FINDING INTELLECTUALLY TALENTED YOUTHS AND HELPING THEM EDUCATIONALLY[1]

Julian C. Stanley, EdD
The Johns Hopkins University

This is a discussion of the first 14 years (1971-1985) of the Study of Mathematically Precocious Youth (SMPY) at The Johns Hopkins University and the spread of its influence across the country. Many youths who reasoned exceptionally well mathematically were identified, studied further, and aided.

BACKGROUND

My interest in general intellectual talent was kindled by a graduate course in "tests and measurements" at the University of Georgia during the summer of 1938. At that time, I was barely a 20-year-old veteran of a year of teaching in as nearly a blackboard-jungle high school as Atlanta could provide. Much of that summer course consisted of the students' taking a number of intelligence tests, notably the Otis, the Toops Ohio State University Psychological Test, and the Miller Group Test, one-third of which later grew to become the Miller Analogies Test. For a year or so, I administered the Otis to everyone who could be persuaded to take it, including my students, my parents, my girlfriends, and my sister's boyfriends. I even proceeded to try out a standardized chemistry achievement test on my high school chemistry class. This testing was heady experience, but other concerns such as the coming world war took over. Not until 1958 did my interest in gifted children resurface. That enthusiasm soon was cut short, however, by my Fulbright year in Belgium devoted to test theory. As we shall see later, my major efforts on behalf of intellectually talented youth began in 1971. Before discussing them, however, perhaps we need a brief review of the origins of the gifted-child movement.

THE GIFTED-CHILD MOVEMENT

Building on the work of Galton (1869; also see Forrest, 1974), in 1921 in California, systematic seeking for large numbers of intellectually talented youths

[1]Julian C. Stanley is professor of psychology and Director of the Study of Mathematically Precocious Youth (SMPY) at The Johns Hopkins University.

Editorial assistance was provided by Barbara S. K. Stanley and Camilla Persson Benbow. Parts of this report appeared in somewhat different form in Stanley (1982). I dedicate this article to Professor Herbert J. Klausmeier on the occasion of his becoming Professor Emeritus of Educational Psychology at the University of Wisconsin, Madison, at the close of the 1985–86 academic year. We were colleagues there from 1953, a year after he arrived, until 1967, when I moved to Johns Hopkins University.

began with Professor Lewis Terman's monumental but somewhat unfortunately titled *Genetic Studies of Genius.*[2] His 1,528 school-age subjects, born on the average in 1910, are less numerous today, but the survivors are still being followed systematically. From this classical descriptive longitudinal study has come empirical refutation of most myths about intellectually talented youths. They do not tend to die early, peter out, burn out, become neurotic or psychotic, or fail in their professional and personal lives (see Stanley, 1974, concerning these myths).

Although the extent and quality of the contributions of Terman's "geniuses" (or *Termites,* as some preferred to call themselves) are still being debated, even in the 1960 survey their vocational achievements were impressive. While the group averaged only 50 years of age then, according to Oden (1968, pp. 19–20),

> Three men had been elected to the National Academy of Sciences and two to the American Philosophical Society. . . . [Forty-six] are included in . . . *Who's Who in America,* 10 in *The Dictionary of American Scholars,* and 81 in *American Men of Science* . . . Some 2500 articles and papers and more than 200 books and monographs in the sciences, arts, and humanities have been published and at least 350 patents granted. Miscellaneous articles (technical, travel, hobby, etc.) number around 350. Other publications include close to 400 short stories, 55 essays and critiques, and a small amount of poetry and several musical compositions. Not included in the foregoing account are the professional output of editors and journalists or the many radio, TV and motion picture scripts that have been authored. . .

