1981) comment on the "threshold effect" that has been suggested by some psychologists. They imply that a threshold of academic ability in a discipline is required, but beyond that level, additional academic achievement is not as important as other abilities such as creativity or motivation. In a sense, scientific performance guarantees a certain level of academic achievement because research can't be done without the necessary knowledge. On the other hand, what you know doesn't matter if you don't know how to use it. In a study of STS honorable mentions done by Harold A. Edgerton some years ago (1973), the scientific achievers (those with the best research papers) were not always those with the highest grades. The study looked at 300 honorable mention winners who were selected on the quality of their research papers, that is, on their scientific performance. These 300 were compared with another 300 from the total pool of entries selected for their academic achievement (grades, SAT scores, and class rank).

The study compared the two groups to see how many students were in both. Two-thirds of the students chosen on the basis of scientific performance would not have had high enough scores if academic achievement had been the criterion. And

two-thirds of those chosen on the basis of academic achievement had such low ratings on their scientific achievement that they would have been excluded from the top 300 on the basis of scientific performance.

How Well Do the Winners Do?

If the selection process for the Science Talent Search is so different, how well do those selected do? One can look at this in two ways—in terms of college success and occupational success.

The results of a Science Service mail survey (64.9 percent response) of winners from 1942 through 1979 show that 99 percent of the winners have a B.S. or higher (Science Service, 1979). Even more impressive is that 70 percent of the group have a Ph.D., M.D., or both. Because undergraduate and graduate degrees only indicate college success, we need to look at post-college success (Hoyt, 1966). In science, post-college success is generally defined by how the scientific community recognizes the winners.

To date, five former Science Talent Search winners have won the Nobel Prize. That it probably takes 30 years after winning the STS to finish undergraduate and graduate school and do the necessary research is even more significant. And so, winners prior to 1960 are old enough and experienced enough to be eligible.

The National Academy of Sciences recognizes outstanding achievement in science through election to membership, which is considered the highest elective honor a scientist can receive in this country. To date, 28 former Science Talent Search winners have been elected.

For younger scientists, a fellowship award is an important recognition and often the precursor to later scientific achievement. One of the oldest and most prestigious programs is the Sloan Research Fellowships, aimed at stimulating fundamental research by young scientists of outstanding promise. To date, 47 former winners have received these Fellowships. Other major awards include two Fields Medals (the Nobel Prize of Mathematics) and eight MacArthur Fellowships.

This analysis of success cannot by any means be called "scientific," but it does suggest that, for whatever reasons, students selected by the Science Talent Search will succeed both in and after college.

The Importance of the Teacher

In one of the major contemporary studies of talent, Bloom (1985) concluded that the old expression "genius will out" does not hold. Whatever the individual's natural talents, strong support and influential teachers are essential in helping a student reach high levels of achievement.

One might correlate winning the Science Talent Search with attending a good school. This is not completely true. The schools that produce winners and honors are usually good, but many good schools do not produce any winners or honorable mentions. Many do not even have entries. Some schools produce winners for a while and then, for no apparent reason, stop. We found that usually a particular teacher left that school. If the teacher moved to a school that had no winners or honors, the school began producing winners. Nothing changed but the teacher's location.

Thus, the overall quality of a school seems unimportant. Instead, the school must have one or more teachers who want to develop student research, and more specifically, who want to encourage students to enter the Science Talent Search.

What characteristics do these teachers have? A study of the Science Talent Search (Campbell, 1983) found that they have exceptional knowledge of and enthusiasm for the subjects they teach, and they can communicate those qualities to their students. They are interested not only in the subject in an academic sense, but also as an area of ongoing research to develop new knowledge. They are hardworking and often put in long hours at night and on weekends. They have close relationships with the students, and working with the students on the projects deepens those relationships.

In the Personal Data Blank students name one person who influenced their scientific interest the most. Students mention teachers or school staff most frequently, scientists second, and family members third.

References

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Helpful Hints

■ Research:

Identify promising students in the ninth or tenth grades and have them learn about and do research.

Start students early on their research projects. Some projects represent months or even years of work.

Do not let students wait until the last minute to write their papers, which also takes time.

Refer students to the *Directory of Student Science Training Programs for High-Ability Precollege Students* published by Science Service if they are looking for summer research opportunities.

■ Entries:

Mail entries early. Remember, the deadline is midnight, December 15, for receipt of the entry, not the postmark. If you're near the deadline, use an overnight delivery service.

Requests for entry materials must be from a teacher, guidance counselor, or principal on school letterhead, and materials must go to the school. Parents and students may not request materials.

Have students fill in the Personal Data Blank first. The teacher may then add comments and provide transcripts of tests scores and grades.

Encourage students to be concise and to the point. The quality of the writing, not the quantity, counts.

■ Rules:

Avoid library research.

Read the rules carefully and note that they may change in some way from year to year.

■ Recognition:

Recognize participants and especially honorable mentions or winners through a school assembly, the school newspaper, local newspaper, etc.

Last, write Science Talent Search, 1719 N St. NW, Washington, DC 20036 if you have questions.

SCIENCE SERVICE
1719 N STREET, N.W., WASHINGTON, DC 20036 • 1-202-785-2255

This letter was sent to all + attached list + we've indicated known responses + attendance to date

January 22, 1991

Dr. D. Allan Bromley
Science Advisor to the President and
Director, Office of Science and Technology Policy
Executive Office of the President
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Dear Allan:

This March, Science Service and Westinghouse will celebrate the 50th anniversary of the Westinghouse Science Talent Search, the preeminent national science scholarship competition for high school seniors.

We hope that you will be able to join us at the Washington Hilton at the Awards Banquet on the evening of March 4. The President has been invited to speak, and we expect it to be the largest and most prestigious gathering of the Washington scientific community in many years.

The banquet will honor the 40 current national finalists as well as the 1,960 winners who have preceded them in the past 49 years and have been invited back to celebrate with us. Almost all have gone on to become scientists, and among them there are five Nobel Laureates, two Fields Medalists, and eight MacArthur Fellows.

As you may recall, each year 40 winners are selected on the basis of the quality of an independent research project in science, mathematics or engineering, and only secondary importance is given to academic achievement.

The STS serves as a means of encouraging an interest in science. At a time when so many of our able students are being siphoned off into other fields, it is important to send the message that studying and achieving in science at the precollege level is important to our country. We say this often to each other, but we do not say it enough to the students themselves. Being at the Awards Banquet is one way of doing so.

You will be receiving a formal invitation soon, but knowing your busy schedule, we wanted to alert you to the date. We have many gatherings in which we cheer our sports achievers; we need to give equal glory to our science achievers. We look forward to seeing you.

Sincerely,

Ted.

E. G. Sherburne, Jr.
President

ES:yvt

Enc: Finding Tomorrow's Scientists



FINDING TOMORROW'S SCIENTISTS

50th Westinghouse Science Talent Search

no — but has come in the past + spoken before

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STATUS OF STATES IN THE 50TH SCIENCE TALENT SEARCH

Students from 45 States, the District of Columbia, American Samoa, Guam, Puerto Rico, the Virgin Islands, and Overseas American Schools completed entries in the 50th National Science Talent Search. Thirty-three States and D.C. hold State Science Talent Searches.

State	Number Completed Entries		Number National Semifinalists		Number National Finalists	
	Entries	H.S.	Semifinalists	H.S.	Finalists	H.S.
AL	43	16	6	6	2	2
* AK	-	-	-	-	-	-
* AZ	10	8	2	2	-	-
AR	4	4	-	-	-	-
* CA	75	49	17	16	3	3
CO	13	12	3	3	1	1
CT	11	11	3	3	1	1
* DE	1	1	-	-	-	-
DC	6	5	3	3	1	1
FL	70	47	12	11	1	1
GA	22	21	2	2	-	-
GU	1	1	-	-	-	-
* HI	6	6	1	1	-	-
* ID	3	3	-	-	-	-
IL	32	16	8	5	2	2
IN	14	10	1	1	-	-
IA	6	5	1	1	1	1
KS	6	3	3	2	-	-
KY	7	7	2	2	-	-
LA	4	4	2	2	-	-
* ME	2	2	1	1	-	-
MD	43	20	12	8	-	-
MA	22	20	3	3	-	-
MI	19	15	3	3	1	1
MN	16	15	2	2	-	-
MS	8	8	1	1	-	-
MO	17	13	-	-	-	-
MT	9	7	2	2	-	-
NE	16	11	2	2	1	1
* NV	-	-	-	-	-	-
* NH	-	-	-	-	-	-
NJ	50	33	11	11	3	3
NM	7	7	2	2	1	1
* NY	736	112	128	32	14	8
NC	13	7	4	2	1	1
* ND	4	4	-	-	-	-
OH	19	18	3	3	1	1
OK	12	7	3	3	-	-
OR	6	4	1	1	-	-
PA	51	33	4	4	1	1
* PR	5	5	-	-	-	-
* RI	5	3	1	1	-	-
* SC	11	8	5	4	-	-
* SD	-	-	-	-	-	-
* TN	11	9	3	3	-	-
* TX	57	41	15	13	1	1
UT	4	4	1	1	-	-
* VT	-	-	-	-	-	-
VA	51	19	23	8	4	2
WA	23	11	-	-	-	-
WV	5	5	-	-	-	-
WI	12	11	4	4	-	-
WY	2	2	-	-	-	-
*OTHER+	3	3	-	-	-	-
	1,573	686	300	174	40	32

* States which do not conduct State Science Talent Searches

\+ Taipei American School, American Samoa, and the Virgin Islands

STANDING OF STATES IN THE ANNUAL SCIENCE TALENT SEARCH
WESTINGHOUSE SCIENCE SCHOLARSHIPS
1942–1991
FINALISTS (40 per year)

STS	(1–30) TOTAL	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	(1–50) TOTAL
AL	4	1	–	1	–	–	–	–	–	1	1	1	1	–	–	1	–	1	–	–	2	14
AK	2	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3
AZ	20	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	21
AR	1	–	–	–	–	–	–	–	1	1	–	–	–	–	–	1	–	–	1	–	–	5
CA	84	3	4	2	5	3	1	3	2	5	4	4	–	1	3	3	1	3	1	4	3	139
CO	10	1	1	1	–	–	–	2	1	–	–	–	–	–	–	–	1	–	–	–	1	18
CT	20	–	1	–	–	–	–	1	–	1	1	1	–	1	–	1	1	–	–	1	1	30
DE	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
DC	16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	17
FL	29	4	2	1	3	1	4	–	2	2	3	–	4	1	3	4	2	3	1	–	1	70
GA	15	1	–	–	1	–	1	–	–	–	–	1	–	1	–	1	–	1	–	–	–	22
HI	1	1	2	–	2	–	1	1	–	1	–	–	–	–	–	–	–	–	–	1	–	10
ID	4	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5
IL	99	2	2	1	2	3	–	3	2	2	2	5	1	2	3	–	4	2	3	1	2	141
IN	31	1	1	–	–	1	2	–	–	1	–	1	1	1	–	1	–	–	–	–	–	41
IA	8	–	–	–	1	–	–	1	–	–	–	–	–	–	–	–	1	1	–	–	1	13
KS	9	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	11
KY	6	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7
LA	3	1	–	1	2	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	8
ME	5	–	–	–	–	–	1	–	–	–	–	–	–	1	–	–	–	–	–	–	–	7
MD	20	–	1	–	1	2	1	2	3	2	1	1	1	2	–	–	2	–	2	4	–	45
MA	44	2	–	–	3	2	1	2	–	–	–	–	1	2	3	–	1	2	1	1	–	65
MI	10	–	–	–	1	1	–	1	1	2	–	1	2	1	2	2	3	1	1	–	1	30
MN	16	–	–	2	–	–	1	–	–	–	–	–	1	–	–	–	–	–	1	–	–	21
MS	3	–	–	–	–	–	–	–	1	–	–	–	–	1	–	–	–	–	–	–	–	5
MO	11	–	1	–	1	–	–	2	–	–	–	1	–	1	1	–	–	–	1	–	–	19
MT	6	–	1	–	–	–	–	–	–	2	–	–	–	1	1	–	–	–	1	1	–	13
NE	11	–	1	1	–	–	–	–	1	–	1	–	1	–	–	1	–	–	–	–	1	18
NV	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2
NH	12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	13
NJ	52	1	1	2	1	3	–	2	1	–	2	1	–	1	2	–	–	1	1	2	3	76
NM	3	–	–	–	–	1	1	–	–	–	–	–	1	–	–	–	2	–	1	–	1	10
NY	357	11	12	9	10	13	14	14	15	14	17	16	19	19	12	15	15	16	19	19	14	650
NC	3	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	1	–	1	6
ND	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2
OH	54	1	1	2	–	3	1	1	–	–	–	3	–	1	–	2	2	1	1	–	1	74
OK	13	–	–	2	1	1	1	–	1	–	–	1	–	–	–	–	–	1	–	–	–	21
OR	20	2	–	1	1	–	–	–	–	1	–	–	–	1	1	–	–	–	–	–	–	27
PA	66	1	1	4	2	1	3	2	–	–	–	1	–	–	3	4	2	1	2	2	1	96
PR	0	–	–	–	–	–	–	–	–	–	–	–	1	–	1	–	–	–	–	–	–	2
RI	3	1	1	1	–	–	–	1	–	–	–	–	–	–	–	–	1	–	–	–	–	8
SC	2	1	1	–	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	6
SD	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
TN	11	1	–	1	–	1	–	–	1	1	–	–	1	–	–	–	1	–	–	–	–	18
TX	24	3	1	3	–	–	1	1	2	1	3	1	2	–	–	–	–	1	–	1	1	45
UT	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	3
VT	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
VA	24	–	1	2	1	2	3	1	2	2	2	–	1	–	4	2	1	3	1	2	4	58
WA	9	–	–	–	1	–	1	–	–	–	1	–	–	–	–	–	–	–	1	1	–	14
WV	13	–	–	–	–	1	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	16
WI	33	–	1	1	1	–	1	–	–	1	1	1	1	1	1	–	–	1	–	–	–	44
WY	3	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
OAS+	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1

+ Overseas American Schools

TOTAL 2,000

STANDING OF STATES IN THE ANNUAL SCIENCE TALENT SEARCH
WESTINGHOUSE SCIENCE SCHOLARSHIPS
1942–1991
SEMIFINALISTS (@ 260 per year)

PLEASE NOTE: Finalists (top 40) are not included statistically in this compilation.

STS	(1-30) TOTAL	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	(1-50) TOTAL
AL	52	5	5	4	7	4	5	1	2	3	3	4	6	3	6	3	1	4	1	4	4	127
AK	9	–	–	–	1	1	–	1	–	–	–	–	–	1	–	–	–	–	–	–	–	13
AZ	151	2	2	5	–	–	2	–	–	–	1	1	1	–	–	–	1	1	1	2	2	172
AR	23	1	1	1	1	–	2	1	2	1	–	1	1	1	1	1	3	–	–	–	–	41
CA	552	19	30	14	14	25	15	12	16	22	16	17	16	7	10	5	5	10	10	15	14	844
CO	60	1	4	3	3	2	3	3	1	3	3	2	2	–	1	5	1	1	1	4	2	105
CT	85	1	1	4	5	5	2	5	4	6	4	2	6	–	3	1	1	1	1	1	2	140
DE	13	2	1	2	–	–	1	–	–	–	1	–	2	1	1	–	1	1	–	–	–	26
DC	64	–	1	1	1	–	–	1	2	–	1	1	1	2	–	2	1	–	1	1	2	82
FL	217	24	9	12	20	20	14	19	18	20	19	16	21	26	19	12	12	11	18	5	11	543
GA	83	4	5	7	3	2	4	2	3	1	1	2	2	3	1	3	–	2	2	2	2	134
HI	29	5	4	2	3	7	7	1	1	1	6	1	1	1	2	1	2	–	1	–	1	76
ID	23	–	–	2	1	1	2	2	–	2	–	1	1	–	–	–	–	–	–	–	–	35
IL	608	9	12	11	9	13	10	11	12	14	9	5	5	6	11	15	9	7	9	8	6	799
IN	248	4	4	7	10	7	6	10	10	11	7	6	9	1	6	2	2	–	–	1	1	352
IA	115	1	2	–	1	1	2	4	2	–	3	3	1	1	–	–	2	–	1	–	–	139
KS	90	1	4	3	–	–	5	1	1	2	–	1	1	–	1	1	1	–	1	1	3	117
KY	33	–	1	1	2	–	5	1	2	5	3	2	–	–	2	4	2	–	2	1	2	68
LA	46	2	5	3	1	1	1	2	2	1	–	–	1	1	–	2	–	–	–	–	2	70
ME	23	1	1	2	1	1	–	–	1	2	–	1	–	–	1	2	–	–	–	–	1	37
MD	146	6	3	10	7	10	10	11	12	5	11	10	8	9	8	4	7	12	13	8	12	322
MA	221	6	9	5	2	3	7	4	6	3	3	6	1	4	5	4	2	2	5	6	3	307
MI	165	6	6	3	5	6	5	4	7	4	4	2	5	6	4	5	2	2	3	3	2	249
MN	120	3	5	2	4	2	2	5	5	1	6	3	2	2	2	2	4	1	5	3	2	181
MS	34	–	1	–	1	1	2	1	2	–	–	1	1	2	1	–	1	–	–	–	1	49
MO	95	3	2	8	4	4	8	5	4	3	3	2	3	2	3	2	2	2	4	3	–	162
MT	82	2	–	5	–	–	1	2	–	–	3	1	1	–	–	–	1	1	2	4	2	107
NE	67	1	3	5	1	3	10	7	3	2	1	2	6	–	1	–	1	4	–	2	1	120
NV	6	–	1	–	–	–	1	–	–	–	–	–	–	–	–	–	1	–	–	1	–	10
NH	21	–	1	–	–	–	1	–	–	–	–	1	–	–	–	–	–	–	1	–	–	25
NJ	235	5	5	6	11	8	8	4	8	4	10	3	7	6	7	5	6	6	5	10	8	367
NM	41	1	2	3	1	4	1	4	1	2	1	1	3	3	–	1	3	2	2	4	1	81
NY	2386	60	55	61	61	61	69	75	64	81	89	103	90	121	121	134	136	148	118	130	114	4277
NC	53	3	4	–	2	3	–	3	2	1	1	–	–	2	3	2	1	–	3	3	3	89
ND	30	1	3	2	3	1	–	2	–	–	1	1	1	–	1	–	–	1	–	–	–	47
OH	368	9	8	7	17	5	10	9	9	3	8	6	8	6	6	6	2	6	3	3	2	501
OK	107	5	3	–	2	1	1	5	3	5	5	2	2	1	2	4	–	–	1	1	3	153
OR	75	–	1	3	2	1	1	1	1	1	1	6	3	2	2	3	1	1	2	2	1	110
PA	463	19	9	14	8	13	10	10	13	10	8	5	10	11	1	6	9	4	4	2	3	632
PR	0	–	–	–	–	–	1	–	–	1	–	–	1	2	1	–	–	–	1	–	–	7
RI	42	–	1	3	2	1	3	–	2	–	–	–	–	–	–	1	2	1	–	1	1	60
SC	19	1	–	1	2	2	2	1	–	1	1	3	–	1	1	–	1	3	–	2	5	46
SD	22	–	–	–	–	1	–	1	–	–	1	1	–	–	1	–	–	–	–	–	–	27
TN	110	6	5	1	4	5	2	6	–	4	4	4	3	2	2	–	2	6	1	–	3	170
TX	195	9	13	10	8	9	5	6	16	9	5	8	11	11	7	3	11	9	8	5	14	372
UT	31	1	1	3	2	–	–	1	1	2	1	–	2	1	1	1	2	2	–	–	1	53
VT	12	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	14
VA	215	19	18	10	15	12	6	9	13	14	4	14	11	8	12	11	12	4	23	20	19	469
WA	114	7	5	7	9	11	3	4	4	6	6	–	–	2	–	1	–	–	–	2	–	181
WV	70	–	2	1	–	–	1	2	1	3	3	3	2	–	2	2	–	1	–	1	–	94
WI	187	4	1	6	3	2	3	1	4	1	3	5	2	2	1	4	5	3	7	2	4	250
WY	17	1	–	–	1	1	1	–	–	–	–	1	–	–	–	–	2	–	–	–	–	24
OAS+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0

+ Overseas American Schools

TOTAL **13,476**



FINDING TOMORROW'S SCIENTISTS

Good overview of program — Nobel winners, etc. listed in back

50th Westinghouse Science Talent Search

FINDING TOMORROW'S SCIENTISTS

For thousands of students who dream of careers in science, the Westinghouse Science Talent Search has helped make those dreams come true.

Since 1942, this nationwide competition has identified and encouraged high school seniors to pursue careers in science, mathematics or related fields.

The 50th annual Westinghouse Science Talent Search, now underway, caps half a century of remarkable achievements by the 15,000 semifinalists and 2,000 finalists who have participated in this, America's most highly regarded precollege science competition.

Seniors who participate have the opportunity, while still teenagers, to join the ranks of the nation's most eminent scientists.

The Search brings together the brightest, most creative science students in the land. In fact, many of our top scientists and mathematicians share the common bond of having participated in the STS when they were students.

The Search has identified young scientific talent with remarkable precision. STS alumni have won more than 100 of the world's most coveted science and math awards and honors.

Five former finalists have gone on to win Nobel Prizes. Two have earned Fields Medals, the Nobel equivalent in mathematics. Two have been awarded the National Medal of Science. Eight Search alumni have won MacArthur Foundation Fellowships, the so-called "genius awards." Fifty-one have been named Sloan Research Fellows and 28 have been elected to the National Academy of Sciences. Three have been elected to the National Academy of Engineering.

- more -

50th Annual Science Talent Search

More than half of the former Search winners are either teaching or engaged in research at colleges and universities.

The 1991 competition, which started in September, 1990, is the 50th annual Search. Westinghouse Electric Corporation has sponsored STS since its inception. The Search is administered for Westinghouse by Science Service, a Washington-based nonprofit organization engaged in furthering public understanding of science.

Since 1942, nearly 105,000 students have completed independent research projects and submitted entries. Currently, some 1,500 seniors meet the entry requirements each year. The deadline for entries received at Science Service is midnight, December 10.

The entry consists of a written description of the student's research, plus a completed entry form which is designed to elicit evidence of student creativity and interest in science.

Search candidates are judged by a board of eight distinguished scientists from a variety of disciplines. Chairman is Dr. J. Richard Gott, professor of astrophysical sciences at Princeton University and a former STS finalist. Members include Dr. Glenn T. Seaborg, a Nobel Prize winner and University Professor of Chemistry at the University of California at Berkeley.

The judges are aided by other scientists to complete a careful evaluation of each entry. Then, the elimination begins. The top 300 entrants are selected as semifinalists. These students are recommended to colleges and universities for admission and financial assistance, based on their STS achievement.

Winners Announced in January

Next, 40 finalists are selected from the 300 semifinalists. Both groups are announced in January.

