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## *Introduction*

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The Study of Mathematically Precocious Youth began officially on September 1, 1971. Its origins went back at least thirty-three years, however, to the time when as a young high-school teacher of science and mathematics taking a summer “tests and measurements” course at the University of Georgia I became enchanted by intellectual talent. It also owes much to Galton (1869), Terman’s *Genetic Studies of Genius*,<sup>1</sup> Hollingworth (1942), Pressey (1949), Worcester (1956), and Hobson (1963).

Its more immediate instigators were Doris Lidtke, Joseph Louis Bates, Jonathan Middleton Edwards, Carl Swanson, and Sam Nocella. Doris told me in the summer of 1968 about 12-year-old computer prodigy Joe. Johns Hopkins Dean Swanson admitted him as a regular freshman in the fall of 1969; only 13 years old until that October 20, he performed outstandingly, earning his B.A. and M.S. Engr. degrees at age 17. Jon heard about Joe and insisted on being admitted to Johns Hopkins in the fall of 1970 at age 13. He did well, too.

As international vice-president of the Amalgamated Clothing Workers of America, in 1969 Sam was instrumental in giving Johns Hopkins a \$110,000 endowment with which to start the Hyman Blumberg Symposium on Research in Childhood Education. From time to time the symposia have helped SMPY report orally and in book form the progress of the many remarkable youths it has discovered and assisted educationally.

The stage was well set in early 1971 when the newly created Spencer Foundation of Chicago solicited proposals. One of the foundation’s interests was intellectual talent. Having recently seen the potentialities for research and development in the area of mathematical reasoning ability, I submitted a proposal to President H. Thomas James and Secretary (now Vice-President) Marion M. Faldet. It was approved initially for five years, with a grant of \$266,100. This generous support, followed by renewal grants for three, two, and three years, enabled us to create what is now a vast, far-flung set of educationally facilitative special opportunities for young students who reason exceptionally well mathematically or verbally. For a detailed rationale of SMPY see Stanley (1977).

From the first talent search in 1972 (450 participants) to the tenth in 1983 (15,479), and from the first fast-paced mathematics class in 1972 (22 students) to the residential summer program for 1,000 students in 1983, there are many milestones worth noting. That is why, with assistance from the National Science Foundation, the Blumberg Fund, and the Spencer Foundation, SMPY organized an overview symposium in November of 1980 at Johns Hopkins. What had been accomplished during the first eight years? What were appropriate guidelines for the future? This book is the augmented and updated result of the symposium's deliberations. The main focus of the volume is on mathematical talent because not until the seventh talent search, in 1980, was verbal talent sought explicitly. Nevertheless, the backgrounds of the participants at the symposium and of the authors of this volume vary widely. The supplementary or complementary backgrounds help guard against provincialism and bias.

Nearly all of the participants in SMPY's first three talent searches who had scored fairly well had graduated from high school and entered a postsecondary institution by 1977. They were systematically followed-up. Even though most of these students had been touched rather lightly by SMPY's educational-facilitation efforts (mainly through its newsletter, the *Intellectually Talented Youth Bulletin*—the *ITYB*), studies of them revealed definitely positive influences. As chapters 4–8 and 11 show clearly, influence on educational pace and level was quite strong when SMPY worked directly with some of the ablest young people found in the talent searches.

Though tempted to summarize the papers, I shall leave the savoring of their contents to you. See the concluding chapter of this volume for relationships among the chapters. These reports point SMPY in the direction of the twenty-first century, because by 2001 participants from that first talent search in 1972 will be only in their 40s. Having been born near the end of World War I, I cannot expect to see much (if any) of the new century. Dr. Camilla P. Benbow is vastly younger, however, so to her will probably go the privilege of learning via long-term follow-ups how SMPY's identified, acclaimed, and educationally facilitated young students perform professionally and behave personally as adults. Other persons, such as Dr. Lynn H. Fox, will also be observing the outcomes of various programs.

Perhaps some of the talent-search participants will spark grass-roots movements on behalf of intellectually talented youths. At least, many "ex-prodigies" (see Wiener 1953) may be able to help their own children use their abilities better. Programs based on unusual ideas tend to die when the zeal, fervor, and even fanaticism which characterized their original progenitors wither in transition. We believe, however, that SMPY's principles, practices, and programs are robustly exportable, not like a delicate wine on the hill at San Marino which will not travel well even to Rimini nearby.

Across the country many successful replications and adaptations testify

to the power of the simple models SMPY developed by working directly with youths who reason extremely well mathematically. For example, at Duke University during the academic year 1980–81 Assistant Provost Robert N. Sawyer, supported strongly by Provost William Bevan, conducted Duke's first search for verbal and/or mathematical talent, closely following the SMPY model, in the following thirteen states: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas. Nearly 9,000 students, chiefly 12-year-old seventh-graders, participated. In 1982, Iowa, Kansas, and Nebraska were added.