The persistent reporting of *Genetic Studies of Genius* findings of five volumes, a monograph, and a number of articles did much to quell the worst fears of the uninformed and prejudiced. Being almost solely a nonmanipulative study of the gifted child in his or her native habitat, however, this great work had little to say, except incidentally, about educational facititation of high IQ students. Also, because during those early days Terman dealt primarily with a global measure of intellectual ability, he told us little about specific intellectual talents and how they might be useful educationally. This led teachers to group children for instruction in many school subjects by IQ, rather than on the basis of whatever combination of abilities best predicted sucess in a given course. That may explain a considerable part of the failure of homogeneous grouping, ability grouping, and streaming. For example, grouping on IQ reduces the variability of mathematical reasoning ability within the group far less than grouping on mathematical reasoning ability itself does.

OTHERS IN THE MOVEMENT

Concurrently with Terman, but at Teachers College of Columbia University in New York rather than Stanford University across the country, Leta Hollingworth (1942) both identified and facilitated educationally a considerable number of extremely high IQ children. Terman worked for the most part from IQ 140 up, whereas Hollingworth preferred at least 180. Her methods were less like a sur-

[2]Its chief publications thus far are Terman et al. (1925), Cox (1926), Burks, Jensen, and Terman (1930), Terman and Oden (1947, 1959), Oden (1968), P. Sears and Barbee (1977), and R. Sears (1977). Perhaps the best analysis, which covers the first 40 years, was done by Oden (1968) after Terman's death in 1956. It is, in effect, Volume VI of *Genetic Studies of Genius.* I believe that her little-known monograph should be required reading for all specialists in intellectual talent.

vey and more personal than his. Despite Hollingworth's untimely death in 1939 at age 53 (see H. L. Hollingworth, 1943), she has had a continuing impact on the education of the gifted. Her emphases on special schools for the gifted and moderate educational acceleration affected the New York City area and quite a few other large cities, especially during the 1920s and 1930s. Like Terman, however, she tended to prefer the single-score Binet-type IQ for identification and educational placement.

A third towering figure was Pressey (1949). He and others sought freedom for intellectually able youths to traverse the school system from kindergarten through graduate school faster than the usual age-in-grade Carnegie-Unit lock step permitted. Going beyond Terman and Hollingworth, Pressey showed that the presumed evils of educational acceleration were about as imaginary as had been those alleged for having a high IQ.

Many others have worked on some aspect of great intellectual ability, from Galton (1869; Forrest, 1974) to more recent researchers, including Klausmeier (e.g., Klausmeier, 1963; Klausmeier & Ripple, 1962; and Klausmeier &Wiersma, 1964). During the 50 years from 1921 until 1971, however, Terman's research-oriented talent search remained virtually unique. It did, however, inspire a number of states—notably California—to search systematically for high IQ youths and to offer them special provisions, chiefly a modest degree of educational enrichment rather than acceleration.

BEGINNING OF THE STUDY OF MATHEMATICALLY PRECOCIOUS YOUTH (SMPY)

In 1971, a fortunate combination of events led to my securing a generous grant from the newly formed Spencer Foundation of Chicago. This provided 13 consecutive years of support for ever-growing talent searches among junior high school students. Unlike Terman's search, however, these searches were conceived from the start as a means of finding youths with special talents who could be helped to move ahead better and faster educationally. Terman and Pressey had provided powerful ammunition against most of the worst stereotypes; strong, determined educational facilitation was needed. It is not possible, however, to facilitate unknown or imprecisely identified youths. Efficient searching was clearly the initial step, necessary but not in itself sufficient.

The first search for mathematical and scientific talent was conducted at Johns Hopkins in March of 1972 with 450 7th-and8th-graders, chiefly from the Baltimore area (Stanley, Keating, and Fox, 1974). By January of 1985, the 12th search involved, about 23,000 7th-graders from Virginia to Maine and in Arizona, California, Oregon, Washington, Alaska, Hawaii, and Western Canada. Many other young students were tested in annual talent searches conducted by Duke University, Northwestern University, and the University of Denver. By the school year 1982–83, all states in the U.S.A. were firmly in the talent-search network. They were also canvassed for ultra-high talent. The search has grown large and complicated. It continues to be effective, however, because of the accumulation of relevant experience during the decade. As might be expected, facilitation efforts have also been expanded greatly.