Westinghouse provides the 40 finalists a five-day trip to Washington where they undergo additional judging. On the basis of interviews and their research, 10 top scholarship winners are selected.

The Westinghouse Foundation has increased Search scholarships to the present total of $205,000, which is awarded each year to the 40 finalists. The top prize is a $40,000 scholarship.

Second- and third-place winners receive $30,000 and $20,000 scholarships, respectively. Three others win $15,000 each. Four $10,000 scholarships are awarded. The other 30 finalists receive $1,000 scholarships.

When the students are in Washington, they meet leading scientists and their Congressional representatives. Their prize-winning exhibits are on public display. The young scientists describe their research to thousands of visitors -- many of them important figures in the government and scientific community.

During their stay in Washington, students are interviewed by news media from their hometowns, national and international newspapers, press associations, television networks and science and education journals.

The finalists visit Washington's historic and scientific sights. Past winners have met with the President, the Vice President and distinguished Science Advisers. On the final evening -- March 4, 1991 -- they are honored at a black-tie awards banquet for several hundred guests.

Meeting Other Young Scientists

Yet, what the students say they value most is the opportunity to meet and interact with their scientific peers, often for the first time. Friendships and professional associations made during those five days continue through college and beyond.

Statistics on the 1,960 past finalists show that 95 percent of former Search winners have had some branch of science as their major field of study. More than 70 percent have gone on to earn PhDs or MDs. Career choices are about evenly divided among the physical sciences and the biological sciences and medicine.

To date, Westinghouse has awarded almost $2.6 million in scholarships. Also, thousands of students have received scholarships and financial aid from other sources as a direct result of STS achievement.

High school science educators find "the Westinghouse," as students call the competition, an excellent tool for stimulating latent abilities in their brightest students.

Since 1942, New York state has produced the highest number of finalists, accounting for 636. Illinois is in second place with 139. California ranks third with 136, followed by Pennsylvania, 95; Ohio, 73; New Jersey, 73; Florida, 69; Massachusetts, 65; Virginia, 54; Maryland, 45; Wisconsin, 44; Texas, 44; Indiana, 41.

Other states which have produced at least ten finalists are Michigan and Connecticut, 29; Oregon, 27; Georgia, 22; Arizona, Oklahoma and Minnesota, 21 each; Missouri, 19; Tennessee, 18; Nebraska and Colorado, 17 each; the District of Columbia and West Virginia, 16 each; Washington, 14; New Hampshire and Montana, 13 each; Alabama and Iowa, 12 each; Kansas, 11; Hawaii, 10.

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October 1990

Major Honors Achieved by
Westinghouse Science Talent Search Finalists

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

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

28 SCIENCE TALENT SEARCH FINALISTS ELECTED TO THE NATIONAL ACADEMY OF SCIENCES

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., Greensboro, 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	Biogen, Inc., 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
Rosenblatt, Murray	University of California, San Diego, LaJolla, CA	1943
Sessler, Andrew M.	Lawrence Berkeley Laboratory, Berkeley, CA	1945

28 SCIENCE TALENT SEARCH FINALISTS ELECTED TO THE NATIONAL ACADEMY OF SCIENCES (Cont'd.)

Name	Affiliation	STS Year
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
Wilczek, Frank A.	Institute for Advanced Study, Princeton, NJ	1967

3 SCIENCE TALENT SEARCH FINALISTS ELECTED TO THE NATIONAL ACADEMY OF ENGINEERING

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

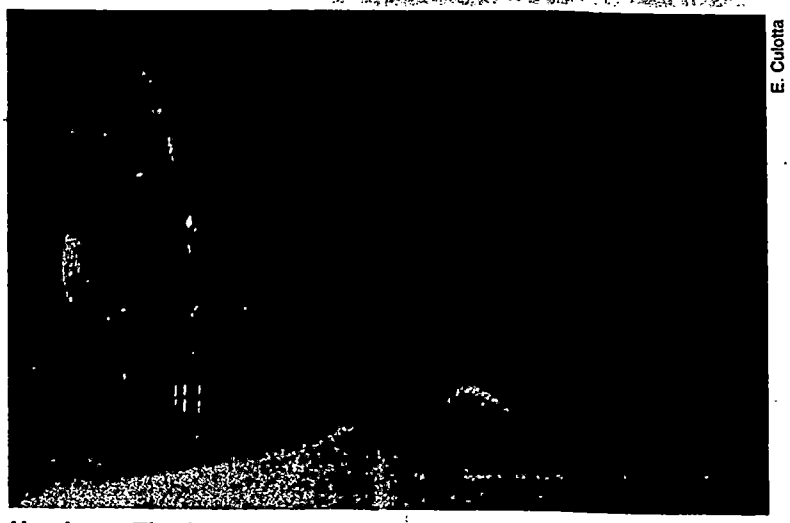
Info on
47th STS finalists,
plus some general
background

USED IN AAAS Remarks Feb 15, 1991

Can Science Education Be Saved?

Three ambitious but very different projects are testing a variety of ways to overhaul an education system that has been getting failing grades

WISCONSIN 9TH GRADER Joel Marino has already decided at age 14 that science is bad news, but he's pretty content with the project his earth science teacher gave him last September: building a working, three-dimensional model of a mid-ocean ridge. To Joel, "This project is more recreational. It's not from the book, you don't have to memorize stuff, and you can work together. Also, it's not due tomorrow. It's not like real science."



E. Culotta

Hands on. *Third graders in McFarland, Wisconsin, learn about dilution through direct experimentation with eyedropper and colored water.*

Joel's dreary image of "real science"—sitting alone memorizing books—will come as no surprise to anyone who has heard the litany of reports on the dismal state of U.S. science and math education. But the scope and ambition of current efforts to attack the problem may be surprising. After 7 years of gloomy warnings about the problem, legions of teachers and scientists are together launching a reform movement the likes of which hasn't been seen since Sputnik. And scientists are playing an increasingly important role in the revolution.

As individuals, scientists across the nation are trying to advise and cajole their local school boards and the teachers of their children to teach science in a more compelling manner. Some scientists have even taken on entire school systems—Nobel prize–winning physicist Leon Lederman is leading an effort to reform science curricula and teaching throughout the city of Chicago (*Science*, 31 August, p. 979). But if there is to be reform on a national scale it will likely require more than the heroic efforts of individuals.

During the past few months, *Science* has looked at three national reform programs, each dedicated to heeding Joel's message, but each pursuing a rather different route to the grail of getting kids intellectually involved in science. One is a long-range effort sponsored by the American Association for the Advancement of Science (AAAS is also the publisher of *Science*); the second, run by the National Science Teachers' Association, is concentrating on more immediate goals; and the third, a project of the National Council of Teachers of Mathematics, is trying to overhaul the content and style of math courses. Will these programs—or any others around the country—succeed? No one can answer that question today. But these efforts to use classrooms as laboratories for education experiments—to permit hands-on, creative, even noisy environments for "real science"—will receive their own grades in the coming years, as local districts decide whether to jump on the reform bandwagon or cling to the status quo.

To Joel, the folks who came up with his plate boundary project deserve—well, at least a B. While the specific project isn't part of a reform program, Joel's teacher, Joe Cabibbo, is a member of a revolutionary cadre of teachers and scientists involved in what is arguably the most ambitious of all the efforts: the AAAS's Project 2061. Named for the year Comet Halley returns to Earth, Project 2061's long-term goal is nothing less than the complete transformation of science, math, and social studies teaching from kindergarten through 12th grade. No part of the present system is considered sacred. Subjects, textbooks, grades—all are under scrutiny, and if this project somehow winds up flunking as a revolutionary movement, it will at least have earned an A for effort.

Project 2061 is developing its vision in three stages: First, decide what students need to know; second, illustrate how they can learn it; third, spread the revolution around. In stage one, teams of prominent scientists delineated what every high school graduate should know about science in a 100-page exposition published in 1989 titled "Science for All Americans." The book emphasizes concepts over data and considerably lightens the burden of facts students must know. Oxidation and isotopes are in; the periodic table is out.

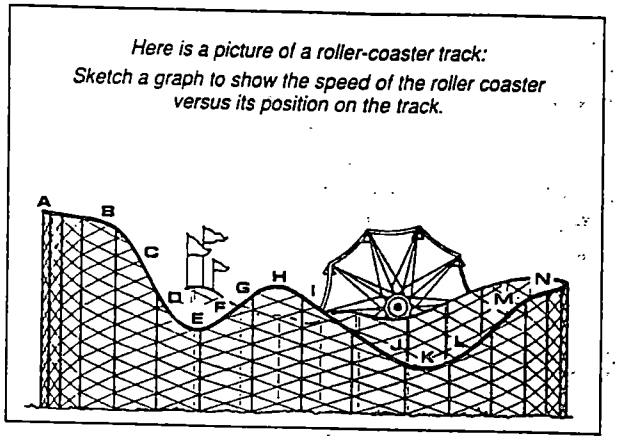
Not every reviewer loved the book. "Still No Beef," complained an editorial in *The Washington Post*, saying Project 2061's "lofty theorists" had put off the work of developing a curriculum. Of scientists' reactions to their colleagues' work, Project 2061 director F. James Rutherford sighs, "They always want more of their own discipline in there."

But many educators and scientists have endorsed both the book and the entire project as a vision of what education could become. "For the first time we have a total representation of what should constitute science education," says Luther Williams, head of education and human resources at the National Science Foundation. NSF has provided more than praise; it chipped in over $2 million for the project's $8.5-million second phase. IBM, the Department of Education, AAAS itself, two private foundations, and state and local governments made substantial contributions.

The *Post*'s criticisms are being answered—slowly—by this crucial second phase, now under way at six sites around the country: Philadelphia; McFarland, Wisconsin; rural Georgia; San Antonio; San Francisco; and San Diego. This time, it's the teachers who are in charge. Their mission: to design a new type of curriculum that carefully builds an accurate picture of the way the world works. With support from scientists, they're translating the concepts in "Science for All Americans" backward into simple ideas children can understand, reorganizing the

book's knowledge into a framework for curricula. For example, a high school understanding of organ systems might begin with the simple statement: "Things go on inside my body that I can't see." That seems obvious, but kids need to thoroughly comprehend it before they attempt to understand body processes, 2061 teachers say.

This type of work, more conceptual than concrete, draws critics such as the director of a smaller science education program, who extended the *Post*'s complaint to stage two and told *Science* that 2061 was too idealistic and slow. But the project was never intended to make change quickly, responds Rutherford. This is to be a thorough and therefore slow revolution. If the models are any good, AAAS expects the rest of the nation to join the revolution, district by district, throughout the decade and later. But Rutherford himself concedes that 1993 will be the watershed year for the project. That's when the curriculum models will be unveiled and a few vanguard districts are expected to start putting the 2061 philosophy into practice. And that's when critics will finally have something tangible to endorse or reject.



Graphic example. *A sample problem from the new math standards. (Source: "Reshaping School Mathematics: A New Philosophy and Framework for Curriculum," National Academy Press, 1990.)*

But even if 2061 were to get the seal of approval from the scientific and education communities in 1993, the project's Achilles' heel may be the decades required by stage three. AAAS knows the risk, and took it, because it felt that every quick fix previously tried in the U.S. educational system had eventually fallen before the multi-headed monster that has parceled out authority across 50 states and 80,000 schools. Reformers might change any one piece of the system—say, by training teachers differently—but the other pieces, such as textbooks, standardized tests and school boards, will drag teachers back to the status quo. So, for good or ill, AAAS opted to try to change the entire system. As Rutherford puts it, "We can't overwhelm that system; we've got to out think it."

But schools can't wait years to improve. While members of Project 2061 dream of the possibilities, other science teachers, through the National Science Teachers Association (NSTA), have spearheaded another massive project called Scope, Sequence, and Coordination (SSC). NSF coughed up an even larger amount for this teacher-based program—$8.6 million—and the Department of Education awarded an additional $2.5 million (*Science*, 31 August, p. 978). Focusing on grades 7 through 12, the project is already in classrooms in three sites—California, Iowa, and Houston—and planning is under way in two more, Puerto Rico and North Carolina.

It works something like this: Seventh graders in Houston don't study the life and physical sciences separately, but instead learn

The Reform Agenda: Emerging Consensus

It may be a time of experimentation for science education, but many trials are testing the same hypotheses. Some common themes are emerging from the patchwork of programs:

■ **Less is more.** It's time for kids to stop memorizing the difference between a type I and type II lever and the names of all the molecules involved in photosynthesis. One study estimated that students encounter more new words in a high school biology book than in 2 years of instruction in a foreign language. "We still live with the Victorian view of school, with minds trained like dogs to memorize things," says Timothy Goldsmith, chair of the committee that wrote a recent report on biology education for the National Research Council. New programs have kids doing more projects and less memorizing.

■ **Teacher power.** Post-Sputnik reforms sometimes took the tone of academic highbrows telling teachers what to do, and teachers have taken much of the blame for education's ills. But the new goal is to boost teachers, not bash them, giving them time to learn science themselves, rather than berating them for their backgrounds.

■ **Science without walls.** Sixth graders in rural Elbert County Georgia don't take science, math, social studies, or reading. Instead, they take one big course—200 minutes run by four teachers—that incorporates all four subjects. A trial balloon floated by members of Project 2061, the course illustrates the push for integrating subjects. Real life problems rarely come labeled as "chemistry" or "math," educators say. How far should such course integration go? Each program seems to have a different answer. Meanwhile, Georgia teachers are still seeking a good moniker for their mega-course.

■ **Do it yourself.** At the end of the school day in inner-city Philadelphia, teachers gather to learn how to separate salt from pepper using static electricity. They're being trained to use an elementary science kit, doing all the experiments their students will do. A staple of the 1960s reforms, hands-on activities are back and better, with a new emphasis on quality—"minds-on" as well as hands-on. Teachers are to be trained more carefully and given the logistic support they need.

■ **Two-way traffic.** Kids haven't understood much of what we've been telling them, in part because we haven't listened to the ideas they already have. For example, research shows that many youngsters don't understand the concept of temperature. They think putting on a sweater keeps you warm because sweaters always exist at a higher temperature. Listening to kids can give teachers clues on how to change such ideas.

■ **Science for everyone.** It's vital to widen the science career pipeline, especially to include more women and minorities. Reformers now also recognize a second goal: producing scientifically literate citizens. Even students who will never become scientists need to understand more about how the world works. New programs are aimed at all students, not just the gifted.

■ **Matchmaker, matchmaker.** Scientists and teachers come from very different worlds. Elementary teachers often opted out of science as soon as they could, but they know their business—kids. Meanwhile many scientists would like to help with science education, but don't know how to do it. "We're like a long-term marriage broker," says F. James Rutherford of Project 2061. "Our job is finding useful work and structures where both sides can interact."

■ E.C.

rmation in thematic blocks. In one, ed "Floating and Sinking," students are ected to learn some physics, chemistry, biology as they try density experiments, uding testing gold jewelry for authentic- The heart of SSC is spaced learning: ead of getting 1 year each of biology, sics and chemistry, youngsters study each ipline each year so they remember what 've learned, according to Bill Aldridge, utive director of NSTA. Each site is to luce and test course materials for NSTA listribute; Houston's "Floating and ing" has already been sent to other sites. lso, students are to learn concrete ideas , then move to abstractions. "The 7th e textbooks define temperature as the age kinetic energy of molecules. That's even true at very low temperatures and ns absolutely nothing to a 7th grader," Aldridge. "In 7th grade you should be ing about temperature as it's connected perience—the difference between heat temperature, thermal equilibrium. But naterials start with atoms and electrons. 's stupid," he says indignantly.

STA coordinates the program and ev- ne involved is committed to spaced ing, concrete ideas, and fewer facts, but site has quite a bit of independence. In nport, Iowa, for example, 6th graders r around a specially designed gold and commode for their science project, Royal Flush." Their task: to investi- ecology and consumer choice by test- ow well various types of toilet paper tegrate. That project is a Science/ nology/Society (STS) project run by Chautauqua program of the University wa Science Education Center. Recently enter hooked up with SSC and was d this fall to develop 6th grade mate- "Traditionally kids were told, 'Learn nd you'll find it useful.' But it wasn't l. Now we turn that around," says am director Robert Yager.

another example involves trade-ori- high school juniors in Iowa—a class eacher referred to as the future cosme- ists of America—who focused on the hole as a way to learn about science. eir teacher's amazement, the students soon clamoring for information: t's an atom? What's a molecule? What pH mean?" The class became the com- ty ozone experts, and college-bound nts began to complain that their course oo dull, Yager says.

ll this sounds scientifically sensible, it without its critics. For one thing, the g STS focus on current events draws om Aldridge himself, who believes in ples first, applications second. But he's g to support Yager in developing the experiment. A second concern is that SSC teachers are being asked to do too much. NSF's Williams, though clearly an overall booster of SSC, nevertheless warns, "In my view, the greatest potential liability of the program is the preparation of the teachers." Indeed, several Houston life science teachers hadn't had chemistry since high school and never took physics, but are now required to teach both. NSTA officials say they've built in teacher supports, such as summer workshops and detailed training sessions. Aldridge himself gave a workshop on "Floating and Sinking" to the Houston teachers. "Most of them hadn't had any physics, and they didn't have any trouble with it," he says.

Ironically, while Project 2061 is criticized for being too slow, SSC gets accused of moving too fast to make real change. Several education experts, including one involved


E. Culotta

Human development. *Philadelphia high school student giving presentation in class taught by a Project 2061 team member.*

with SSC itself, told *Science* they worried that at some sites the project could become a cosmetic reshuffling of the old curriculum. Aldridge counters that on his advice the NSF funds are conditional on an annual show of progress. If a center doesn't seem to be doing the job, NSF can simply yank it off the project—and perhaps substitute a willing newcomer from a growing pool of states eager to join the program. Also, NSTA officials say they expect change to snowball, as other parts of the system accommodate the project. In conjunction with SSC, California has already begun to use new hands-on tests so unusual that some 6th graders asked to take them again, says Tom Sachse, coordinator of the California site.

While SSC and 2061 compete for funds and are sponsored by very different organizations, after a period of initial jostling over their respective roles the two programs have endorsed each other, with Project 2061 staking out the long-term vision and SSC moving ahead now. But no matter how cordial science educators seem, they've a long way to go before reaching the solidarity of the math community, which is sponsoring a third great challenge to the educational status quo in the United States.

While science educators experiment with course integration and current events, and argue about what to toss out of the curriculum, they watch with envy as the math community calmly describes what to teach and how to teach it. Mathematicians have already wrestled with the tough curricular questions and are moving swiftly toward implementing reform. Last year, math curriculum standards for all grade levels were issued in the form of a 250-page book that was almost universally endorsed. The sequel comes next spring, when another book on professional standards will explain how teachers can reach the curriculum goals.

Part of the smooth progress in math seems to come from the cozy relations between mathematicians and math teachers. The National Council of Teachers of Mathematics (NCTM) developed the standards, but works closely with representatives from the math community on the Mathematical Sciences Education Board (MSEB), an arm of the National Research Council. "The degree to which people agree is amazing," says Iris Carl, who happens to be both president of the teachers' group and vice-chair of the education board.

Mathematicians have an easier time reaching consensus because their field doesn't encompass sub-disciplines as diverse as those in science, Carl says. Also, almost everyone, including parents, believes kids should learn math starting on the first day of school. Of course, most parents think math = multiplication tables, and popular opinions can be a burden as well as a blessing, says MSEB executive director Kenneth Hoffman. "Math came to replace Latin in the minds of some people. It's one of those things you do because it's good for you, to teach you neatness, discipline, and order."

Lovers of discipline are in for a bit of a surprise. The draft version of the professional standards describes a different style of classroom. Youngsters work and talk in groups, explaining problems to each other. Calculators and computers are everywhere and thinking skills and reasoning are emphasized. Kids are to spend less time laboriously plotting points and more time understanding graphs—after a computer does the plotting. It sounds great, but what if the 12-year-olds resist engaging in "mathematical

discourse" and chatter about rap music instead? Be patient, counsel the math wizards.

"I tell people over and over: Don't expect it to happen overnight," says Shirley Hill, former chair of MSEB and professor of math and education at the University of Missouri. "Kids are conditioned otherwise and they're not going to expect math to be fun or relevant all of a sudden. It's a process." The best math teachers already run classrooms like those in the standards, says Carl.

For reform to spread, educators say it's important that all these projects—and many smaller ones not mentioned here—work together, or at least pull in the same direction. "No one will succeed in isolation," says Williams. But while there's much agreement on what teachers should strive for, each program has a slightly different vision of the future. It's not exactly clear, for example, how the new math standards fit with "Science for All Americans," which includes math, but less of it.

And new programs are coming. The National Academy of Sciences, for example, is expected to decide upon a much-expanded role for itself in science education in late December. A few educators who work for existing programs fear the academy will repeat or compete with their efforts, although executive officer Philip Smith insists the institution won't invade any turf. Academy officials are still plotting their strategy and Smith defers any detailed revelations until later this month. But he says they're considering a two-pronged approach, to provide immediate relief as well as long-term vision. And he hints that the academy may tackle undergraduate instruction, an arena where other educators say they'd especially welcome the academy's clout.

For the moment, all sides tend to downplay whatever differences may exist. "It doesn't hurt at all to have different experiments going on simultaneously," says Susan Snyder of NSF's division of teacher preparation and enhancement. "We'll probably never have one single answer."

Snyder and other educators would prefer to focus instead on the momentum for change. The president and National Governors' Association, they boast, have announced the goal of having U.S. students first in math and science by 2000. Privately, though, almost no one thinks that can be done. At least, those involved plaintively conclude, the goal is on the national agenda. The unspoken question: How long will our easily distracted society keep it there? Back in Wisconsin, Joel Marino had the perseverance to complete his model of a mid-ocean ridge with chicken wire, blue plastic, kitty litter, and a mysterious red substance that quickly developed fruit flies. If the education experts succeed equally well with their own models, then Joel—or at least his younger siblings—may one day admit that science and recreation can sometimes be the same thing. ■ ELIZABETH CULOTTA

Elizabeth Culotta is a science writer for the Milwaukee Journal.

Computer Security: NAS Sounds the Alarm

Electronic vandals, viruses, and other malignancies of the computer world are likely to grow more virulent soon, according to a new report from the National Research Council. Indeed, a panel of computer security experts chaired by David Clark of the Massachusetts Institute of Technology warns that unless preventive action is taken, the economy could suffer. In a study titled "Computers at Risk," the panel calls for the establishment of an Information Security Foundation, a private nonprofit body that would set standards, promote research, and review the "trustworthiness" of computer software and hardware. It would require federal support to get started, says one panel member, and after that, it could support itself with membership dues.

"To date, we have been remarkably lucky," the report begins. Money has been stolen by computer—perhaps millions of dollars from credit card companies alone—and "lives have been lost because of computer software errors." But no intruder has been able to "subvert" a critical system. Yet the report warns that "there is reason to believe that our luck will soon run out."