In the fall of 1980 former SMPY Assistant Director Sanford J. Cohn began a talent search in Arizona, using Arizona State University at Tempe as his base for trying out the SMPY approach. In 1981 he extended the program to California and Washington. In 1982 Oregon and parts of Canada were added.

Dr. Joyce Van Tassel-Baska at Northwestern University, using elements of the SMPY model, conducts an annual search in the Midwest for mathematically apt youths. Educators in the Minneapolis–St. Paul area of Minnesota perform similar screening in order to form fast-paced mathematics classes. There are other laudable efforts here and there, including Eau Claire in Wisconsin, Omaha in Nebraska, and Berkeley in California.

As of the seventh talent search, conducted in January of 1980, however, SMPY relinquished the important service activity of screening to an agency under the provost at Johns Hopkins, the Center for the Advancement of Academically Talented Youth (CTY).<sup>2</sup> CTY conducts the talent search each year, looking for mathematically, verbally, and/or generally talented seventh-graders and youths in higher grades who are of seventh-grade age. In 1980 it added New Jersey to the group of political entities involved in the fourth through sixth talent searches, which included Delaware, the District of Columbia, Maryland (the sole state in the first three talent searches), Pennsylvania, Virginia, and West Virginia. CTY is also taking over the educational facilitation of all but the most mathematically able of the talent-search participants. Currently the staff of SMPY works only with students who before their thirteenth birthday score 700 or more on SAT-Mathematical (SAT-M). These students receive a great deal of individual counseling and educational facilitation.

### Three Youths Move Ahead Especially Fast

The progress thus far of three of SMPY's ablest protégés helps reveal the great educational strides the intellectually most advanced young students can make when they are allowed the curricular flexibility they sorely need. By considering these extreme "radical accelerants," one can

readily infer that milder acceleration is appropriate for a considerable percentage of youths (see George, Cohn, & Stanley 1979).

One of the earliest intellectual “finds” under the original Spencer Foundation grant occurred during the fall of 1971; this was a sixth-grade Baltimorean named Colin Farrell Camerer, who had been born on December 4, 1959. Having come from a state that had an earlier cut-off date for school entrance than Maryland, he was one of the oldest students in his grade, although undoubtedly the ablest. Colin was cooperative and ingenious, and so were his parents, so over the ten years — until the fall of 1981 — he went through to a Ph.D. degree and an assistant professorship before his twenty-second birthday. Had his pace before being identified initially as highly talented intellectually continued, he would have earned only a bachelor’s degree by June of 1982. How did Colin move so fast and so well?

First, of course, it was established by careful use of difficult tests that Colin had the potential to accomplish far more than age-in-grade school curricula require. Then he was encouraged to skip the seventh grade in order to become one of the younger students in the eighth grade, rather than one of the oldest in the seventh. Also, he took for credit the regular introductory computer science course in the Johns Hopkins day school at age 13 and made a final grade of *A*. His easy success in the eighth grade and in the college course emboldened him to take many more accelerative steps. He skipped grades seven, nine, ten, twelve, and (by entering college with sophomore standing) thirteen. This allowed him to complete his B.A. degree in quantitative studies at Johns Hopkins in five semesters (rather than the usual eight) shortly after his seventeenth birthday. He did this through a combination of college courses taken for credit while still in high school, Advanced Placement Program (AP) examinations, and heavy course loads in college.

Yet, despite his academic speed he found plenty of time for extracurricular activities: varsity wrestling and the television academic quiz team in high school, varsity golf in college, much writing for the college newspaper, and tutoring of several other mathematics prodigies. Also, during the second semester of the academic year 1976–77, Colin, already a college graduate, worked as a factotum for a weekly newspaper on the Eastern Shore of Maryland until it was time for him to enter the University of Chicago’s Graduate School of Business that fall while still 17 years of age. Two years later, at age 19, he had earned the M.B.A. degree. By December of 1981 he had completed the doctorate there in social science aspects of finance. In September of 1981 he became a 21-year-old assistant professor and statistics specialist in the Graduate School of Management of Northwestern University. All of this was done with much zest and gusto, quite unlike the public image of the student “pushed” too fast academically by anxious, overly ambitious parents.

Colin seems to have a highly promising future, as at each point in the

past he did. Success and, as Zuckerman (1977) put it, cumulative educational advantage breed more success and cumulative advantage. Of course much depends on continued level of aspiration and many other personal and environmental factors. In social science one cannot hope that prediction at the individual level will be as precise as, for example, predicting the melting point of a bar of pure copper under known conditions of temperature and pressure. In the aggregate, however, high scorers on the College Board's Scholastic Aptitude Test at age 12 can accomplish vastly more than low scorers given the same opportunities.