From the start, the primary identifying instrument used by the Study of Mathematically Precocious Youth (SMPY) was the College Board's Scholastic Aptitude Test (SAT). At first, chiefly the mathematical part (SAT–M) was administered, because SMPY wanted mainly to find and help young students who reason exceptionally well mathematically. Soon, however, values of the verbal part (SAT–V) became apparent. Searches from the seventh, in 1980, onward are as much for verbal reading and reasoning ability as for mathematical reasoning ability. Even SAT's rather recently introduced Test of Standard Written English (TSWE) has proven useful for helping to determine readiness for foreign language and writing courses.

Fears that the 12-year-olds tested would find the SAT too difficult did not turn out to be true, probably because Johns Hopkins restricts participation in the talent search to persons who on nationally standardized achievement-test batteries administered by their schools score in the top 3% of their age group verbally, mathematically, or overall. Thus, only about 1 out of 20 seventh-graders or youths in higher grades who are not yet 13 years old qualify for the talent search. The abler of these tend to be the ones who actually take the SAT, so for the most part the Johns Hopkins Center for the Advancement of Academically Talented Youth (CTY), which has conducted the annual Johns Hopkins search since 1980; deals with approximately the top 1 out of 30 youths. Interest focuses on those who score at least 500 on SAT–M or 430 on SAT–V. By comparison, the average scores of the college-bound twelfth-graders are males—499M and 473V; females—452M and 425V (College Board, 1985). To achieve scores of at least 500 and 430, respectively, five years before becoming high-school seniors represents considerable intellectual precocity and, if other factors are favorable, indicates a potential for accelerating progress in relevant school subjects.

How do eligible students learn of CTY's annual talent search? Full explanatory materials concerning it are sent each fall, in the states served, to several different educators at every public, parochial, and independent school with a seventh grade. Also, extensive news coverage is sought in each geographical area. The student need only learn from his or her school about the required upper 3% score on a relevant part of an in-school, achievement test battery. The eligible youth then registers directly with CTY, which in turn sends information about preparing to take the SAT in the regular national January administration, as well as much other material.

Scores from the January SAT test come to CTY by means of its code number, at which time (usually February or early March) information concerning summer programs is sent to all the examinees whose SAT score(s) qualify them for such fast-paced academically oriented experiences. For example, of the approximately 23,000 7th-grade participants in CTY's January of 1985 talent search, about 10% scored high enough on SAT–M (at least 500 before age 13) and M + V (at least 930 before age 13) to become eligible to attend CTY's concentrated three-week residential summer program to study precalculus, calculus, biology, chemistry, physics, computer science, quantitative economics, statistics, or other courses.

700–800 ON SAT–M BEFORE AGE 13

In the fall of 1980, SMPY started a national search for youths who score at least 700 on SAT–M before their 13th birthday. Only 6% of college-bound 12th-grade males achieve that score. We estimate that at a given time only 400 persons in the entire country could score 700–800 before age 13, making each high scorer one out of approximately 10,000 in their age group. Persons having upper one-hundredth of 1 percent mathematical reasoning ability show promise of stellar academic performance, especially in the mathematical and physical sciences and engineering. This precious natural resource was seldom discovered before we of SMPY went looking explicitly for it. In the words of Thomas Gray's "Elegy Written in a Country Churchyard," most youths of this caliber were "born to blush unseen, and waste their sweetness on the desert air" of elementary and junior high schools. At age 12 or 13, some of them could master the typical 4½ year precalculus sequence from first-year algebra through analytic geometry in three intensive summer weeks. Thus, some become ready to take 12th-grade Level BC Advanced Placement Program calculus when just 8th-graders, or even earlier, rather than Algebra I in the 8th or 9th grade. How much boredom and wasting of time can they be spared by being identified objectively be means of a well-known, secure instrument—SAT!