The reason: Little is being done outside the government to reduce the vulnerability of computer networks, even though the nation's reliance on them is growing. For example, no concerted effort has been made to plug the many faults of personal computers, which are difficult to make secure because of the way they were designed. As network linkages grow, more PCs will be connected, and the weak points in systems will increase. "There's no doubt that things get considerably more dangerous when you get unprofessionally administered machines on networks," says panel member M. Douglas McIlroy of AT&T Bell Laboratories.

Most computer and software manufacturers have failed to take the risks of attack seriously, responding to problems as they occur in an "episodic and fragmented" fashion, says the report. And within government, computer security work is concentrated in the National Security Agency, which has been constrained by its secrecy and its national defense mission.

However, McIlroy points out that between 1983 and 1990, the NSA ran an advisory body "outside the perimeter" of secrecy called the National Computer Security Center. It set public standards and served as a clearinghouse for research. This was a valuable service for the handful of companies—like his own AT&T—that wanted to develop better defenses. But this year, the NCSC went back "behind the wire" of secrecy, McIlroy says, and it's not clear that any other office will step in to serve the public. The National Institute of Standards and Technology (NIST) might fit the bill, but the report comments that NIST "has limited technical expertise and funds" to do the work. Congress gave it only $2.5 million for computer security programs in 1990; when NIST attempted to double this budget for 1991, the increase was axed by Congress.

Meanwhile, companies are reluctant to advertise security problems. Their customers often aren't convinced that they're real. Unless they have been stung themselves, says McIlroy, they may not want to bear the costs of improving systems. Many computer users try to get around the problem in a superficial way, using security gimmicks of one kind or another. As a result, hundreds of products are offered for sale, but there's no objective means of judging their quality. The Clark report recommends several actions, in addition to creating a new foundation:

- Establish guidelines for "trustworthy systems" that reflect the consensus of security experts.
- Take a series of immediate short-term actions such as creating emergency response teams and asking vendors to ship products with security systems automatically turned "on."
- Create a system to monitor security breaks and to collect data on them for research.
- Clarify a confusing jumble of export controls and consider relaxing limits on the use of the U.S. Data Encryption Standard.
- Develop and fund a comprehensive program of research on computer security issues. ■ ELIOT MARSHALL

SCIENCE SERVICE

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SCIENCE YOUTH PROGRAM

Science Talent Search
International Science and Engineering Fair
SSTP Directory

February 14, 1991

Sent via messenger

Ms. Carolyn Cawley
Old Executive Office Building
Room 111 1/2
17th & Pennsylvania Avenue, N.W.
Washington, DC 20500

Dear Ms. Cawley:

I have enclosed the background material on the Westinghouse Science Talent Search that we discussed.

As I mentioned, Westinghouse Electric Corporation sponsors the competition and Science Service administers it. This has been true since the inception of the program in 1942.

I'm sure Charlie Carroll of Westinghouse (412/642-3370) will also be able to give you some helpful tips and suggest some appropriate content for President Bush's speech. He is the Director of Public Information and a writer on the Westinghouse PR staff and has also been involved in some of the advance meetings with White House staff regarding President Bush's intended visit.

Please call me if I can be of additional help.

Sincerely,

Carol

Carol Luszcz
Director of Youth Programs
and Program Director, STS

CL:lc

Encs.

LC:

Carolyn Cowley -- speech writer for Bush -- 202/456-7750

Please put this with file copy and send bcc (via fax) of letter and list to Charlie Carroll

Enclosures sent:

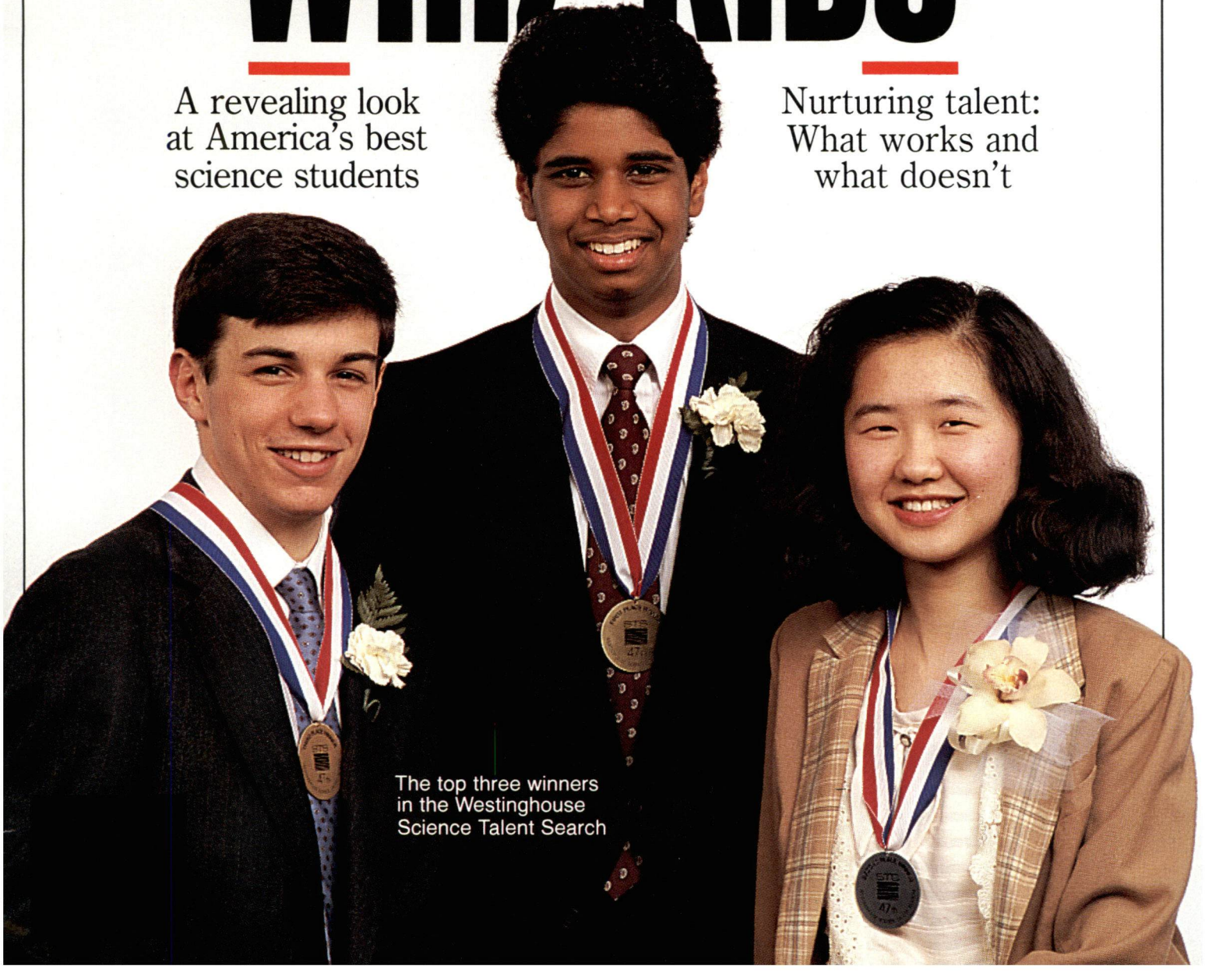
Banquet invitation
Finalists Slip
Finalists Booklet
Seeking & Finding
W press release
Finding Tomorrow's Scientists
Statistics
Reader's Digest article on Kurzweil (STS-65)
  and copy of front page of Kurzweil's entry form
U.S. News 3/88 reprint
ES article on STS "Science for the Fun of It"
ES letter to encourage key DC people to attend

U.S. News & WORLD REPORT
MARCH 14, 1988

WHAT PUTS THE WHIZ IN WHIZ KIDS

A revealing look at America's best science students

Nurturing talent: What works and what doesn't



The top three winners in the Westinghouse Science Talent Search

Winners of the Westinghouse Science Talent Search speak legions about the importance of family—and immigration—in shaping America's next generation of Nobel laureates

WHAT PUTS THE WHIZ IN WHIZ KIDS

■ They looked at first like any other busload of teenagers in the nation's capital. Some wore braces and blue jeans, and a few seemed as interested in the movie "Moonstruck" as in the sights of Washington. But then the bus stopped—at the National Academy of Sciences—and it was quickly apparent that these young people were in a world apart from the everyday high-school student: A world of lipoproteins and laminar flows, of H-2 genes and 27 cygnus, of paraquat ELISA and the 3x + 1 problem. They came striding into the academy's great hall, the 40 finalists of the 47th annual Westinghouse Science Talent Search, symbols of America's hopes of scientific leadership in the coming century.

When the talent search ended last week in a black-tie bash, 10 of the high-school seniors were declared winners of $140,000 worth of scholarships. "What some of these kids are doing in labs rivals the work that won Nobel prizes not many years ago," declared Richard Plass, chairman of biology and earth science at New York's Stuyvesant High School.

What accounts for this early knack for knowledge? Is it heredity or is it hard work? The winners answer by repeating a famous line from Thomas Edison: "Genius is 1 percent inspiration and 99 percent perspiration." These kids, without exception, work hard. But why do they strive? The answer to this question usually has plenty to do with parents and mentors. Nearly every Westinghouse winner has been lucky enough to have either an aspiring father or mother or an inspiring teacher. Most had both. (As did young Tom Edison, whose mother quit teaching school so she could teach only him. "Everything I am," the great inventor later stated, "I owe to my mother.")

RACE FOR THE FUTURE

Whatever prompts their precociousness, the Westinghouse whizzes are clearly achievers. Of the nearly 1,900 finalists since the competition's start, 7 of every 10 who are old enough have earned a Ph.D. or an M.D. Five finalists received Nobel prizes. Two got the Fields Medal, math's equivalent of the Nobel. The record stretches back to 1942, when Science Service, an educational organization, began running the contest and Westinghouse started putting up the money. Their roles haven't changed, but much else has.

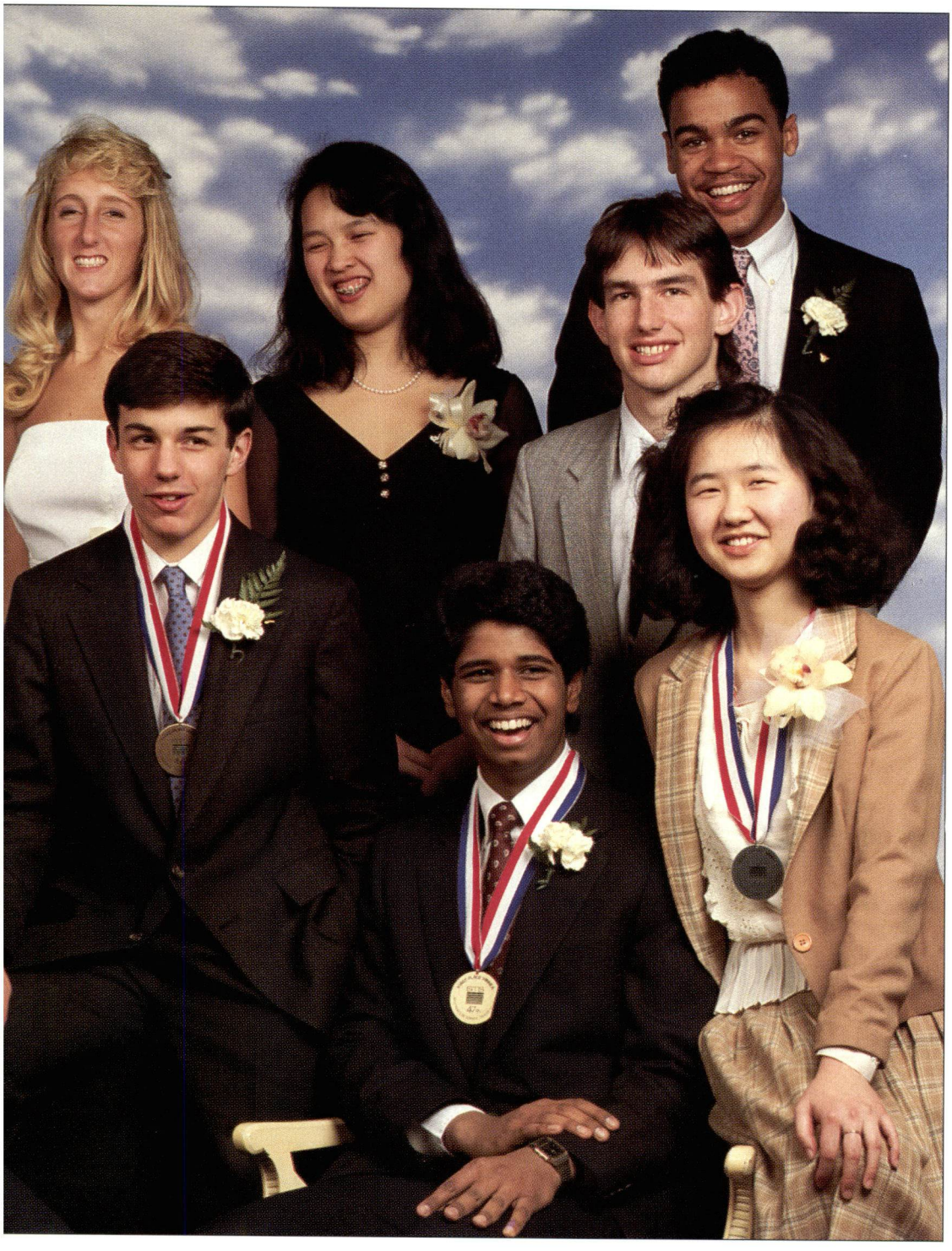
Prodigies uncovered in the early years tended to be children of Jewish immigrants, many of them refugees from Nazi-ruled Europe. Knowledge, they were reminded again and again, was a passport to success in America. In this decade, the competition is dominated by offspring of immigrants from India, Taiwan, South Korea and Vietnam.

by Lew Lord and Nancy Linnon with
William J. Cook, William F. Allman and Edwina Anderson
Photographs by John Bowden



"I want to make my parents happy," says Hong Huynh, 16, a San Diego finalist who fled Vietnam on a crowded boat eight years ago and now craves biochemistry, Cary Grant movies and the Constitution. "They gave up their home, furniture, everything, so I could be here. I don't want to disappoint them."

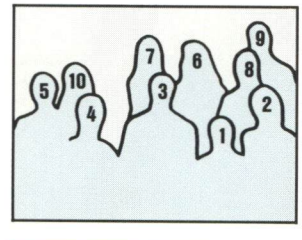
Physics finalist Sheeyun Park, 17, wasn't about to disappoint his parents, either. "Nearly every month, when I was 12 or 13, Dad brought home books—philosophy, Shakespeare, *Pride and Prejudice*—and said, 'Here, read these,' " recalls Sheeyun, who moved from Korea to New York 14 years ago. "If I needed books for courses, they gave me the money. If I wanted sneakers, they said, 'Keep the old pair.' "



MONTHS OF WORK AND A MOMENT OF GLORY

These 10 high-school seniors labored an average of 18 months on the projects that won them $140,000 worth of scholarships in the 47th annual Westinghouse Science Talent Search. How they finished—

1. **Chetan Nayak**, with pencil and paper and parents from India, scored a triumph in pure math.
2. **Janet Tseng**, from Taiwan, is working on a way to help AIDS victims.
3. **Ben Abella**, in an academic family, is strong in biochemistry and the arts.
4. **Vijay Pande**, son of Indian scientists, got his computer to tell him whether Star Wars would work (answer on page 51).
5. **Brian Conrad** is in math, like his dad and his twin.
6. **Weiva Yu Sieh**, of Chinese descent, looked at rats addicted to drugs.
7. **Stacey Beaulieu** wants to be the oceanic version of Neil Armstrong.
8. **Kurt Cuffey** is the fourth Westinghouse winner in a family descended from his astronomer grandfather.
9. **Brian Hooker** learned a lot from his Ph.D. mother.
10. **Meredith Albrecht** will be fourth doctor in family.



Westinghouse projects have changed as much as the contestants. Early efforts focused on the atom, astrophysics and "One Summer's Survey of Shallow-Water Fishes at Coney Island, N.Y." Many findings came from library books. High-school students couldn't go near a quality research lab. Brown University's Leon Cooper, winner of the 1972 Nobel for physics, spent the two summers before his 1947 Westinghouse year as an errand boy at a New York factory and a busboy in a New Jersey hotel.

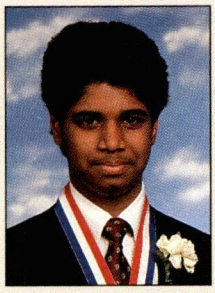
Now, students work summers and weekends alongside Ph.D.'s in university and med-center labs. Every project that reaches the finals—40 out of 1,339 entries—is considered original. This year's scholarship winners, profiled on the following pages, dealt with topics as diverse as glaciers, citrus plants and gravity and as pressing as AIDS, pollution and Star Wars.

"These kids get better each year," says Nobel laureate Glenn Seaborg, who has interviewed and judged every finalist since 1963. But that does not mean, he adds, that American schools are getting better. "We get to see the top people, the motivated students that the system can't block off. There's no turning those kids off."

Who are those kids? During the last six years, 33 of 60 scholarship winners have been the children of foreigners. Westinghouse's talent search, certainly in this decade, is a tribute as much to immigration as to education. □

Chetan Nayak

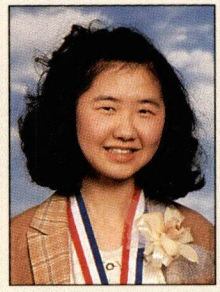
- **Age:** 16.
- **School:** Stuyvesant High, New York City.
- **Project:** "Variational Principle for the 'Already Unified Field Theory' " (a mathematical formulation of a theoretical model that unifies gravity and electromagnetism).
- **Prize:** $20,000.
- **Family:** Only child. Parents earned master's degrees in India—father in political science and mother in history—before moving to U.S. in the '60s. Both now sell real estate. "Most Indians who come here are professionals," says his mother. "Education plays a big part."
- **Parental role:** Took him at age 3 to the American Museum of Natural History and the Hayden Planetarium. At 4, he asked about sharks, and his mother bought him a collection of shark books. "When he was young, we let him watch only 3 or 4 hours of TV a week, and we chose the programs," his mother recalls. "Now he watches what he wants—but he doesn't have time."



- **Progress:** As a junior-high student, studied math for three summers at Johns Hopkins University's advanced summer program. "The interaction with other students got me interested in science." Knew college-level math by 10th grade. Taught himself tensor analysis, the complex math in his winning project.
- **Courses:** Advanced-placement classes in English, French and computer science at Stuyvesant; differential geometry, optics and thermodynamics at Columbia University.
- **Grade average:** 96.5—top 5 percent.
- **Activities:** Captain of Stuyvesant's math and academic-Olympics teams.
- **Daily reading:** The *New York Times.* "I read the editorials, but I usually turn first to the sports pages. You have to have your priorities straight."
- **Leisure:** Tennis. Watching the Yankees on TV. "They have a hell of a lineup this year—Henderson, Clark, Winfield."
- **Favorite authors:** Ernest Hemingway, William Faulkner.
- **Best books read recently:** *Evolution of Physics* by Albert Einstein and Leopold Infeld, *Brothers Karamazov* by Fyodor Dostoevsky.
- **College preference:** Harvard or Stanford.
- **Career:** Undecided.
- **Advice to other youths:** "If you're interested in science, you have to read on your own and learn on your own."
- **Mentor's view:** "When I read his paper, my eyes popped out," says physics adviser Abraham Baumel. "If he doesn't wind up a Nobel laureate, I'll be surprised."

Janet Tseng

- **Age:** 17.
- **School:** Stuyvesant High, New York City.
- **Project:** "Demonstration of Antibodies Against *Cryptosporidium* Sporozoites in AIDS and Non-AIDS Patients" (a study of gastrointestinal infection in AIDS victims).
- **Prize:** $15,000.
- **Family:** Came to U.S. "for better education and opportunities" 11 years ago from Taiwan, where father was a businessman and mother was a math teacher. Both are now in an export-import business. Sister, 18, is studying electrical engineering at MIT. Brother, 16, is at Stuyvesant High.
- **First sign of talent:** "Shortly after we came to New York, my dad mentioned his old phone number in Taiwan, and I asked him why it didn't have seven digits. I was 5 when that happened."



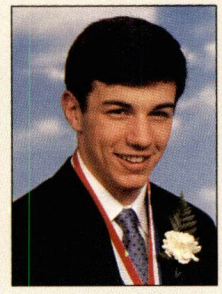
- **Motivator:** "My mother really pushed us. She had us do advanced-math problems at early ages. Later, she showed us newspaper clippings about very intelligent people."
- **Favorite books:** Dee Brown's *Bury My Heart at Wounded Knee* and Dan Rather's autobiography, *The Camera Never Blinks.*
- **Favorite magazine:** *New England Journal of Medicine.*
- **Favorite scientist:** Sir Isaac Newton. "I'd like to know what went through his mind when he first proposed his theories of gravitation."
- **Being smart:** "Most of us are just adept in two or three fields. It's not possible to know everything."
- **College preference:** MIT.
- **Ambition:** "To be an M.D. doing research in immunology and working with AIDS patients. The patients are not as contagious as people think. They are patients, and doctors have a duty to take care of patients."

Daily schedule:

- **6:30 a.m.**—Arise.
- **7 a.m.**—Take subway from Queens to Manhattan, study on train.
- **8:45 a.m.**—Start classes, including linear algebra, philosophy, economics, advanced-placement biology, folk dancing.
- **3 p.m.**—Take subway to St. Vincent's Hospital.
- **3:30 p.m.**—Don gown, gloves and mask; work with two Ph.D.'s on tests of blood samples from AIDS patients. Her goal: A cure for a parasitic intestinal infection that plagues many AIDS victims.
- **7 p.m.**—Board subway for Queens, study on train.
- **8 p.m.**—Arrive home, have dinner.
- **9 p.m.**—Do homework.
- **1 a.m.**—Sleep. "On exam days, I may sleep an hour or two."

Benjamin S. Abella

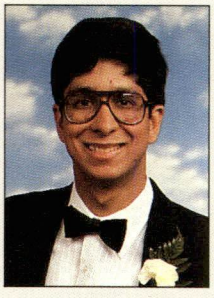
- **Age:** 17.
- **School:** University of Chicago Laboratory Schools High School.
- **Project:** "RNA Polymerase Genes of *Rhodobacter capsulata"* (a study of the relationship between several genes and a bacterium).
- **Prize:** $15,000.
- **Family:** Father is a physicist at University of Chicago. Mother is an art professor at Chicago State University. Sister, 12, is more interested in law than in science.
- **Early interest:** Played with chemistry sets in second grade. "When I got a microscope in the third or fourth grade, I pricked myself so I could look at my own blood."
- **Parental role:** "My dad could always provide answers to my natural curiosity. In grade school, I asked him lots of questions—like how rainbows worked. He'd get excited and say, 'Good question,' and then sit me down and get out some paper and work it out with me. The enthusiasm was contagious. Mom trained me in art history—from Renoir to Kandinsky and Rothko. I follow the Renaissance-man ideal: Know a little about everything."