A second example of the superb accomplishments by highly talented youths which are eminently feasible is the career thus far of Chi-Bin Chien, the American-born son of parents who grew up in Taiwan and completed their bachelor's degrees there. He first came to my attention via his father, a professor of physics at Johns Hopkins. Shortly after his tenth birthday, Chi-Bin scored nearly as high on the verbal part of the College Board's Scholastic Aptitude Test as the average Johns Hopkins student did as a 17- or 18-year-old twelfth-grader. He scored a little higher than their average on the mathematical part.

With much help from extremely facilitative parents and some from SMPY, he skipped grades six, seven, nine, ten, eleven, and thirteen, graduating from one of the country's most outstanding high schools at age 12 with sophomore standing in college because of the Advanced Placement Program examinations, on which he had scored splendidly. In May of 1981 Chi-Bin, who was born on November 3, 1965, became (by seven months) the youngest recipient of a baccalaureate in Johns Hopkins's 105-year history. He broke the record set in 1887 by 16-year-old Charles Homer Haskins, who went on to fame as a medieval historian and dean of the Graduate School of Arts and Sciences at Harvard University.<sup>3</sup>

Chi-Bin took his B.A. degree in physics with the following honors and awards: general and departmental honors, Donald E. Kerr Memorial Award for the outstanding bachelor's degree recipient in physics from Johns Hopkins that year (shared with another student), SMPY award for being the youngest graduate in the institution's history, Churchill Scholarship to study biophysics for a year at Cambridge University, and National Science Foundation three-year fellowship with which to work toward a Ph.D. degree at the California Institute of Technology after he returned from England.

A third SMPY protégé to make truly spectacular educational progress thus far is Nina Teresa Morishige, the American-born (on June 5, 1963) daughter of immigrants from Japan. Her accomplishments already seem virtually superhuman: she won the Oklahoma high-school piano contest as a tenth-grader; plays the flute excellently, and also the violin; was elected president of Oklahoma Girls' State (the mock political gathering) at the end of the eleventh grade; skipped the twelfth grade and came to Johns Hopkins as a mathematics major minoring in piano at the Peabody Insti-

tute, a division of Johns Hopkins; arrived with full second-year standing because of the five Advanced Placement Program examinations she had taken in one week and on which she had scored superbly; took 50 percent to 100 percent “overloads” of difficult courses in order to complete her B.A. degree in mathematics by May of 1982 at age 18 in a total of four semesters rather than the customary eight; won a Rhodes Scholarship with which to study for two years at Oxford University, being one of the youngest winners in the competition’s seventy-eight-year history; and also won a Churchill Scholarship to Cambridge University, but had to decline it because of the Rhodes Scholarship. In her “spare time” Nina taught some of SMPY’s fast-paced mathematics classes and served as a mentor-by-mail in calculus to six mathematically brilliant young students across the country.

We know of quite a few more as remarkable in their own ways as Colin, Chi-Bin, and Nina, but mention of the precocious achievements of these three should provide some idea of the progress readily possible for extremely able students when curricular arrangements are sufficiently flexible. None of these three cost their schools or parents a great deal in time or money. They were amazingly cost-effective in, for example, earning their bachelor’s degrees in four, five, or six semesters instead of the usual eight. They also eliminated a total of ten years of schooling below the college level, and of course avoided much boredom and saved conscientious teachers concern about their special educational needs.

It will be fascinating to follow the progress of SMPY’s “radical accelerants” as they go through life. One must not create a *reductio ad absurdum* expectation, as many have done for the Terman group, that each will become as eminent as Einstein or Newton. A number of them are likely to become first-rate scholars, researchers, or practitioners in their vocations.

We encourage educators and parents everywhere to consider carefully how far curricular flexibility of the kinds described in this book can take young people (most of them, of course, not nearly as able as Colin, Chi-Bin, and Nina) educationally and personally at minimum cost and with only slight disruption of the schools’ usual educational processes. This need for and importance of curricular flexibility for intellectually talented students is perhaps one of the most salient findings of SMPY. It is implicit in all the chapters in this book, and explicit in most of them.

## Notes

1. See Terman (1925), Cox (1926), Burks, Jensen, and Terman (1930), Terman and Oden (1947), Terman and Oden (1959), Oden (1968), Sears (1977), and Sears

and Barbee (1977). These pioneering works are still a basis for present-day research, development, and service to intellectually talented persons.

2. CTY was originally called the Office of Talent Identification and Development (OTID).

3. For further details about the youngest graduates of Johns Hopkins see Stanley and Benbow (in press).

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