From November of 1980 through October of 1983, SMPY found 292 "700–800 on SAT–M Before Age 13" youths. They came through CTY's January of 1981, 1982, and 1983 talent searches, Arizona State University's Project for the Study of Academic Precocity, Northwestern University's Midwest Talent Search, Duke University's Talent Identification Program (2 were reported in 1981), and through SMPY's national publicity, chiefly in newspapers. As a response from the estimated 1,200 population of youths in that period, this was gratifying. Even though some of the first 164 were found too late for admission to the 1981 and 1982 summer programs conducted by Johns Hopkins, Duke, and Arizona State, and despite the fact that several of them were already full-time college students, about half the group has attended at least one residential three-week summer session and quite a few have attended two, three, and even more sessions. SMPY continues its contacts with these remarkable young students as they strive to integrate their summer educational accomplishments with the curricula of the schools (mostly public) that they attend across the United States.

This special search for youths who reason extremely well mathematically is conducted simply. Any interested youth may secure from a senior high school a copy of the official SAT practice booklet entitled "Taking the SAT," may study it, may take the test, and if the score on SAT–M before his or her 13th birthday is at least 700, may send a copy of the score report to CTY, The Johns Hopkins University, 2933 N. Charles Street, Baltimore, Maryland 21218. An examinee may qualify up to age 13 years, 10 months with an 800: for every month or fraction of a month past the 13th birthday, 10 more points above 700 on the SAT are required. For example, at 13 years and barely 3 months, a score of 730 is needed. Obviously, we are estimating that just prior to his or her 13th birthday the score would have been at least 700. This approximate, probably conservative procedure is needed because the SAT is not offered every month of the year, with an especially large hiatus during the summer and early fall.

630–800 ON SAT-V BEFORE AGE 13

The Johns Hopkins Center for Advancement of Academically Talented Youth (CTY) launched a similar search for verbal superstars, those who before age 13 score at least 630 on SAT–V (630 is the 94th percentile of college-bound 12th-grade males). Students may qualify, with a score of 800, up until 14 years, 5 months: 10 points beyond 630 for each month or fraction of a month after the 13th birthday. Score reports at that level should be sent to CTY.

SEX RATIOS

Even though extremely able mathematical reasoners are sought constantly across the country in many ways, the sex ratio for SAT–M scores of 700–800 before age 13 is approximately 12 boys for each girl found. For scores 600–800, the ratio is 4 to 1. For 500–800, it is 2 to 1. This sex imbalance is well established for the 85,000 youths in SMPY's and CTY's first 11 talent searches, but we do not know *why* it occurs (Benbow & Stanley, 1980, 1981, 1982, 1983b, 1984).

Sex differences in mathematical reasoning ability, as ascertained from SAT–M and similar tests, are large enough to be important. In our opinion, this phenomenon merits sound study to ascertain why it occurs and what implications there may be for amelioration and instruction. It serves no useful purpose to deny the existence of these differences. The "whats" are rather clear, but the "whys" are not. Talent searchers such as those described here provide excellent opportunities for much-needed research.[3]

YOUTHS WHO REASON EXTREMELY WELL MECHANICALLY

As discussed elsewhere (Stanley, 1977; Stanley & Benbow, in press), SAT–M was a virtually ideal instrument for the Study of Mathematically Precocious Youth in its formative states. Young students who reasoned extremely well mathematically were found and then studied further in many ways. SAT–M, SAT–V, and TSWE continue to serve SMPY's and CTY's initial identification efforts well. For locating more varieties of intellectual talent, however, a comprehensive aptitude test battery might be developed by an agency such as The College Board or The Psychological Corporation for use in the early years of junior high or middle schools. This would be administered to the intellectually top 5–10% of the age group in a search for persons highly apt in one or more of at least a half dozen valuable intellectual ways. Business, industry, and the professions need more than

[3]Some other reports of SMPY's and CTY's research, development, and service are Bartkovich & George (1980), Bartkovich & Mezynski (1981), Benbow & Stanley (1983a), Fox,Brody, & Tobin (1980), Fox & Durden (1982), George (1979), George, Cohn, & Stanley (1979), Keating (1976), Mezynski & Stanley (1980), Mezynski, Stanley, & McCoart (1983), Reynolds, Kopelke, & Durden (1984), Solano (1979), Stanley (1979), Stanley (1984), Stanley (1985), Stanley & Benbow (1982; in press), and Stanley, George, & Solano (1977, 1978).

mathematical and verbal reasoning ability and knowledge of the mechanics of English expression.