- **Daytime hours:** Advanced-placement classes in French, English and music theory at high school; neurobiology at University of Chicago. Four hours a day at university lab.
- **Evenings:** Work on spring art festival. Do homework.
- **Weekends:** "After being out late on Fridays, I get up at 6 a.m. on Saturdays and go to the lab. I have to kick myself into working."
- **Leisure reading:** "I like Agatha Christie, John LeCarré, Tom Clancy, Stendahl. I just got into Jean-Paul Sartre: He kicks some total butt."
- **Activities:** Debate team. Editor of school paper. Actor in school theater. Has played violin since age 8. "Music is a good escape, a nice change of pace from science."
- **College preference:** Yale, Princeton or Stanford, with a major in genetics or molecular biology.
- **Career:** Research physician investigating cancer or AIDS. "Not sure if I'll go the med-school or Ph.D. route, but I want to be able to sit back 25 years from now and say: 'I've done something useful. I've helped in some way.' "
- **Biggest fear:** "I wonder if I will have the luck instead of just the perseverance to be successful. I'm determined, but I'm not too optimistic sometimes. For each research post at a graduate level, there are 80 people with applications. It's an intense field. Sometimes I wonder if I'm up to it."

Vijay S. Pande

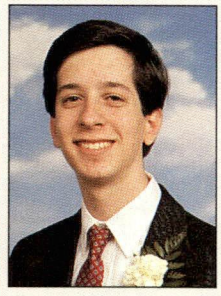
- **Age:** 17.
- **School:** Langley High School, McLean, Va.
- **Project:** "Dynamic Simulation of a Space-Based Laser Ballistic Missile Defense" (a computer simulation of the Strategic Defense Initiative, or Star Wars).
- **Prize:** $10,000.
- **Family:** Parents are Ph.D.'s working at the Naval Research Laboratory in Washington, D.C. Father, born in India and educated at Oxford, is a metallurgist. Mother, born in Trinidad and educated at University of Belfast, is a chemist. Sister, 16, prefers nonscience courses. "There should be a Westinghouse of the humanities for her."
- **Early interest:** "Mom brought home a physics set when I was in the third or fourth grade. My interest snowballed from there."



- **Courses:** Five advanced-placement classes—chemistry, biology, senior humanities (a mix of English and government), drafting and (on weekends) multivariable calculus.
- **Class standing:** Fourth. Perfect record marred by a B+ in French in eighth grade. Wrote a computer program in 10th grade for conjugating French verbs to try to improve his language skill.
- **Homework:** "I have to finish it by 9:30 each night. My brain stops at about that time. For things like computers, I can go on. But for homework, the concentration fades."
- **Leisure:** Football. Computer graphics. Songwriting. Plays piano, violin and synthesizer. "I try to write classical music. The strange thing is that I like to play Chopin and Romantic stuff, but what comes out when I write is mostly Bach-type stuff—more mechanical. I've also set up a system to write music on the computer—things like Bach inventions and Chopin preludes. There's a lot you can do with computers that's not the cold, hard number crunching you usually think of."
- **Favorite nonfiction:** Douglas Hofstadter's *Gödel, Escher, Bach.* "I found it on my father's bookshelf—this wonderful book on the relationship between math, computer science, music and art. I'm realizing now that my father and I really have similar interests."
- **Fiction:** Tom Clancy. "His descriptions of the military are so real and accurate."
- **Favorite scientist:** "Sir Isaac Newton was the greatest physicist, even greater than Einstein. While Einstein could build upon the work of many others, Newton singlehandedly discovered and proved many physical phenomena vital to our understanding of the world today. He invented calculus to do it."
- **College preference:** Cornell, Harvard, Princeton or Stanford, majoring in physics.
- **Career:** Research physics. "I prefer research to teaching. Teachers are doing a hard job and not getting much out of it."

Brian D. Conrad

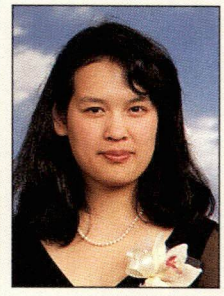
- **Age:** 17.
- **School:** Centereach High, Centereach, N.Y.
- **Project:** "Inverted Continued Fractions: A New Representation of the Real Numbers" (a study in pure math aimed at obtaining a new type of fraction).
- **Prize:** $10,000.
- **Parents:** Divorced. Father teaches high-school math in Roslyn, N.Y., 50 miles away. Brian lives with his mother, a former math teacher and now a secretary at Brookhaven Laboratory. Twin brother, Keith, accepted at Princeton, shares his interest in math but is pondering a medical career.
- **Parental influence:** "When your father is a math teacher, you're around it for a while. I've always been interested in it. When I drafted a paper for my first math fair, in the eighth grade, Dad gave it back with red ink all over it. Recently, Keith and I wanted to take advanced calculus, and our school didn't offer it. Dad teaches such a course in Roslyn, and he gave us his notes."



- **Summers:** "I attended summer math camps at Ohio State for two years. We did continued fractions the first year—the kind of thing you don't encounter until sometime in college. We had a grueling class in number theory. Our job was to prove something that's obvious—that there are no integers between zero and 1. The program is mind boggling, but the results are wonderful. I'll go back next summer as a counselor, making $1,500. Beats serving hamburgers."
- **Being smart:** "In the first grade, you get put in a group off in a corner, and the class is told: 'These people will do the extra stuff.' There are always people who call you names. The other day, a kid in the hall called me 'nerd.' But I don't associate with such people, and I'm never going to associate with them. People I associate with are in the honors group."
- **Spare time:** Ping-Pong. Juggling. Aerobic throwing. Watching baseball. Working on school paper. "I used to watch TV, but then one day I realized it was mostly stupid."
- **Favorite outside reading:** The *People's Almanac.* "Hundreds of pages filled with everything."
- **Favorite periodicals:** *College Math Journal, Math Magazine.*
- **Nonmath courses:** "English classes are very dull. I've always found literature a bit contrived. I'm turned off from history because you have to memorize. Stuff stays in my mind for math, but I can spend 7 hours studying for a history exam and 2 days later forget everything."
- **College preference:** Harvard.
- **Goal:** Mathematician, in a university or in industry.

Weiva Yu Sieh

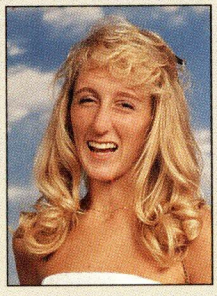
- **Age:** 17.
- **School:** Bronx High School of Science.
- **Project:** "Chronic Administration of a Narcotic Antagonist Decreases Brain Functional Activity in Rats" (neurology research involving naltrexone, a drug used for the prevention of drug readdiction).
- **Prize:** $10,000.
- **Family:** Parents are natives of China who moved to U.S. from Taiwan. Father is a naval architect who studied at the University of Michigan. Mother sells real estate. Brother, 18, studies electrical engineering at MIT.
- **Early science interest:** From watching "Nature," "Nova" and "National Geographic" on the PBS channel.
- **Parental role:** "My father talked about science in normal conversations. If the refrigerator broke, he wouldn't call a repairman; he'd ask me or my brother to fix it."



- **Research:** "I called the neurology departments of hospitals and universities in the Bronx and in Manhattan and asked if I could volunteer for research work and at the same time get some coaching. That's how I got to work at the Albert Einstein College of Medicine. The first day I walked in, I had no idea what was going on. There were so many things in the laboratory, I couldn't identify half the equipment. But the more you learn, the more you want to ask and the more you can ask. It's a snowball effect."
- **Leisure:** Ping-Pong. Guitar. Swimming. Wind surfing. "I write for a biology journal, and I coach novices on the debate team. Now that I've finished my project, life is a lot more relaxed. I have more time to see plays and movies with my friends. Peter Schieffer's play, 'The Public Eye,' is very funny. 'The Princess Bride' was a very good movie. I liked the suspense in 'No Way Out.' "
- **Books:** "I read a lot of philosophy for debating—John Stuart Mill on liberty, Plato on the theory of justice, neat things about rights and society. I like all of Jane Austen and Louisa May Alcott. I never liked science fiction—it's usually just horror—but recently I got into it. I read *Dune,* and it was amazing. The character sketches were incredible. My favorite nonfiction book lately: *A Theory of Justice* by John Rawls."
- **Favorite scientist:** Leonardo da Vinci. "He was a humanist as well as an inventor."
- **College preference:** Harvard.
- **Ambition:** "I want to major in biophysics and do basic research, probably in cardiology. I would like to help fight heart disease."

Stacey Beaulieu

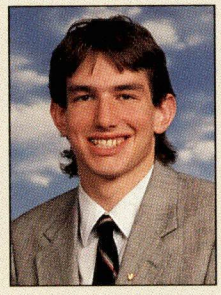
- **Age:** 17.
- **School:** Palm Beach Gardens High, Palm Beach Gardens, Fla.
- **Project:** "Enhancement of Citrus and Dieffenbachia Canker Symptomatology by Xanthan Gum Interaction" (a study of canker diseases in citrus and house plants).
- **Prize:** $7,500.
- **Family:** Father is a structural engineer. Mother is an artist. Brother, 14, is starting to compete in science fairs. "We're the classic middle-class family: We sit around the table and talk about what we did during the day. My parents are always excited about what I do."
- **Early interest:** "When I was little, I'd go outside and look at bugs and dead snakes and see how different they were. Everything is interesting once you look past the surface. I did little science projects as far back as kindergarten. In the eighth grade, I went to a sea camp in the Florida Keys. I was the only girl who would go near the shark pit."



- **First triumph:** "I was forced to do a major science project in the eighth grade, and I came up with an awesome idea: I cooled the inside of a model house, pumped water to the roof, cooled the attic and then used convection properties to pump it through the house. And I won. I've competed in fairs ever since—an environmental project in the ninth grade, microbiology in the 10th and 11th, botany in the 12th."
- **Nonscience honor:** Florida Spelling Bee champion.
- **Spare time:** Cheerleading. Playing basketball. Going to the beach.
- **Favorite books:** Stephen King's *It,* John Steinbeck's *Grapes of Wrath, National Geographic's Builders of the Ancient World.*
- **College preference:** Stanford.
- **Career goal:** "I was going to be a marine biologist. Then I saw how politically involved that would be, and I thought, 'Why go begging for grant money?' So I've decided to be an ocean engineer. I want to do deep-sea research and design submarines."
- **No. 1 ambition:** "Like Neil Armstrong was the first person to step on the moon, I want to be the first to step on the bottom of the sea without being enclosed in a submarine. I want to figure a way to go to the bottom of the ocean and not be surrounded by anything. I want to walk freely, pick up things off the bottom with my hand. I don't need money; I just want fame and respect and recognition."
- **Predictions:** "Automobiles in future centuries will be magnetically levitated from roads. Diet pills will be nutritionally sound."

Kurt M. Cuffey

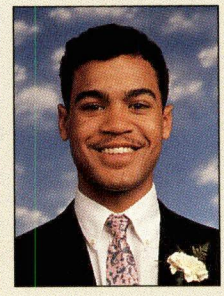
- **Age:** 18.
- **School:** State College Area Senior High, State College, Pa.
- **Project:** "Morphometric Analysis of Glaciated Valleys" (a study of how glaciers changed the shape and size of valleys in Montana).
- **Prize:** $7,500.
- **Family:** Grandfather is a retired astronomy professor who taught at New Mexico State. Father is a paleontologist at Penn State. Mother is an epidemiologist. Brother Clifford, 20, a paleontology major at Penn State, was a Westinghouse winner two years ago. Father was a winner in the '50s, as was an aunt who now is an opera singer.
- **Early years:** "Starting when I was 5, my father took us on his research trips out West just about every summer. We spent a lot of time looking at mountains and valleys in California, Colorado and New Mexico—things that I'm interested in scientifically."



- **Classes:** At high school, college-level English and chemistry, contemporary American society; at Penn State, differential equations.
- **Spare time:** Riding mountain bike on nearby trails. Math club. Knowledge Masters, the state's No. 1 scholastic team. Listening to classical music (mostly opera) and classic rock (mostly Beatles, Rolling Stones).
- **Latest disappointment:** "I had tickets to see Placido Domingo do Verdi's 'Otello' at the Met on the Saturday of the Westinghouse finals in Washington. Two great things in my life—and they had to happen at the same time!"
- **Reading:** "All sorts of things—modern novels, Camus and Heller, books disproving UFO sightings."
- **Favorite book:** A biography of John Muir, the naturalist. "You see how land has an inherent worth apart from its ability to help humans materially. It has a value as it stands."
- **Biggest fear:** "That a liberal environment supporting science and free thought won't last forever."
- **Biggest problem:** "I get really tired. I catnap a lot. If I could change one thing, I'd add 5 hours for being wide awake in the middle of the day."
- **College preference:** Penn State.
- **Career goal:** "We have two paleontologists in the family, and that's enough. I'm interested in a branch of geology known as geomorphology, the study of landscapes. It's an underrated field in which people are just starting to break through. You use lots of chemistry, physics, geology and statistics and blend them together. And you get to spend summers in the wilderness."

Brian C. Hooker

- **Age:** 17.
- **School:** Benjamin E. Mays High School, Atlanta.
- **Project:** "Development and Application of a Portable Device for Determining Atmospheric Carbon Monoxide."
- **Prize:** $7,500.
- **Parent:** "My mom has been divorced since I was born; it's just been the two of us all these years." She has a Ph.D. in educational administration and works for Atlanta University Center's seminary.
- **Early interest:** "At 7, I got a chemistry set for ages 12 and up. It fascinated me."
- **Courses:** Advanced-placement classes in English, computer science and chemistry; also a typing class.
- **Reading:** "I was a Stephen King freak in the seventh and eighth grades. *Firestarter* got me started. *Dead Zone* was thick. *Pet Cemetery* was good. King is bizarre. It's fascinating just how twisted some of these things are he comes up with."



- **College preference**: MIT or Stanford, majoring in electrical engineering and taking courses in business. "I've been intrigued with the business world ever since the recent stock-market crash."
- **Goal:** "Get out, work in the corporate world a bit, then go back and get my master's in business. Then I'd like to climb the corporate ladder in record time, be way up there by 30—a senior V.P. in something. By 40, I want to have enough experience and contacts to start my own engineering firm."
- **Money:** "I don't have to have a mansion and 17 cars. I'll be happy with a decent house and a decent Porsche."
- **Biggest fear:** "I'm afraid of burning out, running into something that will destroy that drive I have and turn me in an opposite direction. I feel stressed out already."

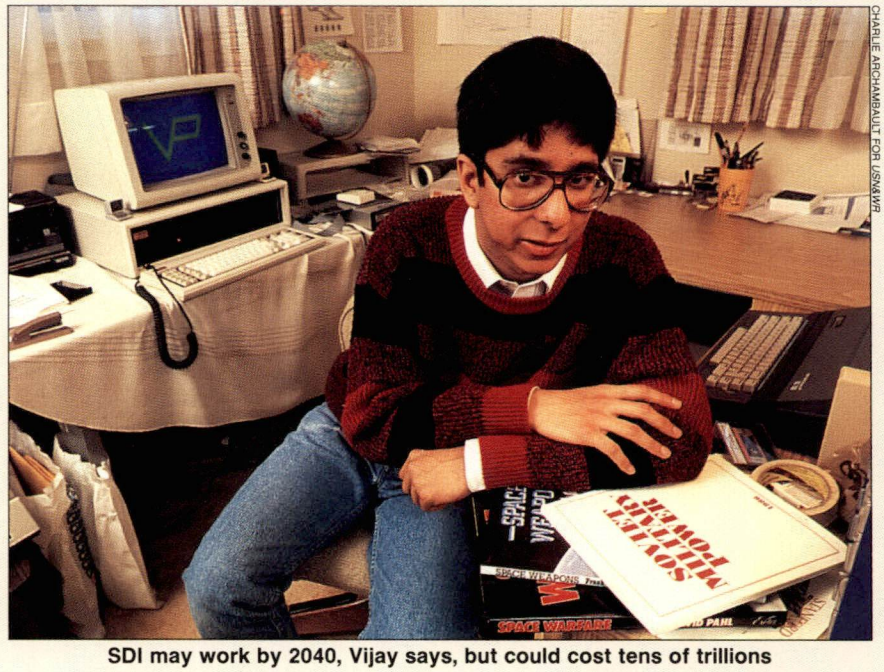
Daily schedule:

- **6:30 a.m.**—Wake up.
- **8 a.m.**—Drive to school. "I bought my car with $3,000 I've won in science fairs."
- **8:30 a.m.**—Start classes.
- **3:15 p.m.**—Finish classes. "Some days, I practice soccer. Sometimes, I go to the Georgia Tech lab."
- **7 p.m.**—Go home. Dine with mother. Clean kitchen. "I also clean the house and wash clothes. Only thing I don't do is cook."
- **8 p.m.**—Do homework. "Usually friends start calling, and I'll ask Mom to say that I'm gone or can't come to the phone. If she takes care of the calls, I get my assignments done quickly."
- **Midnight**—Sleep.

Meredith Albrecht



- **Age:** 17.
- **School:** Evanston Township High, Evanston, Ill.
- **Project:** "Effect of Geometric Variations in the Dispersed Phase on the Thermal Diffusivity of Composite Materials" (a study of changing temperature patterns).
- **Prize:** $7,500.
- **Parents:** Mother, a former nurse, introduced her to math workbooks before kindergarten. Father, an anesthesiologist, encourages her to work in his research lab.
- **Siblings:** Two older brothers—one a medical student, the other in premed. "When I was 2, we were driving along and my brothers were talking about future plans. One of them said: 'Meredith can't be a doctor. She'll have to be a nurse.' My dad pulled the car to the side of the road and said: 'She's going to be a doctor. If she wants to be a doctor, she will be a doctor.' "
- **Early years:** Her first school was a Montessori program, which promoted independence and inquisitiveness. When she was 5 years old, her father started to read the C. S. Lewis series *Chronicles of Narnia* and J. R. Tolkien's trilogy, *The Lord of the Rings,* to her and her brothers after dinner. No TV was allowed on weekdays, a rule that's followed even now. She tapes her favorite shows—"MacGyver" and "The Equalizer"—and watches them on weekends. The family's Saturday dinners are planned for 6 p.m. so that she can see "Star Trek: The Next Generation."
- **Grades:** "Our family works on a grade-reward system, with the pay depending on the level of difficulty and the level of the class. You get $5 for an A in an advanced-placement course. If you get a C in a regular course, you have money taken away. Gym grades don't count. None of us ever did well in gym."
- **Grade average:** 4.58 in a 4.0 system. (Points above 4.0 are awarded for advanced-placement courses.) Spends 6 to 7 hours a night on homework.
- **Being smart:** "You get yelled at for breaking the chemistry grading curve."
- **Spare time:** Piano. Guitar. Ringing handbells in choir. Soccer. Science fiction. Mystery novels. "But I can't abide Harlequin romances."
- **College preference:** Northwestern.
- **Research goals:** "Nerves have an electrical field that can be modeled using physics. I want to explore how we can use electrical stimuli to help people walk and to refine the technique used for paraplegics and then find out how to use it for quadraplegics. I would like to be an M.D. and maybe pick up a Ph.D. doing research and clinical work in bioengineering."



CHARLIE ARCHAMBAULT FOR USN&WR

SDI may work by 2040, Vijay says, but could cost tens of trillions

A VERDICT ON STAR WARS

Vijay Pande's project may bomb at the White House, but it's a hit with the judges for Westinghouse

He had been frustrated in the past when science-fair judges weren't captivated by the elegance of his entries. So for his Westinghouse project, Vijay Pande picked a central question of science and politics: How many satellites carrying laser weapons would be needed to stop a Soviet ballistic-missile attack? "I felt I would have a much easier time marketing SDI."

Vijay's findings aren't going to please backers of President Reagan's Strategic Defense Initiative, but the Westinghouse judges liked his study enough to make him a $10,000 winner. His computer model showed that if low-powered experimental lasers expected in the 1990s are deployed, an impractically large number of them—roughly 8,000—would be required to stop 2,400 Soviet missiles. That's because at any one time most of the lasers would be out of position. If lasers 10 times stronger could be developed to zap targets more quickly or from greater distances, only 200 would be needed. But such devices, Vijay says, "are a long way off—like 40 or 50 years." And if each satellite will cost $2 billion, as estimated, the price of a missile-defense system could range "from hundreds of billions to tens of trillions of dollars."

Vijay prepared for the project by reading reams of SDI literature and talking to IBM physicist Richard Garwin and military experts in the Washington area. Then he devised mathematical equations to describe the laser weapons and missile boosters. And he wrote 5,000 lines of code on his Compaq personal computer to simulate the missile battles, inventing in the process his own coordinate system to locate each laser satellite and each missile in space. "The missiles in the model," he says, "moved just as they would in real life."

The computer model matched 336 separate defense scenarios against 64 different missile threats. "I tried each defense against each offense in every possible combination"—21,504 in all. That was more than his personal computer could handle, so he did the final run on a more powerful minicomputer at his summer workplace, the Naval Research Laboratory.

The project attracted far more attention than Vijay expected. When he displayed it at the National Academy of Sciences, a man walked up, introduced himself as a Soviet naval attaché and asked for a copy of the computer program. Vijay said no. He had told the contest judges the same thing earlier. "I don't think anyone should get a free ride by using my code." □

by William J. Cook

SCOTT THODE—USN&WR



Freshmen dissect a frog at Stuyvesant High. The New York school produced this year's No. 1 and No. 2 Westinghouse winners

FORGET JAPAN, CATCH ROMANIA

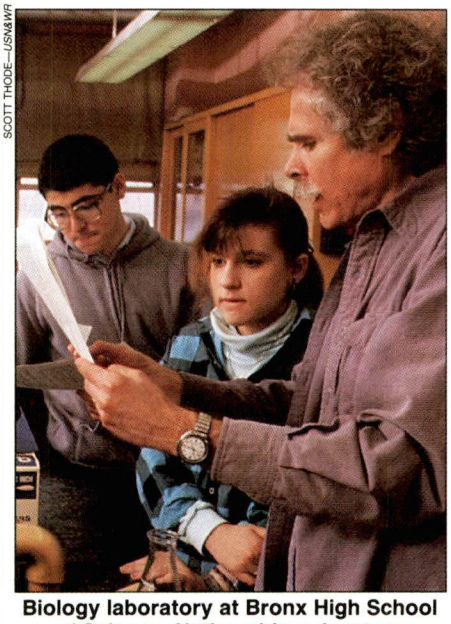
The two announcements occurred the same day in the nation's capital. One was the awarding of scholarships to the top 10 students in the Westinghouse Science Talent Search. The other—delivered with much less fanfare—was a report from the National Science Foundation measuring educational achievement around the world. In knowledge of chemistry, American 12th graders placed 11th on a 13-country list. In biology, they finished dead last.

Chetan Nayak, the top Westinghouse winner this year, isn't surprised. "When it comes to science education, the United States is practically a Third World country," he says. "Most high-school students in America get one or two years of science at the most. In other countries, like Romania, kids are expected to take six or seven years of science."

Glenn Seaborg, Nobel laureate and Westinghouse judge, agrees that most U.S. teenagers are ill-prepared for the technological demands of the coming century. A lack of qualified science and math teachers is much to blame. "We have a growing need for scientists, engineers and an educated work force," says Seaborg. It will take a Sputnik-like initiative, he argues, to fill the gap.

The U.S. boasts some of the best high schools in the world for science and math education, so why isn't their example being followed?

SCOTT THODE—USN&WR



Biology laboratory at Bronx High School of Science. Nationwide, educators complain that lab classes are waning

Deficiencies in science education start earlier than high school. The best students in the upper grades are usually those who have been stimulated in science at early ages. But, according to a recent study by North Carolina's Research Triangle Institute, only 1 in 3 grade-school science teachers has taken a college chemistry course, and only 1 in 5 has had college physics.

The same survey looked at junior high schools. Ten years ago, 3 of every 5 junior-high science teachers taught students by using hands-on experiments in laboratories. In this decade, only 43 percent have used lab work. It's not that teachers prefer textbooks to lab work; the problem is that they don't have enough lab equipment to do the work, says researcher Iris Weiss. "You cannot do hands-on science in a sterile room."

Making matters worse

State legislatures are slowly recognizing the need for better science and math training. But Mary Budd Rowe, president of the National Science Teachers Association, argues that their "cures" not only are falling short but in many cases are making things worse. Several states have added science requirements on top of the standard curriculum—

with the effect that all subjects are covered in less time. "They don't provide time for lab work," says Rowe. "Lab work is what makes science powerful. The whole beauty of science—to uncover patterns—is out the window."

Another effort that's backfiring, Rowe says, is the nation's passion for testing. Many companies that produce science textbooks, she contends, pore over the competence exams of states across the country and try to make their texts fit them all. "Your book turns out to be a glossary. It has no theme."

The two schools that do best in the Westinghouse Science Talent Search—Bronx High School of Science and Stuyvesant High in Manhattan—don't have the problems that plague the average school. For starters, their students are motivated—40 percent are of Asian descent—and feel lucky to be there. "We test 12,000 kids each year and take 800," says Stuyvesant Principal Abraham Baumel. "It's harder to get into than Harvard." The result is "the most select student body in the world. They achieve in everything."

Science teachers at Stuyvesant and Bronx High as well as at several neighborhood schools in New York approach science achievement—and the Westinghouse search—the way most high-school coaches gear up for state basketball tournaments. The goal in New York is to create a culture of science. "You make doing a science project as culturally acceptable as playing basketball," says Carol Greene, a biology teacher at Bronx High. "Here you can do a project without thinking that you've joined the ranks of the nerds."

Another tactic is to put bright youngsters together as much as possible and let the ideas fly. Bronx High's top math students eat lunch each day in a special mathematics dining room, discussing one project, then another. "This is usually pure math," says teacher Sherrill Mirsky. "You can go through four years of college math and never do the kind of independent projects that these students do."

Stuyvesant teachers encourage incoming freshmen and sophomores to take special double-period courses stressing research. Juniors who want to compete for a Westinghouse are reminded that a year or more of serious work on their own time is what it will take. That work usually includes several months of afternoon and weekend sessions with a professional researcher at one of New York's many laboratories—work that the teachers often help set up. "We point to the door," says Baumel. "We open the door, and then we get out of the way." When time comes for a term paper on a project—in the spring of the student's junior year—the teacher looks for the kind of effort that would earn a master's degree at many universities.

Test tubes vs. boob tubes

The problems of American education, of course, aren't just in the schools. Bronx High Principal Milton Kopelman shakes his head in dismay at millions of young people spending their hours being entertained by television. "They expect schools to provide that same sort of entertainment."

Yet even students who try to get ahead in science are falling short by international standards. An American teenager can take four years of science and still wind up with only one third of the class hours put in by the average high-school graduate in Japan.

American schools don't have enough science teachers to match that effort. But educators say the federal government could help end the shortage by providing more money for teaching fellowships and summer training institutes. In its early years, the Reagan administration cut such spending by 73 percent. "Almost overnight, we had a shutdown—a bit like the Gang of Four problem in China," says Rowe. Counting inflation, it was not until this year that the science-education budget got back to the level of 1980.

Glenn Seaborg fears that public support for science will continue to fall far short of the kind of investment that occurred a generation ago in the wake of the Soviet Sputnik challenge. "At that time, science was considered a necessity from a national-security point of view," notes Seaborg. "Now, it's seen as an economic necessity. That isn't as easy to sell." □

TRAINING CAMPS

High schools with most Westinghouse winners, 1942-88

Bronx High of Science (New York)	107
Stuyvesant High (New York)	65
Forest Hills High (New York)	42
Erasmus Hall High (New York)	31
Evanston Township High (Chicago)	27
Benjamin N. Cardozo High (New York)	25
Midwood High (New York)	20
Jamaica High (New York)	19
Martin Van Buren High (New York)	15
Abraham Lincoln High (New York)	11
Central High (Philadelphia)	11
Brooklyn Technical High (New York)	11

USN&WR—Basic data: Science Service

JOHN BONDEN FOR *USN&WR*



Brian's gauge measures pollution

THE KID WHO NEVER QUIT

It's taken a while, but Brian Hooker is getting used to being what he calls "the poster boy for the Atlanta public-school system."

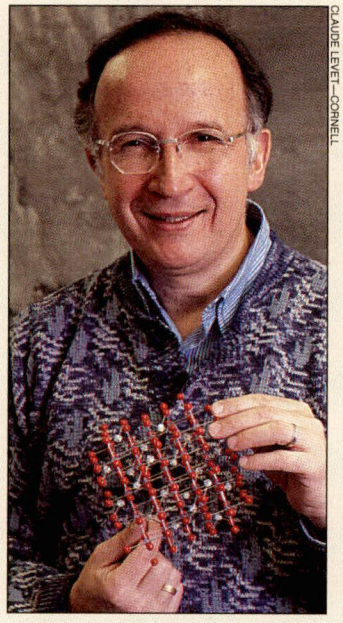
Yes, the Westinghouse winner says, those stories about young blacks resenting the successes of achieving blacks are true. "I got a lot of flak from my peers for doing well. But instead of letting it hold me back, I doubled, tripled, quadrupled what I was doing then into what I'm doing now." Those activities range from heading the soccer team to winning an array of science awards. (He's the fifth black in 47 years to get a Westinghouse scholarship.)

Brian is by no means the only gifted student at Benjamin E. Mays High School. Most of the 1,400 pupils—all but two of them black—are from the neighborhood. But 400 of them, including Brian, are in a science-and-math program that lures achievers from miles around.

At first, students in the magnet academy, established in 1981, had trouble being accepted by the neighborhood kids. But over time, says Principal Rubye McClendon, "the academy students brought recognition to Mays, and support within the school grew." Now, they get along fine. If they didn't, Brian Hooker would not have been elected student-body president.

Conversation with Roald Hoffman: From refugee to whiz kid to Nobel laureate

'TAKE THE CHAUCER'


CLAUDE LEVET—CORNELL

It was in 1943 or '44. We were living in a schoolhouse attic in Poland, hiding from the Germans. That's when my mother says my interest in science first began. I don't remember it, but she recalls reading me some books about electrons when I was 6 or 7. What I do remember were two books I read after the war when we were in refugee camps in Germany. One was a biography of Marie Curie by her daughter Eve. The other was an inspiring children's book on the life of the great applied chemist George Washington Carver. So the role models for me—a white kid from Poland—were a woman in France and a black man in America.

The instability around us at the time was incredible—first the war, then five years as refugees, then a new country and a new language. But I felt very stable at home with much support and love; there was a lot of praise for good performance in school. My mother and my stepfather didn't allow me to help around the house—they wanted me to have more time to study.

Stuyvesant High School, then and now

When we came to America, I was well ahead of kids here because of what I learned in Europe. I had algebra in Germany in the sixth grade; I didn't hit algebra in New York until the eighth grade. At Stuyvesant High, I encountered 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 and graduate school at Harvard.

I went back to a Stuyvesant graduation not long ago, and there was a different bunch of kids. In my day, most were Jewish immigrants, first or second generation. Now, nearly half seemed to be Asian Americans. But it was just like the old Stuyvesant: A normal teenage environment with horseplay and joking but intellectually very competitive. I'll tell you, when someone asks what America should do to keep up the flow of sciences for industry and universities, the answer is obvious. It's in the faces of the kids: Liberalize the immigration laws. If we open our doors, we will never have trouble getting scientists and doctors.

Through the Westinghouse Talent Search, I got my first job in science, a summer job at the National Bureau of Standards that introduced me to the joys of research. In fact, I saw just how addictive research can be: The natural high of solving problems in science is so great that you must watch yourself lest you be consumed by it. A scientist is a partial human being if he's just a scientist. Scientists tend to go for deterministic, reductionist viewpoints of how the world around them operates. Fortunately, most of us are not stuck in science 24 hours. Normal human emotions—love, money, power—enter our lives, diverting us enough to humanize us.


SCIENCE SERVICE, INC.

DWIGHT EISENHOWER and young Hoffman, bottom left, in 1955 Westinghouse finals. Now at Cornell, Hoffman won the 1981 Nobel Prize for chemistry. He recently wrote a book of poems, *The Metamict State*

"The first and best opportunity"

For me, the world opened up at Columbia. There was an excellent core curriculum, and I took a great-books course—100 books in one year, all the Greek plays. From one course in Japanese literature came a lifelong interest in Japanese culture. Mark Van Doren taught me how to read a poem. I took Howard McParlin Davis's course in Italian Renaissance art and almost became an art-history major.

To today's science students, I would say this: "Sure, push ahead in science as much as you can. But in college, you have the first and best opportunity to absorb the great ideas of civilization—the literature, the philosophy, the art, the music—without which we cannot be complete human beings. Don't let yourself be captured just by science. The world is there to be perceived. If you can fulfill an English requirement by reading Chaucer or by reading science fiction, for God's sake, take the Chaucer."

Must one go to an elite high school to be a good scientist? No, not at all. My colleagues, the great chemists at Cornell, are from a cross section of America, small rural high schools and the elite. American education offers incredible opportunities and flexibilities. What we look for in a high-school graduate is not advanced knowledge of chemistry but the basics: Mathematics, writing ability, foreign-language knowledge. The science we can teach.

Every citizen, whether in science or not, ought to know chemistry, physics and biology at some level. People should have the right to decide technical questions; with that right comes a responsibility to learn enough science to be able to judge the basic issues. Science is an essential part of our *culture*. To deal with the complicated, technological world of tomorrow, one needs the lessons of both science and the humanities. ■

Conversation with Lew Lord

FINDING TOMORROW'S SCIENTISTS

Westinghouse Electric Corporation has been pleased to sponsor the Science Talent Search since its beginning in 1942.

The competition was begun in response to a national concern that U.S. technology lagged behind other nations in those World War II years. Westinghouse and Science Service, which administers the program, sought a mechanism to encourage young scientists. Out of that concern emerged the Science Talent Search.

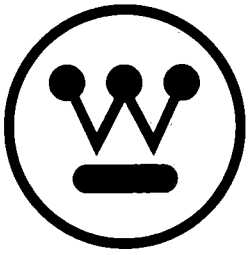
The enormous success of STS is reflected in these pages. Over the past 47 years, the program has enriched lives of thousands of young Americans who have participated. Hundreds of these students have reported that their participation in STS enabled them to get into the colleges of their choice.

The strength and vitality of the program obviously come from the steady flow of brilliant, inquisitive, challenging youngsters who want to improve the world through science.

These young people exemplify a dedication to excellence that is heartwarming. They're committed to doing their best. And that's good news for all America. They demonstrate a pride in themselves, a desire to excel and a recognition of the part that teamwork plays in their research. We—all of us—have a huge stake in our children's future and the future of our nation.

I salute these remarkable young scientists for their accomplishments. And I also salute *U.S. News & World Report* for bringing Science Talent Search to the attention of its readers.

John C. Marous
Chairman
Westinghouse Electric Corporation



Westinghouse

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FOR USE: FRIDAY, JANUARY 25, 1991

THE 50TH ANNUAL STS SCIENCE TALENT SEARCH

1991 FINALISTS

EDITORS, NOTE THE FOLLOWING:

- PLEASE DO NOT TRY TO CONTACT WINNERS, THEIR FAMILIES OR SCHOOLS BEFORE NOON, WEDNESDAY, JANUARY 23, when they will be told of their selection.
- The announcement date is January 25, 1991.
- The biographies are listed alphabetically by state and hometown of the winners.
- The 40 high school seniors listed in this booklet will come to Washington, D.C., for final judging February 28 to March 4, 1991, and will share $205,000 in Westinghouse scholarships on March 4.

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ALABAMA

Mehul Vipul Mankad, 17, of 5724 Vendome Drive S., MOBILE, investigated both DNA and protein synthesis in malignant cells for the Science Talent Search in work carried out at the College of Medicine at the University of South Alabama. Mehul believes that his work on these biological mechanisms will be useful in understanding gene expression, which in time will be helpful in the design of treatments for genetic diseases and cancers. A senior at St. Paul's Episcopal School, Mehul has won 21 science fair awards in local, national and international competitions. His interests include music, studio art and photography. He is chairman of the Panamanian delegation at the Model United Nations in Mobile and performed extensive volunteer work in the 1990 Alabama gubernatorial campaign. Mehul plans to attend Northwestern University to prepare for a research and academic career in medicine. His parents are Drs. Vipul and Aparna Mankad.

ALABAMA

Weily Soong, 18, of 2355 Tyrol Place, VESTAVIA HILLS, selected a project in molecular biology for the Science Talent Search. He investigated the genetic requirements for the efficient assembly and transport of the protein coat, or capsid, of the Mason-Pfizer monkey virus. Through genetic engineering of three gene regions that encode proteins found in the capsid of the virus, Weily was able to analyze the role of each in the assembly process. He found that only one gene region needed to be expressed for capsids to assemble, but that this process and their transport were inefficient. A senior at Vestavia Hills High School, Weily is active in the school's math club, student government and tennis. He has numerous math awards and has been recognized for outstanding literary and language accomplishments. He plans to study at Emory University, with the goal of becoming a medical scientist. He is the son of Dr. and Mrs. Seng-jaw Soong.

CALIFORNIA

Rageshree Ramachandran, 15, of 8541 Dominique Court, FAIR OAKS, performed computer-intensive research on the adequacy of a proposed numerical model of the oceanic and atmospheric phenomena known as the El Nino--Southern Oscillation (ENSO) for her Science Talent Search project. ENSO is the earth's most significant interannual climate variation, with considerable economic impact. It includes abnormal surface warmth, trade and wind shifts, torrential coastal rains, fish scarcity and death of seabirds. Through the creation of computer codes for implementing the simple chaotic model and use of live data collected at the Scripps Institute of Oceanography, Raga believes she has established the model's adequacy for further ENSO studies. Born in Madras, India, Raga is first in her class of 313 at Rio Americano High School in Sacramento. She placed first in combined score in the verbal and math sections of the SAT for the Western Region and was the 1988 National Spelling Bee champion. The daughter of Drs. Doraiswamy and Geetha Ramachandran, Raga plans to study engineering biology at Princeton.

CALIFORNIA

Wei-Jen Jerry Shan, 17, of 5411 Osburn Place, RIVERSIDE, entered the Science Talent Search with a project inspired by the airplane designs of Burt Rutan, who built the first airplane to circle the earth nonstop. Jerry, while still an eighth grader, became curious about the plane's small, nearly vertical wingtip extensions called winglets, used to reduce drag. Using a homemade water tunnel to collect data, he developed an equation that he believes can be used to optimize winglet length for maximum aerodynamic efficiency. Born in Taipei, Taiwan, Jerry is first in his class of 315 at John W. North High School, where he has won awards and medals in science, math, economics, writing, speech, history and photography. He has also been active in the community drama/music group and played junior varsity tennis. Son of Mr. Guang-Yih Shan and Ms. Lo-Chung Chang, Jerry plans to study mechanical or aeronautical engineering at California Institute of Technology.

CALIFORNIA

Tessa Lorrell Walters, 16, of 2244 Calle Margarita, SAN DIMAS, entered a biochemistry project in the Science Talent Search. Recognizing that the development of inhibitors of biologically important enzymes represents a fruitful area for the design of safe, effective drugs, Tessa decided to look for inhibitors of angiotensin-converting enzyme because of their probable importance as a hypertensive agent. Her studies involved the synthesis of such inhibitors found in snake venom, as well as the design of novel structures with greatly increased inhibitory action and, finally, the confirmation of the inhibitors' antihypertensive activity. First in a class of 736 and class vice-president at San Gabriel High School, Tessa has won many top science honors and awards. She is president of the school's science and math club. Her other interests include debate, jazz violin, volleyball and painting. She plans to attend Harvard and Radcliffe Colleges to study chemistry and astrophysics or geophysics. Her parents are Mr. and Mrs. George T. Walters.

COLORADO

Mark Allen Larson, 17, of 4224 E. 126th Avenue, THORNTON, designed and built an optical neural network computer for the Science Talent Search. By using fiber optics, he planned a neural connectionist-type computer that would be lighter and less costly but equal in performance to a free-space optics model currently working at the University of Colorado. Mark believes that this has been achieved: his computer correctly sorts all patterns out of a 16-pattern set; it can be reprogrammed easily; it is portable; and he estimates it to cost less than the computer at the University. Mark's many local, state, national and international science and engineering honors include awards from NASA, the American Meteorological Society, and the U.S. Army, Navy and Marine Corps. After graduation from Horizon High School in Brighton, Mark plans to study electrical engineering at the University of Colorado, and pursue a career as an opto-electrical engineer. He is the son of Dr. and Mrs. Allen L. Larson.

CONNECTICUT

Don H. Kim, 18, of 15 Sundance Drive, COS COB, chose a physics project for the Science Talent Search, devising a novel method for determining the viscosities of liquids. His method involves the measurement of displacement and period for a liquid set into oscillation in a specially designed U-tube, and the substitution of these values in an equation Don constructed for the project. Don found that the mathematical model described the motion of the liquid reasonably well, but that the range of viscosities that a U-tube can measure is rather narrow. Nonetheless, he believes the method as tested can provide new insights into the nature of such oscillations and fluid flow. Born in Taegu, South Korea, Don leads his class of 503 at Greenwich High School. He was a member of the 1990 U.S. Physics Olympiad team and won first place in the state Junior Engineering Technical Society competition. Don is interested in music, drawing, painting and metalworking. Son of Mr. and Mrs. Chul Kim, he plans to study physics at Princeton.

FLORIDA

Clifford Lee Wang, 16, of 515 Date Palm Road, VERO BEACH, conducted a study in biochemistry for the Science Talent Search, leading him to propose that seaweed can be grown in the ocean to remove metal pollutants and then harvested as a potent biomass for methane generation, cleaning the environment and producing energy at the same time. Clifford used seaweed he cultivated in the family garage to absorb trace metals. His experiments showed the metals served as biocatalysts, enhancing methane production from the seaweed. He did some of the highly technical analyses at the Harbor Branch Oceanographic Institution in Ft. Pierce; he performed other lab tests at his school, Vero Beach High School. Recipient of many first-place awards and dozens of other honors for science, academic games, art, photography, cross-country and tennis, Clifford is also an accomplished pianist, community volunteer and participant in a variety of school groups, including Masterminds, the Latin club and the varsity debate team. Son of Dr. and Mrs. Tsen Wang, he plans to study bioengineering at Harvard or Duke.

ILLINOIS

Joseph Izak Seeger, 17, of 1521 Greenleaf, EVANSTON, conducted a physics experiment for the Science Talent Search to determine what effects common heat sinks -- such as supports, temperature sensors and convection -- have on measurements of thermal diffusivity as determined by the widely used "flash method." Through both laboratory setup and computer simulation, Joe found that these heat sinks, rarely considered in the literature, do affect thermal diffusivity and that such factors as the material used for sample supports and their positioning are important. He suggests that more computer simulations are needed to determine optimum conditions for laboratory apparatus when the flash method is used. A senior at Evanston Township High School, Joe is active in the science club, bicycle club and theater. He has won a number of awards, including one for French, a language he reads readily. Son of Mr. and Mrs. Greg Seeger, Joe plans to major in mechanical engineering at Princeton.

ILLINOIS

Irwin Lee, 16, of 1006 Dakota Circle, NAPERVILLE, for his Science Talent Search project, studied the acoustic properties of an electrorheological fluid, one that increases its viscosity and varies its absorption of sound according to frequency when an electric field is applied. Irwin believes that the acoustic properties have many potential uses that have been overlooked because of more obvious mechanical applications. An "intelligent" acoustic damper that could selectively absorb low-frequency machinery noise is one example. Using special equipment he designed to study these properties, he showed that the increase in viscosity was possibly caused by a temporary molecular structure, and that sound attenuation was due to scattering effects around this structure. A senior at Naperville North High School, Irwin is active in the school's science, math and engineering clubs. He holds a number of science awards and lists as hobbies aircraft modeling, electronics and ham radio. Son of Dr. and Mrs. Frank Lee, Irwin plans to major in aerospace engineering at MIT.

IOWA

Nupur Ghoshal, 17, of 1310 Glendale Avenue, AMES, entered a genetics project carried out at Iowa State University in the Science Talent Search. Nupur showed that variations in proteinase inhibitors, a type of protein found in plants, produced corresponding variations in electrical activity. This discovery, along with the new apparatus she designed for the purpose, provided an inexpensive, quick and accurate test for Proteinase Inhibitor II in plants, assisting studies of its use to make plants pest-resistant. A senior at Ames High School, Nupur has edited its literary magazine, directed the speech club, chaired the Amnesty International chapter and helped produce the school's TV show. Known for her curiosity, she once researched a theory that the Loch Ness Monster was a herd of dinosaurs. Besides her many academic and civic awards and honors, she is a pianist, singer and ballet performer. Daughter of Dr. and Mrs. N. G. Ghoshal, Nupur plans to attend Northwestern University to study for a career in genetics.

MARYLAND

Joel Ellis Moore, 17, of 3804 Leland Street, CHEVY CHASE, combined his knowledge of physics and computers for his Science Talent Search project. He created a computer simulation of molecular-beam epitaxy (MBE), a technique for growing thin semiconductor films used in microelectronic circuitry. Joel used the Monte Carlo method of simulation to approximate growth uniformity of MBE under a variety of conditions; he found that his model gave results very close to experimental measurements. His research was done at the Very-Large-Scale Integrated Circuit computer facility at the University of California, San Diego. Since the fifth grade, Joel has been cited for achievements in math and computer science. A National Merit Semifinalist, he has also been honored for achievement in Latin and Japanese. At St. Albans School in Washington, D.C., he is captain of the "It's Academic" team and tied for the lead in the Maryland Math League. Photography, kayaking and skiing are among his hobbies. Son of Mr. and Mrs. William S. Moore, Joel hopes to major in physics or biology at Princeton.