For example, most of the nation's schools give little attention to the need for skilled maintainers of technical hardware whose excellence in mechanical reasoning, nonverbal reasoning, and spatial relationships has been utilized from the early years to make them highly proficient. Educators seldom know who the young students scoring extremely well in these areas are, or care about their special abilities, if they do know. Many potentially splendid repairers of copying machines, computers, electric typewriters and word processors, television sets, electronic musical instruments, plumbing, and automobiles become routine service persons or mediocre engineers, instead. Often, pupils who perform poorly in academic subjects are shunted to the semiskilled or skilled trades by default, rather than because they have the requisite aptitudes for them. The first step toward alleviating this unfortunte situation is to call attention to the large pool of mechanical, spatial, and nonverbal reasoning ability. This could probably be accomplished best by a comprehensive national talent search at the upper elementary or junior high school level, modeled along the lines of the SAT searches conducted by SMPY and CTY.

NEED FOR LONGITUDINAL TEACHING TEAMS

Identifying intellectual talent objectively is the necessary first condition, but as someone once quipped, "You can't major in IQ." Another said, "With a high IQ and fifty cents you can buy a fifty-cent cup of coffee." Mental potential is merely an aid to learning. The quality and extent of learning depend greatly on educational opportunities available to the would-be learner. In turn, such opportunities arise from the adaptability of school systems to the varieties and levels of intellectual talent that they are meant to serve. Therein lies a serious problem that can be illustrated by quoting from Stanley (1980):

> While highly sucessful, SMPY's various [educationally facilitative] procedures occur only because the age-in-grade, Carnegie-unit lockstep of schools, both public and private, makes such heroic measures essential. If schools were organized differently, SMPY would not have been necessary—nor, indeed, would the present special provisions for most slow learners. In my opinion, age-grading for instruction in academic school subjects has crept insidiously upon us as we have moved from tutorial instruction and the one-room schoolhouse to the current situation. It needs to be reversed. But, regrettably, that will not be done easily or quickly [if at all].
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> My proposal in the area of mathematics is for a longitudinal teaching team that spans kindergarten through the 12th grade in a school system. Working from a mathematics learning center, the various members of this team would be responsible for meeting all the mathematics needs of all the students in the school system. The buck would stop with them. Every student would be helped to meet clearly stated, rather substantial criteria of mathematical competence. A few students would accomplish these early, perhaps by age 8; a few others would have to work hard until age [17 or 18] in order to attain the minima. Some students would proceed far beyond the minimum essentials; others would stop with them and devote their efforts thereafter to other subject matter.
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> Much of the instruction might still be in groups, but not age-graded ones. Attaining levels of achievement instead of A, B, C grades would be stressed. All members of the longitudinal mathematics team would have to be highly competent, but some would specialize in helping slow learners and others in helping fast-moving students.
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> Obviously, this longitudinal-teaching-teams model could be applied to other subject matter areas such as language arts, social studies, science, and foreign languages. There might also be similar teams

for the fine arts, music, drama, physical education, and social and emotional development. Attention to individual differences, both within areas and across areas, would be increased vastly.

I should certainly like to see at least two sizable public school systems pioneer this project for at least 25 years. Because of problems that one can readily anticipate and many that one cannot, almost certainly this would be extremely difficult. I believe strongly, however, that some such plan is our only hope for the educational future of America's youths. All else will be sorry stop-gaps.

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