MICHIGAN

Lori Ann Stec, 18, of 95 Braemar Drive, TROY, entered the Science Talent Search with a botany project that involved seven years of research. She collected over 10,000 goldenrods and made over 100,000 measurements to identify factors affecting the formation by three insect species of different stem gall systems (tumor-like growths). Using procedures that included chromatography and scanning electron microscopy, Lori processed both galled and ungalled plants for fluid, conductivity, pH and tissue studies. She believes her work provides models for the relationships between gall insects and their host plants as well as assisting in the general understanding of the relationships between plant and animal cells. A senior at the Detroit Country Day School in Birmingham, Lori won four first-prizes, including a $10,000 U.S. Navy scholarship, at the 1990 International Science and Engineering Fair. She has also been recognized for proficiency in piano and cello. Active in school and community organizations, Lori plans to study medicine at the University of Michigan. Her parents are Mr. and Mrs. Bernard Stec.

NEBRASKA

Kimberly Ann Chapman, 18, of 3631 S. 116th Avenue, OMAHA, completed a project in biochemistry for the Science Talent Search, comparing the binding of benzo[a]pyrene, a known carcinogen produced by organic combustion, to DNA by two activation mechanisms. She compared the bands produced in gel electrophoresis after DNA was cut by two restriction enzymes, BstE II and Hind III. Restriction enzymes cut DNA at a specific sequence, but Kim found the presence of BP activated by either mechanism inhibits the cutting of specific sequences and aids the cutting at other locations. First in a class of 119 at Marian High School, Kim conducted her research at the University of Nebraska Medical Center. She has won many science and academic awards, four letters in cross-country and three each in swimming and track. Daughter of Mr. and Mrs. Dennis T. Chapman, Kim plans to major in biochemistry at Northwestern University.

NEW JERSEY

Stanley Lu, 17, of 577 Cabot Hill Road, BRIDGEWATER, selected a microbiology project for the Science Talent Search. Stanley's objective was to determine whether tetracycline, a popular antibiotic, enclosed in liposomes, or "bags of fat," would be superior to non-enclosed tetracycline in bacterial-inhibiting capability. He found that the growth-inhibiting efficacy of liposome-encapsulated tetracycline is indeed better. Stanley suggests that membrane-to-membrane contact caused by the liposomal encapsulation may be responsible for the improved efficacy, but he feels more experimentation is necessary. A senior at Bridgewater-Raritan High School West in Raritan, Stanley is active in science and math clubs, the Junior Academy of Science, Chinese Culture Club, music and sports. A winner of a number of academic honors, he lists as hobbies tennis, basketball, soccer and piano. Son of Dr. and Mrs. Wen-tong Peter Lu, Stanley plans to study biomedical engineering at Johns Hopkins University.

NEW JERSEY

Denis Alexandrovich Lazarev, 17, of 3623 Gardenview Terrace, FAIR LAWN, completed a project in molecular genetics for the Science Talent Search. Denis analyzed the effect of a recently discovered regulatory protein, called ASF, on RNA splicing. Denis believes his research shows that ASF binds directly to pre-mRNA and changes the binding patterns of other proteins during *in vitro* splicing reactions, which play an important role in the regulation of gene expression. Denis, who was born in Kiev in the U.S.S.R., moved to the U.S. only two years ago. A member of the National Honor Society, he attends Elmwood Park Memorial Junior-Senior High School, where he plays soccer and writes for the school newspaper. His hobbies include 19th Century art, literature, the study of religion, Eastern medicine and tennis. He plans to study biology at Johns Hopkins University for a career in research. Denis is the son of Mr. and Mrs. Alexander Lazarev.

NEW JERSEY

Dean Ramsey Chung, 16, of 60 Pocono Road, MOUNTAIN LAKES, selected a math project in combinatorial geometry for the Science Talent Search. He investigated "graceful" and "non-graceful" geometric configurations. A graceful configuration is a property of lines in a plane whose adjacent regions are numbered such that their values form a consecutive set of numbers and such that the difference of the two numbers of adjacent regions bordering one of the lines is the same as that for all such adjacent regions along that line. During his investigation, Dean developed an elaborate proof to show there are non-graceful configurations and constructed several families of them. First in his class of 88 at Mountain Lakes High School, Dean is a member of the math club, plays the clarinet, and participates in cross-country, track and field. He finished first in the USA Math Talent Search, among other accomplishments. He hopes to enter Harvard and Radcliffe Colleges to pursue pre-med studies. His parents are Drs. Tsung-Jen and Fan-Rong K. Chung.

NEW MEXICO

Cameron Rea Haight, 17, of 720 Gonzales Road, SANTA FE, entered his work in fluid dynamics in the Science Talent Search. Cameron's studies of experimental turbulence using k-Epsilon transport equations led him to conclusions on turbulence structure and on mechanisms that produce large values for turbulence energy that, he believes, may prove useful in applications as varied as artificial heart design, submarine detection, aerodynamic and combustion efficiency and nuclear fusion. Part of his work was done at the Los Alamos National Laboratory. At Santa Fe High School, Cameron is editor of the newspaper and a member of the National Honor Society. He is a top-ranked debater and recipient of many awards in academic competitions, including first place in physics at the 1990 International Science and Engineering Fair. He enjoys backpacking, rock climbing, skiing and other outdoor sports and is active in his church youth group. Son of Dr. and Mrs. Robert Haight, Cameron plans to study physics at Princeton in preparation for a research career in physics.

NEW YORK

Cheryl Lynn Pederson, 18, of 14 Perry Court, ARMONK, submitted a project in psychology for the Science Talent Search. Cheryl designed a series of data tables that would furnish insights into differences between male and female play choice, themes of play and attempted entries into other sex-typed activities. For a period of 11 months she gathered data by observing the activities and interactions of preschool children at nursery schools. She found that a play area containing wood blocks was male-dominated while an area for housekeeping play was female-dominated. In both areas, boys exhibited more aggression than girls for entry as well as play. Acceptance depended upon the play area, with boys being more accepting in the block-building area and girls in the housekeeping area. A lifeguard and volunteer at an elementary school, Cheryl is active at Byram Hills High School in the science, debate and assembly clubs. She has also gained two varsity letters for both tennis and soccer. Daughter of Mr. and Mrs. Bruce A. Pederson, Cheryl hopes to major in psychology at Lehigh University.

NEW YORK

Ciamac Moallemi, 15, of 69-07 226th Street, BAYSIDE, developed a neural-network-based computer system for the Science Talent Search. The system's pattern recognition capabilities are used to determine from microscopic images which voided urine cells are suitable for further cancer diagnosis. He suggests that the system's accuracy and speed of cell classification will greatly enhance computer diagnosis of bladder cancer. He believes it could also serve to select images of cells useful for manual diagnosis, eliminating the need for the physician to use a microscope to search a slide for useful cells. At Benjamin Cardozo High School, Ciamac is captain of the math team and on the editorial staffs of the math and literary publications. He has been awarded gold and silver medals at the N.Y.C. Math Fair. Ciamac plans to study electrical engineering or computer science at MIT in the fall. Born in Iran, Ciamac's parents are Dr. M. Karim Moallemi and Dr. M. Azur Tadayyoni.

NEW YORK

Nuri Mehmet Kodaman, 17, of 225 Park Lane, DOUGLASTON, in a biology project for the Science Talent Search, studied why, as a Manduca sexta (tobacco hornworm) larva approaches the next stage, its labial (salivary) glands are destroyed. This phenomenon -- known as programmed cell death -- is extensively incorporated by living systems, but not well understood. In a laboratory at St. John's University, Nuri analyzed M. sexta to learn how and where cell death begins and whether it is caused by DNA degradation. He concluded that programmed cell death lies in protein loss and not in the destruction of the nuclei. He suggests, contrary to popular view, that the release of an endonuclease (an enzyme) is not a universal component of programmed cell death, but only present in special cases. At Townsend Harris High School in Flushing, Nuri is valedictorian and on the debate, varsity soccer and intramural basketball teams. Nuri has numerous awards in science, mathematics, engineering, Latin and writing. Son of Mrs. Nermin Kodaman and the late Dr. Hilmi I. Kodaman, he plans to study engineering and science at Harvard.

NEW YORK

Debby Ann Lin, 17, of 41-39 Forley Street, ELMHURST, selected virology for her Science Talent Search project -- identification of an evolutionary relationship between two virus groups. She determined the sequence of the second largest RNA segment of a virus transmitted by the tick (Dhori/India/1313/61) and then compared this RNA sequence with known protein sequences of influenza A, B, and C viruses. Her computer analysis showed significant similarity between the Dhori and influenza virus proteins. In addition to an evolutionary relationship, Debby believes her results will contribute to a better understanding of the replication mechanisms of this unusual group of tick-borne viruses. Debby did her laboratory work at The Mount Sinai Medical Center; she will co-author a scientific paper on the work. A National Honor Society member, she attends Stuyvesant High School in New York City. Debby plans to study biology at MIT and pursue a career as a surgeon. She is the daughter of Mr. Tzu-Huei Lin and the late Marlene Lin.

NEW YORK

Linda Tae-Ryung Kang, 17, of 35-70 168th Street, FLUSHING, investigated "Catalytic Reactions Between Alkyl Iodides and Copper Surfaces" for her surface chemistry entry in the Science Talent Search. She examined the Fischer-Tropsch process, a non-petroleum fuel production alternative that uses coal and natural gas and for which a surface serves as catalyst. Her work advanced knowledge of the chemical reactions that comprise the process. In her research, carried out at the Columbia University Surface Chemistry Laboratory, Linda had to master use of an ultrahigh vacuum system equipped with mass spectrometry and electron spectroscopes. Among her honors are National Merit Semi-finalist, Maxima Cum Laude in the National Latin Exam and NASA Space Science Student Involvement Program regional winner. She has also received awards for debate, piano playing and community service. At Stuyvesant High School, Linda is on the math, speech and fencing teams and is cheerleader captain. Daughter of Dr. and Mrs. Yeong Sun Kang, she hopes to attend Harvard and Radcliffe Colleges to continue her chemistry studies.

NEW YORK

Jim Way Cheung, 17, of 32-38 78th Street, JACKSON HEIGHTS, selected a problem in classical number theory for the Science Talent Search. He investigated the properties of continued fractions over the system of Eisenstein integers. Jim designed a computer program to test the convergent approximations that he had hypothesized. He then repeated this process of hypothesizing and testing until he verified the hypothesis. Jim also introduced a construction to provide a geometrical representation of the convergent expressions and a more intuitive way of looking at continued fractions. He has enriched his study of mathematics during the past three summers at Ohio State University's Mathematics Program. At the Bronx High School of Science, Jim has won a number of science and math fair competitions and also enjoys music, computer programming, classic literature, sports and bridge. Son of Mr. and Mrs. John Ng Cheung, he plans to study math and biochemistry at Harvard and Radcliffe Colleges leading to a career in scientific research.

NEW YORK

Tara Sophia Bahna-James, 17, of 25 Montgomery Street, NEW YORK, explored the relationship between mathematics and music for her social science entry in the Science Talent Search. Her goal was to see if musically talented students have basic math understandings which might be used to improve both achievement and interest in math. After analyzing the results of a questionnaire given to 124 music students, Tara found that talents for certain areas in music theory matched with talents for topics in math related to those areas. However, she noted that these students tended to underestimate their math performance. Tara suggests that this may be because they view math as non-creative, sterile and remote from their lives. She concludes that teaching the relationship of mathematics to music might make math more enjoyable and easier for music students. The recipient of many academic, music and sports awards, Tara attends LaGuardia High School of Music and the Arts. Daughter of Carol Lee Bahna and Felder Randolph James, she hopes to study cognitive science at Yale.

NEW YORK

William Ching, 17, of 650 W. 171 Street, NEW YORK, chose a project in neurobiology for the Science Talent Search. In his optic nerve research at the Neurosurgical Research Laboratory, New York University Medical Center, William's results indicated the presence in the optic nerve of a certain chemical receptor, known as GABA-B. His extensive search of the scientific literature found no references to such a discovery. His work further showed that a related chemical, baclofen, may be an effective treatment for spinal cord injury and multiple sclerosis. First in his class of 112 at Riverdale Country School in the Bronx, William has been cited for excellence in science, mathematics, Greek, Spanish and history. Captain of his school's fencing team, his hobbies include computer programming and critical literary analysis. Son of Mr. and Mrs. Kok Poi Ching, he plans to study at Yale University leading to a career in medical research.

NEW YORK

Petal Pearl Haynes, 18, of 89-30 164 Street, NEW YORK, selected a project in gerontology for the Science Talent Search -- an investigation of the correlation between friendships and morale among nursing home residents. She developed a questionnaire to identify friendships that residents shared with other residents, staff members and family outside the institution. She used the Philadelphia Geriatric Center Morale Scale to measure morale. Her results showed no correlation, and she suggests that they support earlier studies on the social structure of nursing homes. One study, which Petal's findings support, introduced the idea of the "total institution" -- that to facilitate the care of residents, the staff forces the residents into a social conformity. A student at Stuyvesant High School, Petal has participated in a variety of activities: Junior Academy of Science, NYC Volunteer Corps, Gospel Choir, the Moot Court competition and varsity track and field. She plans to study liberal arts at Yale. Born in Georgetown, Guyana, Petal is the daughter of Patrick Martinborough and Eileen Haynes.

NEW YORK

Tien-An Yang, 17, of 90 La Salle Street, NEW YORK, selected a project in membrane physiology for the Science Talent Search. She investigated a class of ion channels -- the potassium channels -- which have not previously been isolated due to their low abundance in most muscle and nerve cells. Different forms of potassium channels are found in various types of cells and may be a factor in the specialized functions of these cells. Tien-An produced two antibodies to synthetic peptides and then tested the reaction of these antibodies with membrane proteins from rats. She concluded that such antibody reactions could be useful in the study of ion channels, which could lead to new treatments for diseases. Editor of the Chinese school newsletter at Stuyvesant High School, Tien-An participates in science and math fairs, volunteer choir, basketball and soccer. Also, she tutors biology and Spanish. She plans to attend Yale to pursue a career in medicine and cancer research. Tien-An is the daughter of Drs. Koahsiung and Chia-Ping Huang Yang.

NEW YORK

Yves Jude Jeanty, 16, of 145-36 115 Avenue, SOUTH OZONE PARK, entered a project in cellular biology in the Science Talent Search. Yves' experiments were designed to discover proteins which could be used as indicators of a phenomenon known as contact inhibition of motility, which occurs when cells collide and then change direction and move away from the contact site. Since cancerous cells exhibit abnormal contact inhibition, knowledge about what happens at the molecular level during contact could provide a better understanding of cancerous cell growth. Yves found evidence for contact-induced changes in cytoskeletal proteins and believes that his work may help lead to techniques for assaying contact inhibition. A student at Stuyvesant High School, Yves plans to study at Cornell for a career in medicine. In addition to his interest in science, Yves is a member of the French Honor Society and plays handball, football and baseball. He also collects investment-grade comic books and baseball cards. Yves is the son of Yves Jeanty and Chantal Edouard.

NEW YORK

Michael John Lopez, 18, of 24 Annandale Road, STONY BROOK, selected a project in nuclear chemistry for the Science Talent Search. Using the chemistry facilities at State University of New York at Stony Brook, he tested a formula that predicts the spin axis of a compound nucleus formed by the fusing of two reactant atoms. Recorded raw data for his analysis came from a recent experiment conducted in France which involved bombarding a silver target with an intermediate-energy argon beam. Michael analyzed computer data developed from millions of individual atomic collisions. While it is assumed that taking more emitted particles into account will estimate spin axis more accurately, Michael's results indicated that when more emitted particles are considered, the observed particle emission becomes more random and so the estimate is no more accurate. A senior at Ward Melville High School in Setauket, Michael has won a number of awards in math and science competitions and participates in several sports. Michael plans to study electrical engineering at Duke University. He is the son of Mr. and Mrs. Edward Lopez.

NEW YORK

Ani Jean-Mee Fleisig, 17, of 87-44 94th Street, WOODHAVEN, completed a cell biology project for her Science Talent Search entry. Ani examined the process by which folic acid directs movement of certain amoeba to their bacteria food source, an example of chemotaxis, the attraction or repulsion of cells or organisms by chemical agents. She tested chemicals that resemble parts of the folic acid molecule for both chemoattraction and chemotactic inhibition, concluding that chemotaxis is not controlled by a single receptor site, as previously suggested, and so more complex receptor models must be considered in future studies. Born in South Korea, Ani moved to the U.S. when she was five years old. The winner of numerous awards in science and Latin, Ani is also very artistic. She plans to study at the University of Wisconsin for a career in genetic research. She attends Townsend Harris High School in Flushing. Ani is the daughter of Mr. and Mrs. Paul L. Fleisig.

NEW YORK

Sunmee Louise Kim, 17, of 39-60 54th Street, WOODSIDE, investigated the effects of stress on eating habits of female students for her Science Talent Search entry, developing an original method to test, in a natural setting, her hypothesis that eating increases during stressful periods. Previous studies had only been done under laboratory conditions. Twenty-six schoolmate volunteers at Stuyvesant High School recorded food intake and moods during stressful times (exams) and unstressful times (days without exams). Sunmee's data analysis verified her hypothesis that stress increases total calorie intake, whether or not the subjects were on a diet. Further research on stress and eating habits among teenagers may help avoid health risks in later years, Sunmee suggests. Active in the Korean Presbyterian Church of N.Y. as a member of the choir and church band, Sunmee also serves as a volunteer for the sick and disabled. Tennis, basketball and swimming are among her hobbies. Daughter of Mr. and Mrs. John J. Kim, she plans to major in education and psychology at Columbia University.

NORTH CAROLINA

Ashley Melia Reiter, 17, of 5827 Beckett Court, CHARLOTTE, selected a project in mathematics in an area known as fractal geometry for the Science Talent Search. Ashley determined the dimension of fractals generated by Pascal's triangle, which has long fascinated mathematicians with its intriguing number patterns. Her project on Pascal's triangle began while she was attending a junior year fractals class at her school, the North Carolina School of Science and Mathematics in Durham. She continued her work during the summer as an intern at the San Diego Supercomputer Center, where she did her own programming and numerics to carry out the necessary computer simulations. Ashley plans to continue her study of mathematics at Rice University. She has won many awards in math competitions and also holds awards in chemistry, computers, Latin and other areas, including her work with the Girl Scouts. She has been president of the NCSSM Math Club for the past two years. Daughter of Dr. and Mrs. Harold Reiter, her hobbies include photography, music, cooking and sewing.

OHIO

Jeremy Randall Riddell, 18, of 3254 Ferry Road, BELLBROOK, selected a project in physics for his Science Talent Search entry. Jeremy, a senior at The Miami Valley School in Dayton, designed and carried out experiments that measure electron spin-orbit changes, one of the two factors that determine the energy of the photon of light emitted when electrons in atoms change energy levels. Jeremy designed and built his own spectrometer using available components, such as a riflescope and a homemade 20-power telescope, for observing the grating spectrum. He believes his work could advance understanding of quantum mechanical systems and the scientific principles governing them. An athlete-scholar, Jeremy has letters in soccer, basketball and track. He also plays trumpet in several orchestras and holds the rank of Life Scout in the Boy Scouts. His hobbies include backpacking, origami, rock collecting and poultry farming. Son of Mr. and Mrs. James Riddell III, Jeremy plans to study biology and physics, leading to an advanced degree in medicine.

PENNSYLVANIA

Susan Elaine Criss, 17, of 1980 Squaw Run Road, PITTSBURGH, selected a research project in botany for her Science Talent Search entry. Recently released studies indicate that higher levels of betacarotene in the blood stream may lower the risk of cancer. These reports led Susan to her two-year project, which was to determine how copper, manganese and zinc ions affect betacarotene production of Romaine lettuce. Using thin-layer chromatography, spectroscopy and plant tissue culture, she concluded that stresses caused by the metal ions do affect the production of betacarotene in lettuce plants. Add-ons to Susan's study being developed include testing various ions in different concentrations to determine their optimum concentration for betacarotene production. Susan, a student at Fox Chapel Area High School, plans a career in chemical engineering. She has been active in the National Honor Society and has won numerous science and other academic awards. She earned seven varsity letters in track and soccer and twice captained the soccer team. She is the daughter of Mr. and Mrs. Charles W. Criss.

TEXAS

Wade William Butin, 17, of 8810 Tranquil Park Drive, SPRING, chose chemistry for his Science Talent Search project, which involved the creation of special varnishes. One objective was to develop a high-quality, high-performance varnish that could withstand the rigors of weather exposure, dilute acid and salt water. He found that incorporating common sunblock ingredients into the varnish molecular structures improved the performance in all those areas, resulting in experimental varnishes that Wade believes are superior to commercially available varnishes. He also created a varnish that would be "slippery" when in contact with water to reduce the drag of varnished boat hulls. He did this by incorporating a soap-like substance into the varnish molecular structure. Wade, a student at Klein High School, plans to attend Rice University and major in mathematics or physics. He has won numerous top awards in local and international science competitions. Wade also has a strong interest in music, winning high honors in many competitions. He is the son of Mr. and Mrs. William F. Butin.

VIRGINIA

Tatiana Tamara Schnur, 16, of 6009 Lincolnwood Court, BURKE, conducted exhaustive research in the field of psycholinguistics for her Science Talent Search project. Tatiana designed a number of experiments to investigate the processes involved in language comprehension. She tested subjects by orally presenting sentences containing an ambiguous word. Ten of the sentences were biased toward the primary meaning of the word and ten of the sentences were biased toward the secondary meaning. After each sentence, the ambiguous word was displayed visually and the subject was required to determine whether the target word had one, two or more meanings. Tatiana's research, she believes, offers a new method of investigating how language is organized in the brain. The research is relevant to computational linguistics, artificial intelligence and computer sciences. Tatiana, a student at Robinson Secondary School in Fairfax, plans to attend Yale to study linguistics. Her parents are Drs. Joel M. and Sara Lee Schnur.

VIRGINIA

Judson Lawrence Berkey, 17, of 9123 Peabody Street, MANASSAS, chose a project on the physics of baseball for the Science Talent Search. Using the principles of fluid dynamics, he modeled the flight of a baseball on a computer and then simulated the effects of different launch angles on the distance it would travel. He found that when spin reduction and varying drag forces are taken into account, the launch angle that maximizes range does not change considerably for different spins and speeds. A senior at Thomas Jefferson High School for Science and Technology in Alexandria, Judson is, of course, a varsity baseball player at his school and lists as hobbies philosophy, reading and computer programming. He is a National Merit Semifinalist and has won national recognition for his proficiency in Latin. He is interested in pursuing computer science for a career, but has not yet determined where he would like to attend college. He is the son of Mr. Walter and Dr. Judith Berkey.

VIRGINIA

Venkataramana Kuntimaddi Sadananda, 17, of 8015 Daffodil Court, SPRINGFIELD, developed for the Science Talent Search a computer simulation of the onset of heart attacks due to irregular interactions of stimuli and used it to establish conditions under which heart beat becomes chaotic. She determined that chaos is absent in normal heart rhythm but could be present in abnormal rhythm, experimental evaluation on the latter being inconclusive. She believes the non-linear dynamic techniques used in her study offer powerful new tools for understanding the mechanics of complex cardiac rhythms. A prize winner for science studies since third grade, Ramana was a member of the Thomas Jefferson H.S. for Science and Technology's winning team in SuperQuest 90. She has made presentations at scientific meetings, and her paper, "Probabilistic Approach to Bone Fracture Analysis," was published in the January 1991 Journal of Materials Research. A professional classical Indian dancer, she performs here and overseas. Daughter of Dr. and Mrs. Kuntimaddi Sadananda, she plans to study for a career in medical research.

VIRGINIA

Daniel Moshe Skovronsky, 17, of 10705 Hunters Run Court, VIENNA, selected a project in chemistry for the Science Talent Search. He investigated a class of chemical compounds, carbonyl compounds with an alpha hydrogen, that have two different structures in rapid equilibrium with each other. This phenomenon is called tautomerism, and the two tautomers, or structures, studied were keto and enol forms. Through his experiments, Dan found that the enol form was stabilized by several factors, such as interaction with a solvent. Techniques Dan used in his work included titration, ultraviolet spectroscopy and nuclear magnetic spectroscopy. At Thomas Jefferson High School for Science and Technology in Alexandria, Dan is a member of the science and math clubs. Also active in political science, he is president of the Model United Nations Team and of two political clubs. He has won awards for his work in chemistry, including one at the 1990 International Science and Engineering Fair. Son of Dr. and Mrs. Jeffrey Skovronsky, Dan hopes to do medical research after studying chemistry at Cornell.

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SCIENCE TALENT SEARCH

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SCIENCE SERVICE, a nonprofit institution engaged in the interpretation and public understanding of science, administers the SCIENCE TALENT SEARCH.

The National Association of Secondary School Principals has placed this program on the National Advisory List of Contests and Activities for 1990-91.

SCIENCE SERVICE
1719 N Street N.W., Washington, D.C. 20036
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New York City (continued)	Kim, Sunmee Louise	17 Stuyvesant H.S. 39-60 54th St., #2R, Woodside 11377
	Lin, Debby Ann	17 Stuyvesant H.S. 41-39 Forley St., Elmhurst 11373
	Yang, Tien-An	17 Stuyvesant H.S. 90 La Salle St., #3A 10027
Setauket	Lopez, Michael John	18 Ward Melville H.S. 24 Annandale Rd., Stony Brook 11790
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		OHIO
Dayton	Riddell, Jeremy Randall	18 The Miami Valley School 3254 Ferry Rd., Bellbrook 45305
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Pittsburgh	Criss, Susan Elaine	17 Fox Chapel Area H.S. 1980 Squaw Run Rd. 15238
		TEXAS
Spring	Butin, Wade William	17 Klein H.S. 8810 Tranquil Park Dr. 77379
		VIRGINIA
Alexandria	Berkey, Judson Lawrence	17 Thomas Jefferson H.S. for Science and Technology 9123 Peabody St., Manassas 22110
	Sadananda, Venkataramana Kuntimaddi	17 Thomas Jefferson H.S. for Science and Technology 8015 Daffodil Ct., Springfield 22152
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Finalists

of the

Fiftieth Annual Science Talent Search

for the Westinghouse Science Scholarships

The forty finalists of the 50th Annual Science Talent Search, among whom $205,000 of Westinghouse Science Scholarships will be distributed, represent about 2.5% of those who completed entries in this scientific and educational competition.

Designed to discover and develop scientific and engineering ability among high school seniors, the Science Talent Search is conducted annually for the Westinghouse Science Scholarships by Science Service, 1719 N Street, N.W., Washington, DC 20036.

These 17 females and 23 males are being invited to Washington, D.C. for an all-expenses-paid trip February 28 to March 4, 1991, to attend the Science Talent Institute. Here 10 of the finalists will be selected by the board of judges to receive one of the following four-year Westinghouse Science Scholarships: one $40,000 ($10,000 per year), one $30,000 ($7,500 per year), one $20,000 ($5,000 per year), three $15,000 ($3,750 per year), four $10,000 ($2,500 per year). The remaining 30 contestants will be given Westinghouse Science Scholarships of $1,000 each.

The finalists are 15 to 18 years of age and come from 27 cities in 18 states. They were picked by the judges from among 1,573 contestants who completed their entries by writing a report on their scientific research and submitting it along with an official entry form and supporting documents. Completed entries were received from 45 states, the District of Columbia, American Samoa, Guam, Puerto Rico, the Virgin Islands, and Overseas American Schools.

Finalists -- Washington Trip Winners

AGE OF WINNER FOLLOWS NAME
H.S. CITY IN LEFT COLUMN

HOME ADDRESS FOLLOWS NAME OF H.S.
HOME CITY OMITTED IF SAME AS H.S. CITY

ALABAMA

Mobile	Mankad, Mehul Vipul 17 St. Paul's Episcopal School 5724 Vendome Dr. S. 36609
Vestavia Hills	Soong, Weily 18 Vestavia Hills H.S. 2355 Tyrol Pl. 35216

CALIFORNIA

Riverside	Shan, Wei-Jen Jerry 17 John W. North H.S. 5411 Osburn Pl. 92506
Sacramento	Ramachandran, Rageshree 15 Rio Americano H.S. 8541 Dominique Ct., Fair Oaks 95628
San Gabriel	Walters, Tessa Lorrell 16 San Gabriel H.S. 2244 Calle Margarita, San Dimas 91773

COLORADO

Brighton	Larson, Mark Allen 17 Horizon Sr. H.S. 4224 E. 126th Ave., Thornton 80241

CONNECTICUT

Greenwich	Kim, Don H. 18 Greenwich H.S. 15 Sundance Dr., Cos Cob 06807

DISTRICT OF COLUMBIA

Washington	Moore, Joel Ellis 17 St. Albans School 3804 Leland St., Chevy Chase, MD 20815

FLORIDA

Vero Beach	Wang, Clifford Lee 16 Vero Beach H.S. 515 Date Palm Rd. 32963

ILLINOIS

Evanston	Seeger, Joseph Izak 17 Evanston Township H.S. 1521 Greenleaf 60202
Naperville	Lee, Irwin 16 Naperville North H.S. 1006 Dakota Cir. 60563

IOWA

Ames	Ghoshal, Nupur 17 Ames H.S. 1310 Glendale Ave. 50010

MICHIGAN

Birmingham	Stec, Lori Ann 18 Detroit Country Day School 95 Braemar Dr., Troy 48098

NEBRASKA

Omaha	Chapman, Kimberly Ann 18 Marian H.S. 3631 S. 116th Ave. 68144

NEW JERSEY

Elmwood Park	Lazarev, Denis Alexandrovich 17 Elmwood Park Memorial Jr.-Sr. H.S. 3623 Gardenview Ter., Fair Lawn 07410
Mountain Lakes	Chung, Dean Ramsey 16 Mountain Lakes H.S. 60 Pocono Rd. 07046
Raritan	Lu, Stanley 17 Bridgewater-Raritan H.S. West 577 Cabot Hill Rd., Bridgewater 08807

NEW MEXICO

Santa Fe	Haight, Cameron Rea 17 Santa Fe H.S. 720 Gonzales Rd. 87501

NEW YORK

Armonk	Pederson, Cheryl Lynn 18 Byram Hills H.S. 14 Perry Ct. 10504
Bayside (NYC)	Moallemi, Ciamac 15 Benjamin N. Cardozo H.S. 69-07 226th St. 11364
Bronx (NYC)	Ching, William 17 Riverdale Country School 650 W. 171 St., 5D, New York 10032
Flushing (NYC)	Fleisig, Ani Jean-Mee 17 Townsend Harris H.S. 87-44 94th St., Woodhaven 11421
	Kodaman, Nuri Mehmet 17 Townsend Harris H.S. 225 Park Ln., Douglaston 11363
New York City	Cheung, Jim Way 17 Bronx H.S. of Science 32-38 78th St., Jackson Heights 11370
	Bahna-James, Tara Sophia 17 La Guardia H.S. of Music and the Arts 25 Montgomery St. 10002
	Haynes, Petal Pearl 18 Stuyvesant H.S. 89-30 164 St., Apt. 4J 11432
	Jeanty, Yves Jude 16 Stuyvesant H.S. 145-36 115 Ave., S. Ozone Park 11436
	Kang, Linda Tae-Ryung 17 Stuyvesant H.S. 35-70 168th St., Flushing 11358

On behalf of
The Westinghouse Foundation and Science Service
the President of Science Service
requests the pleasure of your company
at the Awards Dinner of the
Fiftieth Annual Science Talent Search
on Monday, March the fourth
at seven o'clock
International Ballroom, The Washington Hilton
1919 Connecticut Avenue, N. W.
Washington, D. C.

R.S.V.P.
by reply card enclosed
Non-Transferable

Reception
at six o'clock
Intl. Terrace
Black Tie

STS 50th SCIENCE TALENT SEARCH

Some short excerpts on this year's finalists on page 2-4

Contact: Charles F. Carroll
Telephone: (412) 642-3370

Contact: M. Elizabeth Kilkenny
Telephone: (412) 642-2554

Contact: Eileen Milling
Telephone: (212) 838-6330

EDITORS: Students named in this release and the enclosed booklets will be notified of their selection as semifinalists or finalists by noon, Wednesday, January 23. Feel free to contact them after that time--but not before, please.

FOR USE: Friday, January 25, 1991

FINALISTS AND SEMIFINALISTS SELECTED IN 50TH WESTINGHOUSE SCIENCE TALENT SEARCH

WASHINGTON, Jan. 25 -- Forty national winners and 300 semifinalists in the 50th annual Westinghouse Science Talent Search were announced today by E. G. Sherburne, Jr., president of Science Service.

These high school seniors are competing for scholarships of $205,000 in the oldest nationwide high school science scholarship competition.

The 300 semifinalists were judged the most talented of the 1,573 students from 686 schools who entered research projects. This year's semifinalists includes 193 young men and 107 young women.

The 40 finalists, selected from the 300 semifinalists, come from 18 states. There are 23 males and 17 females in this year's national finalists.

Since 1942, Westinghouse Electric Corporation has sponsored the Search which is administered by Science Service, a non-profit Washington organization that promotes public understanding of science.

- more -

The 40 finalists will travel to Washington for final judging which will take place from February 28 to March 4. Each student will be interviewed by a panel of eight scientists to evaluate the student's scientific creativity. Based on the interviews, 10 top scholarship winners will be selected.

The scholarship winners will be announced here on March 4. First prize is a $40,000 scholarship. Second prize is a $30,000 scholarship, and third prize is a $20,000 scholarship. Three students will receive $15,000 and four $10,000 in scholarships. The other 30 national winners each will receive $1,000 scholarships.

The Westinghouse Foundation, which provides funding for the competition, increased scholarships for the 50th Search to a total of $205,000, up from the previous $140,000.

Five former Search winners have won the Nobel Prize and hundreds of others have made significant contributions to their fields of science.

In addition to awards they may win, all 300 semifinalists will be recommended by Westinghouse and Science Service to colleges and universities for admission and financial assistance.

Among the 40 finalists, New York leads the list of winners with 14 students, 12 from New York City schools. Seven finalists were born outside the U.S. with two from South Korea, and one each from Guyana, India, Iran, Taiwan and the U.S.S.R.

Winners' projects ranged from environmental projects to cancer-related research. Among the 40 finalists are the following:

-- Clifford Wang, 16, of Vero Beach, Fla., proposed that seaweed be grown in the ocean to remove pollutants. His research indicated that seaweed could be harvested as a potent biomass for methane generation. Clifford, a student at Vero Beach High, plans to study bioengineering at Harvard or Duke.

-- Lori Stec, 18, of Troy, Mich., did seven years of research for her botany project. She collected more than 10,000 goldenrods and made over 100,000 measurements to identify factors affecting the formation of tumor-like growths on those plants. Lori, who attends Detroit Country Day School, plans to study medicine at the University of Michigan.

-- Judson Berkey, 17, of Manassas, Va., modeled the flight of a baseball using the principles of fluid dynamics. With a computer, he simulated the effects of different launch angles on the range of a thrown ball. He found that the launch angle that maximizes range does not change for different spins and speeds. Judson, a senior at Thomas Jefferson High School for Science & Technology in Alexandria, plans to pursue a career in computer science.

-- Tara Bahna-James, 17, of New York City, explored the relationship between math and music for her social science project. Her idea was to see if musically talented students have basic math understandings that could improve their math skills. She advocates stressing what she sees as a strong tie between music and math. Tara, who attends LaGuardia High School of Music & the Arts, plans to study cognitive science at Yale.

--Wade Butin, 17, of Spring, Tex., chose chemistry for his project which involved the creation of special varnishes. He aimed to develop a high-quality, high-performance varnish that could withstand the rigors of weather exposure, dilute acid and salt water. Wade, a student at Klein High School, plans to major either in math or physics at Rice University.

--Susan Criss, 17, of Pittsburgh, completed a two-year research project that dealt with the production of betacarotene in Romaine lettuce. Betacarotene in the human blood stream may lower the risk of cancer. She examined how mineral ions affect betacarotene production. Susan, a senior at Fox Chapel Area High School, plans to pursue a career in chemical engineering.

##1000-1010##

-1/25/91-

(A complete list of the 40 finalists is attached. Brief descriptions of their research projects and biographies are in the accompanying white booklet. The blue booklet lists the 300 semifinalists, their addresses, schools and titles of their projects.)

ALABAMA

Mehul Vipul Mankad, 17, 5724 Vendome Dr. S., MOBILE, Saint Paul's Episcopal School
Weily Soong, 18, 2355 Tyrol Pl., VESTAVIA HILLS, Vestavia Hills H.S.

CALIFORNIA

Rageshree Ramachandran, 15, 8541 Dominique Ct., FAIR OAKS, Rio Americano H.S., Sacramento
Wei-Jen Jerry Shan, 17, 5411 Osburn Pl., RIVERSIDE, John W. North H.S.
Tessa Lorrell Walters, 16, 2244 Calle Margarita, SAN DIMAS, San Gabriel H.S., San Gabriel

COLORADO

Mark Allen Larson, 17, 4224 E. 126th Ave., THORNTON, Horizon Sr. H.S., Brighton

CONNECTICUT

Don H. Kim, 18, 15 Sundance Dr., COS COB, Greenwich H.S., Greenwich

FLORIDA

Clifford Lee Wang, 16, 515 Date Palm Rd., VERO BEACH, Vero Beach H.S.

ILLINOIS

Joseph Izak Seeger, 17, 1521 Greenleaf, EVANSTON, Evanston Township H.S.
Irwin Lee, 16, 1006 Dakota Cir., NAPERVILLE, Naperville North H.S.

IOWA

Nupur Ghoshal, 17, 1310 Glendale Ave., AMES, Ames H.S.

MARYLAND

Joel Ellis Moore, 17, 3804 Leland St., CHEVY CHASE, St. Albans School, Washington, D.C.

MICHIGAN

Lori Ann Stec, 18, 95 Braemar Dr., TROY, Detroit Country Day School, Birmingham

NEBRASKA

Kimberly Ann Chapman, 18, 3631 S. 116th Ave., OMAHA, Marian H.S.

NEW JERSEY

Stanley Lu, 17, 577 Cabot Hill Rd., BRIDGEWATER, Bridgewater-Raritan H.S. West, Raritan
Denis Alexandrovich Lazarev, 17, 3623 Gardenview Ter., FAIR LAWN, Elmwood Park Memorial Jr.-Sr. H.S., Elmwood Park
Dean Ramsey Chung, 16, 60 Pocono Rd., MOUNTAIN LAKES, Mountain Lakes H.S.,

- more -

NEW MEXICO

Cameron Rea Haight, 17, 720 Gonzales Rd., SANTA FE, Santa Fe H.S.

NEW YORK

Cheryl Lynn Pederson, 18, 14 Perry Ct., ARMONK, Byram Hills H.S.
Ciamac Moallemi, 15, 69-07 226th St., BAYSIDE, Benjamin N. Cardozo H.S.
Nuri Mehmet Kodaman, 17, 225 Park Ln., DOUGLASTON, Townsend Harris H.S., Flushing
Debby Ann Lin, 17, 41-39 Forley St., ELMHURST, Stuyvesant H.S., New York
Linda Tae-Ryung Kang, 17, 35-70 168th St., FLUSHING, Stuyvesant H.S., New York
Jim Way Cheung, 17, 32-38 78th St., JACKSON HEIGHTS, Bronx H.S. of Science, New York
Tara Sophia Bahna-James, 17, 25 Montgomery St., NEW YORK, LaGuardia H.S. of Music and the Arts
William Ching, 17, 650 W. 171 St., 5D, NEW YORK, Riverdale Country School, Bronx
Petal Pearl Haynes, 18, 89-30 164 St., Apt. 4J, NEW YORK, Stuyvesant H.S.
Tien-An Yang, 17, 90 La Salle St., #3A, NEW YORK, Stuyvesant H.S.
Yves Jude Jeanty, 16, 145-36 115 Ave., S. OZONE PARK, Stuyvesant H.S., New York
Michael John Lopez, 18, 24 Annandale Rd., STONY BROOK, Ward Melville H.S., Setauket
Ani Jean-Mee Fleisig, 17, 87-44 94th St., WOODHAVEN, Townsend Harris H.S., Flushing
Sunmee Louise Kim, 17, 39-60 54th St., #2R, WOODSIDE, Stuyvesant H.S., New York

NORTH CAROLINA

Ashley Melia Reiter, 17, 5827 Beckett Ct., CHARLOTTE, North Carolina School of Science and Mathematics, Durham

OHIO

Jeremy Randall Riddell, 18, 3254 Ferry Rd., BELLBROOK, The Miami Valley School, Dayton

PENNSYLVANIA

Susan Elaine Criss, 17, 1980 Squaw Run Rd., PITTSBURGH, Fox Chapel Area H.S.

TEXAS

Wade William Butin, 17, 8810 Tranquil Park Dr., SPRING, Klein H.S.

VIRGINIA

Tatiana Tamara Schnur, 16, 6009 Lincolnwood Ct., BURKE, Robinson Secondary School, Fairfax
Judson Lawrence Berkey, 17, 9123 Peabody St., MANASSAS, Thomas Jefferson H.S. for Science and Technology, Alexandria
Venkataramana Kuntimaddi Sadananda, 17, 8015 Daffodil Ct., SPRINGFIELD, Thomas Jefferson H.S. for Science and Technology, Alexandria
Daniel Moshe Skovronsky, 17, 10705 Hunters Run Ct., VIENNA, Thomas Jefferson H.S. for Science and Technology, Alexandria

The Science Talent Search

The Science Talent Search is an annual activity supported by the Westinghouse Foundation and Westinghouse Electric Corporation and administered by Science Service of Washington.

This year 1,573 seniors in secondary schools in the United States, American Samoa, Guam, Puerto Rico, the Virgin Islands and overseas American schools completed entry materials, including written reports on their research projects.

Three hundred of these entrants won special recognition by being named as semifinalists and of these, 40 were chosen to attend the Science Talent Institute in Washington.

At the discretion of the judges, Westinghouse Science Scholarships consisting of one $40,000, one $30,000, one $20,000, three $15,000 and four $10,000 are awarded at the conclusion of the Science Talent Institute and the remaining 30 finalists receive Westinghouse Science Scholarships of $1,000 each.

The principal basis for decision in the Science Talent Search is the evaluation of an independent research project done by the student. The Board of Judges wishes to thank the following scientists for their assistance in evaluating these research reports and supplementary materials.

DR. BAHIGE BAROUDY
Gamble Institute of Medical Research

DR. JOSEPH BOLEN
National Institutes of Health

DR. LOUIS COHEN
National Institutes of Health

DR. PAMELA EBERT FLATTAU
National Research Council

DR. BRUCE FERNIE
Georgetown University

DR. HOWARD GARRISON
Applied Management Sciences

DR. JORDAN GOODMAN
University of Maryland

DR. ROBERT J. HIGHET
National Institutes of Health

DR. PETER HOWLEY
National Institutes of Health

DR. JAMES HUMMEL
University of Maryland

DR. MALCOLM MARTIN
National Institutes of Health

THOMAS N. PYKE, JR.
National Oceanic and Atmospheric Administration

DR. LAWRENCE WASHINGTON
University of Maryland

DR. NIELS WINSOR
GT Devices, Inc.

Awards Banquet

OF THE

FIFTIETH ANNUAL WESTINGHOUSE SCIENCE TALENT SEARCH

MONDAY, MARCH THE FOURTH
NINETEEN HUNDRED NINETY-ONE

☆

THE WASHINGTON HILTON HOTEL

Guests of Honor

Tara Bahna-James
New York, New York

Judson Berkey
Manassas, Virginia

Wade Butin
Spring, Texas

Kimberly Chapman
Omaha, Nebraska

Jim Way Cheung
Jackson Heights, New York

William Ching
New York, New York

Dean Chung
Mountain Lakes, New Jersey

Susan Criss
Pittsburgh, Pennsylvania

Ani Fleisig
Woodhaven, New York

Nupur Ghoshal
Ames, Iowa

Cameron Haight
Santa Fe, New Mexico

Petal Haynes
New York, New York

Yves Jeanty
South Ozone Park, New York

Linda Kang
Flushing, New York

Don Kim
Cos Cob, Connecticut

Sunmee Kim
Woodside, New York

Nuri Kodaman
Douglaston, New York

Mark Larson
Thornton, Colorado

Denis Lazarev
Fair Lawn, New Jersey

Irwin Lee
Naperville, Illinois

Debby Lin
Elmhurst, New York

Michael Lopez
Stony Brook, New York

Stanley Lu
Bridgewater, New Jersey

Mehul Mankad
Mobile, Alabama

Ciamac Moallemi
Bayside, New York

Joel Moore
Chevy Chase, Maryland

Cheryl Pederson
Armonk, New York

Rageshree Ramachandran
Fair Oaks, California

Ashley Reiter
Charlotte, North Carolina

Jeremy Riddell
Bellbrook, Ohio

Venkataramana Sadananda
Springfield, Virginia

Tatiana Schnur
Burke, Virginia

Joseph Seeger
Evanston, Illinois

Wei-Jen Jerry Shan
Riverside, California

Daniel Skovronsky
Vienna, Virginia

Weily Soong
Vestavia Hills, Alabama

Lori Stec
Troy, Michigan

Tessa Walters
San Dimas, California

Clifford Wang
Vero Beach, Florida

Tien-An Yang
New York, New York

Program

ADDRESS

The President of the United States

PRESIDING

Ira Flatow

INTRODUCTION OF WINNERS

Carol Luszcz
Director of Youth Programs, Science Service

INVOCATION

The Right Reverend Monsignor W. Louis Quinn
St. Matthew's Cathedral

REMARKS

Edward G. Sherburne, Jr.
President, Science Service

Dr. Glenn T. Seaborg
Chairman of the Board, Science Service
University Professor of Chemistry
University of California, Berkeley
Nobel Laureate 1951

Paul E. Lego
Chairman and Chief Executive Officer
Westinghouse Electric Corporation

REPORT OF THE JUDGES

Dr. J. Richard Gott, *Chairman*

Dr. Gilbert Castellan
Dr. Stuart Hauser
Dr. Brigid Leventhal
Dr. Charles Schwartz
Dr. Glenn T. Seaborg
Dr. William Thurston
Dr. Andrew Yeager

THE 50TH ANNUAL

STS

SCIENCE TALENT SEARCH

SCIENCE TALENT INSTITUTE

PROGRAM

THURSDAY, FEBRUARY 28–
MONDAY, MARCH 4, 1991

ALL EVENTS WILL BE HELD AT THE WASHINGTON HILTON HOTEL
1919 Connecticut Avenue, N.W., Washington, D.C.
UNLESS OTHERWISE SPECIFIED

THURSDAY, FEBRUARY 28

Morning and afternoon	FINALISTS ARRIVE at the Washington Hilton Hotel for registration and room assignment
Morning and afternoon	VISITS TO CONGRESSIONAL OFFICES
10:30 a.m.-12:15 p.m.	SCHEDULED INTERVIEWS WITH JUDGES
12:00 noon-2:00 p.m.	DELI BUFFET LUNCHEON - Conservatory
2:00-6:30 p.m.	SCHEDULED INTERVIEWS WITH JUDGES
8:00 p.m.	INTRODUCTIONS AND ORIENTATION DINNER Jefferson West Welcomes from: E. G. Sherburne, Jr., President, Science Service Charles F. Carroll, Director of Public Information Westinghouse Electric Corporation

FRIDAY, MARCH 1

7:30-8:30 a.m.	BREAKFAST - Conservatory
Morning and afternoon	VISITS TO CONGRESSIONAL OFFICES PRIME TIME APPOINTMENTS
12:00 noon-1:30 p.m.	MEXICAN BUFFET LUNCHEON - Conservatory
1:30 a.m.-5:15 p.m.	SCHEDULED INTERVIEWS WITH JUDGES

1:30-7:00 p.m.	SET UP EXHIBITS AND PHOTOGRAPHY - Exhibit Hall
7:00 p.m.	Bus leaves hotel (T Street side) for The Great Hall, National Academy of Sciences, Constitution Avenue between 21st and 22nd Streets, N.W.
7:30 p.m.	DINNER - The Refectory, National Academy of Sciences
8:30 p.m.	SEMINAR - The Lecture Room, National Academy of Sciences Maxine Singer, Ph.D. President, Carnegie Institution of Washington Glenn T. Seaborg, Ph.D. Chairman of the Board, Science Service University Professor of Chemistry University of California, Berkeley Nobel Laureate 1951
10:00 p.m.	Bus returns to hotel

SATURDAY, MARCH 2

Morning until noon	FREE TIME
12:00 noon-12:45 p.m.	ITALIAN BUFFET LUNCHEON - Conservatory
1:00-4:00 p.m.	EXHIBITION OF FINALISTS' PROJECTS - Exhibit Hall
4:30 p.m.	Bus leaves hotel (T Street side) for restaurant
5:00 p.m.	DINNER - Le Rivage, 1000 Water Street, S.W.
8:00 p.m.	ARENA STAGE - Kreeger Theatre George Bernard Shaw's "Pygmalion"

SUNDAY, MARCH 3

8:00-9:00 a.m.	BREAKFAST - Conservatory
9:00 a.m.	Bus leaves hotel for EINSTEIN AND CAPITOL STEPS PHOTOS
10:30-12:45 p.m.	FREE TIME
1:00-4:00 p.m.	EXHIBITION OF FINALISTS' PROJECTS - Exhibit Hall
1:00-4:00 p.m.	SEMINARS PRESENTED BY STS ALUMNI Caucus, Conservatory, Hemisphere & Military Rooms
4:00-5:00 p.m.	Dismantle and Pack Exhibits

6:00-9:00 p.m.	ALUMNI (1942-91) REUNION RECEPTION - Crystal Ballroom Greetings from: Paul E. Lego, Chairman and Chief Executive Officer, Westinghouse Electric Corporation; Glenn T. Seaborg, Chairman of Science Service; Gayle Wilson, STS-60 and First Lady of California; Paul Teschan, top scholarship winner from the 1st STS (1942)

MONDAY, MARCH 4

7:30-8:30 a.m.	BREAKFAST - Conservatory
8:30-9:00 a.m.	BANQUET REHEARSAL - International Ballroom
Morning and afternoon	VISITS TO CONGRESSIONAL OFFICES PRIME TIME APPOINTMENTS
11:00 a.m.-1:00 p.m.	OPEN FORUM - ROUNDTABLE DISCUSSION - Crystal Ballroom Panelists: Leon N Cooper (STS-47 and 1972 Nobel Laureate); R. Stephen Berry (STS-48 and 1983 MacArthur Fellow); Sheldon Glashow (STS-50 and 1979 Nobel Laureate); Frank Wilczek (STS-67 and 1982 MacArthur Fellow); and Nina Schor (STS-72 and First Female #1 Scholarship Winner)
6:00 p.m.	RECEPTION - International Terrace
7:00 p.m.	BANQUET - International Ballroom Presiding: Ira Flatow Introduction of Finalists: Carol Luszcz Director of Youth Programs, Science Service Invocation: The Right Reverend Monsignor W. Louis Quinn Saint Matthew's Cathedral Remarks: E. G. Sherburne, Jr. President, Science Service Glenn T. Seaborg, Ph.D. Chairman of the Board, Science Service Paul E. Lego Chairman and Chief Executive Officer Westinghouse Electric Corporation Report of the Board of Judges J. Richard Gott, Ph.D. Professor, Astrophysical Sciences Princeton University Presentation of the Westinghouse Science Scholarships
10:00 p.m.	FAREWELL PARTY FOR 1991 FINALISTS - Jefferson West

JUDGES FOR THE FIFTIETH SCIENCE TALENT SEARCH

Dr. J. Richard Gott, Chairperson
Dr. Gilbert Castellan, Dr. Stuart Hauser,
Dr. Brigid Leventhal, Dr. Charles Schwartz,
Dr. Glenn T. Seaborg, Dr. William Thurston, Dr. Andrew Yeager

Professional Fields represented are:
Biology, Chemistry, Engineering,
Mathematics, Physics, Psychiatry, and Psychology

* * * * * * * * * * *

STAFF OF SCIENCE TALENT INSTITUTE

Science Service:	E. G. Sherburne, Jr., Donald R. Harless, Carol Luszcz, William Greene, Laurie Clevenger, Yvonne Tilghman, Sharon Manley
Westinghouse:	Ronald Hart, Charles Carroll, M. Elizabeth Kilkenny, William MacLaurin, Robert Benke, Eileen Milling, John Armstrong, Beverly Harned, Jim Judkis, Mark Portland, Jack Franchetti, John Gordon, James O'Toole

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DIRECT ALL INQUIRIES DURING THE SCIENCE TALENT INSTITUTE TO:
Washington Hilton Hotel, 1919 Connecticut Avenue, N.W., Washington, DC 20009
Hotel Switchboard: 202/483-3000

Direct Dial Numbers

202/797-4836 or 37	STI OFFICE	Map Room, Terrace Level
202/797-4839, 40 or 41	PRESS OFFICE	

FOR INFORMATION DURING THE REST OF THE YEAR, PLEASE CONTACT:
Science Service, 1719 N Street, N.W., Washington, DC 20036 -- 202/785-2255



FINDING TOMORROW'S SCIENTISTS

50th Westinghouse Science Talent Search

FINDING TOMORROW'S SCIENTISTS

For thousands of students who dream of careers in science, the Westinghouse Science Talent Search has helped make those dreams come true.

Since 1942, this nationwide competition has identified and encouraged high school seniors to pursue careers in science, mathematics or related fields.

The 50th annual Westinghouse Science Talent Search, now underway, caps half a century of remarkable achievements by the 15,000 semifinalists and 2,000 finalists who have participated in this, America's most highly regarded precollege science competition.

Seniors who participate have the opportunity, while still teenagers, to join the ranks of the nation's most eminent scientists.

The Search brings together the brightest, most creative science students in the land. In fact, many of our top scientists and mathematicians share the common bond of having participated in the STS when they were students.

The Search has identified young scientific talent with remarkable precision. STS alumni have won more than 100 of the world's most coveted science and math awards and honors.

Five former finalists have gone on to win Nobel Prizes. Two have earned Fields Medals, the Nobel equivalent in mathematics. Two have been awarded the National Medal of Science. Eight Search alumni have won MacArthur Foundation Fellowships, the so-called "genius awards." Fifty-one have been named Sloan Research Fellows and 28 have been elected to the National Academy of Sciences. Three have been elected to the National Academy of Engineering.

- more -

50th Annual Science Talent Search

More than half of the former Search winners are either teaching or engaged in research at colleges and universities.

The 1991 competition, which started in September, 1990, is the 50th annual Search. Westinghouse Electric Corporation has sponsored STS since its inception. The Search is administered for Westinghouse by Science Service, a Washington-based nonprofit organization engaged in furthering public understanding of science.

Since 1942, nearly 105,000 students have completed independent research projects and submitted entries. Currently, some 1,500 seniors meet the entry requirements each year. The deadline for entries received at Science Service is midnight, December 10.

The entry consists of a written description of the student's research, plus a completed entry form which is designed to elicit evidence of student creativity and interest in science.

Search candidates are judged by a board of eight distinguished scientists from a variety of disciplines. Chairman is Dr. J. Richard Gott, professor of astrophysical sciences at Princeton University and a former STS finalist. Members include Dr. Glenn T. Seaborg, a Nobel Prize winner and University Professor of Chemistry at the University of California at Berkeley.

The judges are aided by other scientists to complete a careful evaluation of each entry. Then, the elimination begins. The top 300 entrants are selected as semifinalists. These students are recommended to colleges and universities for admission and financial assistance, based on their STS achievement.

Winners Announced in January

Next, 40 finalists are selected from the 300 semifinalists. Both groups are announced in January.

Westinghouse provides the 40 finalists a five-day trip to Washington where they undergo additional judging. On the basis of interviews and their research, 10 top scholarship winners are selected.

The Westinghouse Foundation has increased Search scholarships to the present total of $205,000, which is awarded each year to the 40 finalists. The top prize is a $40,000 scholarship.

Second- and third-place winners receive $30,000 and $20,000 scholarships, respectively. Three others win $15,000 each. Four $10,000 scholarships are awarded. The other 30 finalists receive $1,000 scholarships.

When the students are in Washington, they meet leading scientists and their Congressional representatives. Their prize-winning exhibits are on public display. The young scientists describe their research to thousands of visitors -- many of them important figures in the government and scientific community.

During their stay in Washington, students are interviewed by news media from their hometowns, national and international newspapers, press associations, television networks and science and education journals.

The finalists visit Washington's historic and scientific sights. Past winners have met with the President, the Vice President and distinguished Science Advisers. On the final evening -- March 4, 1991 -- they are honored at a black-tie awards banquet for several hundred guests.

Meeting Other Young Scientists

Yet, what the students say they value most is the opportunity to meet and interact with their scientific peers, often for the first time. Friendships and professional associations made during those five days continue through college and beyond.

Statistics on the 1,960 past finalists show that 95 percent of former Search winners have had some branch of science as their major field of study. More than 70 percent have gone on to earn PhDs or MDs. Career choices are about evenly divided among the physical sciences and the biological sciences and medicine.

To date, Westinghouse has awarded almost $2.6 million in scholarships. Also, thousands of students have received scholarships and financial aid from other sources as a direct result of STS achievement.

High school science educators find "the Westinghouse," as students call the competition, an excellent tool for stimulating latent abilities in their brightest students.

Since 1942, New York state has produced the highest number of finalists, accounting for 636. Illinois is in second place with 139. California ranks third with 136, followed by Pennsylvania, 95; Ohio, 73; New Jersey, 73; Florida, 69; Massachusetts, 65; Virginia, 54; Maryland, 45; Wisconsin, 44; Texas, 44; Indiana, 41.

Other states which have produced at least ten finalists are Michigan and Connecticut, 29; Oregon, 27; Georgia, 22; Arizona, Oklahoma and Minnesota, 21 each; Missouri, 19; Tennessee, 18; Nebraska and Colorado, 17 each; the District of Columbia and West Virginia, 16 each; Washington, 14; New Hampshire and Montana, 13 each; Alabama and Iowa, 12 each; Kansas, 11; Hawaii, 10.

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October 1990

Major Honors Achieved by
Westinghouse Science Talent Search Finalists

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

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

28 SCIENCE TALENT SEARCH FINALISTS ELECTED TO THE NATIONAL ACADEMY OF SCIENCES

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., Greensboro, 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	Biogen, Inc., 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
Rosenblatt, Murray	University of California, San Diego, LaJolla, CA	1943
Sessler, Andrew M.	Lawrence Berkeley Laboratory, Berkeley, CA	1945

28 SCIENCE TALENT SEARCH FINALISTS ELECTED TO THE NATIONAL ACADEMY OF SCIENCES (Cont'd.)

Name	Affiliation	STS Year
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
Wilczek, Frank A.	Institute for Advanced Study, Princeton, NJ	1967

3 SCIENCE TALENT SEARCH FINALISTS ELECTED TO THE NATIONAL ACADEMY OF ENGINEERING

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

STS 50th SCIENCE TALENT SEARCH

Contact: Charles F. Carroll
Telephone: (412) 642-3370

Contact: M. Elizabeth Kilkenny
Telephone: (412) 642-2554

Contact: Eileen Milling
Telephone: (212) 838-6330

EDITORS: Students named in this release and the enclosed booklets will be notified of their selection as semifinalists or finalists by noon, Wednesday, January 23. Feel free to contact them after that time--but not before, please.

FOR USE: Friday, January 25, 1991

FINALISTS AND SEMIFINALISTS SELECTED IN 50TH WESTINGHOUSE SCIENCE TALENT SEARCH

WASHINGTON, Jan. 25 -- Forty national winners and 300 semifinalists in the 50th annual Westinghouse Science Talent Search were announced today by E. G. Sherburne, Jr., president of Science Service.

These high school seniors are competing for scholarships of $205,000 in the oldest nationwide high school science scholarship competition.

The 300 semifinalists were judged the most talented of the 1,573 students from 686 schools who entered research projects. This year's semifinalists includes 193 young men and 107 young women.

The 40 finalists, selected from the 300 semifinalists, come from 18 states. There are 23 males and 17 females in this year's national finalists.

Since 1942, Westinghouse Electric Corporation has sponsored the Search which is administered by Science Service, a non-profit Washington organization that promotes public understanding of science.

- more -

The 40 finalists will travel to Washington for final judging which will take place from February 28 to March 4. Each student will be interviewed by a panel of eight scientists to evaluate the student's scientific creativity. Based on the interviews, 10 top scholarship winners will be selected.

The scholarship winners will be announced here on March 4. First prize is a $40,000 scholarship. Second prize is a $30,000 scholarship, and third prize is a $20,000 scholarship. Three students will receive $15,000 and four $10,000 in scholarships. The other 30 national winners each will receive $1,000 scholarships.

The Westinghouse Foundation, which provides funding for the competition, increased scholarships for the 50th Search to a total of $205,000, up from the previous $140,000.

Five former Search winners have won the Nobel Prize and hundreds of others have made significant contributions to their fields of science.

In addition to awards they may win, all 300 semifinalists will be recommended by Westinghouse and Science Service to colleges and universities for admission and financial assistance.

Among the 40 finalists, New York leads the list of winners with 14 students, 12 from New York City schools. Seven finalists were born outside the U.S. with two from South Korea, and one each from Guyana, India, Iran, Taiwan and the U.S.S.R.

Winners' projects ranged from environmental projects to cancer-related research. Among the 40 finalists are the following:

-- Clifford Wang, 16, of Vero Beach, Fla., proposed that seaweed be grown in the ocean to remove pollutants. His research indicated that seaweed could be harvested as a potent biomass for methane generation. Clifford, a student at Vero Beach High, plans to study bioengineering at Harvard or Duke.

-- Lori Stec, 18, of Troy, Mich., did seven years of research for her botany project. She collected more than 10,000 goldenrods and made over 100,000 measurements to identify factors affecting the formation of tumor-like growths on those plants. Lori, who attends Detroit Country Day School, plans to study medicine at the University of Michigan.

-- Judson Berkey, 17, of Manassas, Va., modeled the flight of a baseball using the principles of fluid dynamics. With a computer, he simulated the effects of different launch angles on the range of a thrown ball. He found that the launch angle that maximizes range does not change for different spins and speeds. Judson, a senior at Thomas Jefferson High School for Science & Technology in Alexandria, plans to pursue a career in computer science.

-- Tara Bahna-James, 17, of New York City, explored the relationship between math and music for her social science project. Her idea was to see if musically talented students have basic math understandings that could improve their math skills. She advocates stressing what she sees as a strong tie between music and math. Tara, who attends LaGuardia High School of Music & the Arts, plans to study cognitive science at Yale.

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--Wade Butin, 17, of Spring, Tex., chose chemistry for his project which involved the creation of special varnishes. He aimed to develop a high-quality, high-performance varnish that could withstand the rigors of weather exposure, dilute acid and salt water. Wade, a student at Klein High School, plans to major either in math or physics at Rice University.

--Susan Criss, 17, of Pittsburgh, completed a two-year research project that dealt with the production of betacarotene in Romaine lettuce. Betacarotene in the human blood stream may lower the risk of cancer. She examined how mineral ions affect betacarotene production. Susan, a senior at Fox Chapel Area High School, plans to pursue a career in chemical engineering.

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(A complete list of the 40 finalists is attached. Brief descriptions of their research projects and biographies are in the accompanying white booklet. The blue booklet lists the 300 semifinalists, their addresses, schools and titles of their projects.)

ALABAMA

Mehul Vipul Mankad, 17, 5724 Vendome Dr. S., MOBILE, Saint Paul's Episcopal School
Weily Soong, 18, 2355 Tyrol Pl., VESTAVIA HILLS, Vestavia Hills H.S.

CALIFORNIA

Rageshree Ramachandran, 15, 8541 Dominique Ct., FAIR OAKS, Rio Americano H.S., Sacramento
Wei-Jen Jerry Shan, 17, 5411 Osburn Pl., RIVERSIDE, John W. North H.S.
Tessa Lorrell Walters, 16, 2244 Calle Margarita, SAN DIMAS, San Gabriel H.S., San Gabriel

COLORADO

Mark Allen Larson, 17, 4224 E. 126th Ave., THORNTON, Horizon Sr. H.S., Brighton

CONNECTICUT

Don H. Kim, 18, 15 Sundance Dr., COS COB, Greenwich H.S., Greenwich

FLORIDA

Clifford Lee Wang, 16, 515 Date Palm Rd., VERO BEACH, Vero Beach H.S.

ILLINOIS

Joseph Izak Seeger, 17, 1521 Greenleaf, EVANSTON, Evanston Township H.S.
Irwin Lee, 16, 1006 Dakota Cir., NAPERVILLE, Naperville North H.S.

IOWA

Nupur Ghoshal, 17, 1310 Glendale Ave., AMES, Ames H.S.

MARYLAND

Joel Ellis Moore, 17, 3804 Leland St., CHEVY CHASE, St. Albans School, Washington, D.C.

MICHIGAN

Lori Ann Stec, 18, 95 Braemar Dr., TROY, Detroit Country Day School, Birmingham

NEBRASKA

Kimberly Ann Chapman, 18, 3631 S. 116th Ave., OMAHA, Marian H.S.

NEW JERSEY

Stanley Lu, 17, 577 Cabot Hill Rd., BRIDGEWATER, Bridgewater-Raritan H.S. West, Raritan
Denis Alexandrovich Lazarev, 17, 3623 Gardenview Ter., FAIR LAWN, Elmwood Park Memorial Jr.-Sr. H.S., Elmwood Park
Dean Ramsey Chung, 16, 60 Pocono Rd., MOUNTAIN LAKES, Mountain Lakes H.S.,

- more -

NEW MEXICO

Cameron Rea Haight, 17, 720 Gonzales Rd., SANTA FE, Santa Fe H.S.

NEW YORK

Cheryl Lynn Pederson, 18, 14 Perry Ct., ARMONK, Byram Hills H.S.
Ciamac Moallemi, 15, 69-07 226th St., BAYSIDE, Benjamin N. Cardozo H.S.
Nuri Mehmet Kodaman, 17, 225 Park Ln., DOUGLASTON, Townsend Harris H.S., Flushing
Debby Ann Lin, 17, 41-39 Forley St., ELMHURST, Stuyvesant H.S., New York
Linda Tae-Ryung Kang, 17, 35-70 168th St., FLUSHING, Stuyvesant H.S., New York
Jim Way Cheung, 17, 32-38 78th St., JACKSON HEIGHTS, Bronx H.S. of Science, New York
Tara Sophia Bahna-James, 17, 25 Montgomery St., NEW YORK, LaGuardia H.S. of Music and the Arts
William Ching, 17, 650 W. 171 St., 5D, NEW YORK, Riverdale Country School, Bronx
Petal Pearl Haynes, 18, 89-30 164 St., Apt. 4J, NEW YORK, Stuyvesant H.S.
Tien-An Yang, 17, 90 La Salle St., #3A, NEW YORK, Stuyvesant H.S.
Yves Jude Jeanty, 16, 145-36 115 Ave., S. OZONE PARK, Stuyvesant H.S., New York
Michael John Lopez, 18, 24 Annandale Rd., STONY BROOK, Ward Melville H.S., Setauket
Ani Jean-Mee Fleisig, 17, 87-44 94th St., WOODHAVEN, Townsend Harris H.S., Flushing
Sunmee Louise Kim, 17, 39-60 54th St., #2R, WOODSIDE, Stuyvesant H.S., New York

NORTH CAROLINA

Ashley Melia Reiter, 17, 5827 Beckett Ct., CHARLOTTE, North Carolina School of Science and Mathematics, Durham

OHIO

Jeremy Randall Riddell, 18, 3254 Ferry Rd., BELLBROOK, The Miami Valley School, Dayton

PENNSYLVANIA

Susan Elaine Criss, 17, 1980 Squaw Run Rd., PITTSBURGH, Fox Chapel Area H.S.

TEXAS

Wade William Butin, 17, 8810 Tranquil Park Dr., SPRING, Klein H.S.

VIRGINIA

Tatiana Tamara Schnur, 16, 6009 Lincolnwood Ct., BURKE, Robinson Secondary School, Fairfax
Judson Lawrence Berkey, 17, 9123 Peabody St., MANASSAS, Thomas Jefferson H.S. for Science and Technology, Alexandria
Venkataramana Kuntimaddi Sadananda, 17, 8015 Daffodil Ct., SPRINGFIELD, Thomas Jefferson H.S. for Science and Technology, Alexandria
Daniel Moshe Skovronsky, 17, 10705 Hunters Run Ct., VIENNA, Thomas Jefferson H.S. for Science and Technology, Alexandria