in Nevada range from 0.56 to 0.89; the shot of highest yield produced the debris with the lowest solubility. The solubilities of strontium-90 in debris from balloon and air shots in Nevada range from 0.41 to 0.99; the shot of highest yield produced the debris with the lowest solubility. The strontium-90 in debris from Pacific shots is uniformly acid-soluble.

These observations indicate that all three requirements have been partially fulfilled for Nevada shots but that at least one of the requirements has not been met at all for Pacific Proving Ground shots. The temperature-time requirement should be most nearly fulfilled for tests in which the energy release is very large and the heat capacity of the debris is relatively small. The heat capacity of the debris is not relatively small for most Pacific shots. The uniform solubility of debris from these shots can be attributed to dilution of the fireball by large quantities of coral or sea water. This dilution has two effects. It cools the fireball rapidly and provides soluble particulate matter as a matrix (calcium carbonate, calcium oxide, sodium chloride—all soluble in 1*F* HCl). Unfortunately, no debris samples were available from megaton air bursts, in which both of these effects would be absent.

The most encouraging data come from test number 8, an air burst with a matrix of aluminum and iron. The solubility of the strontium-90 in debris from this test was only 0.52 after exposure to water for more than a year. Although temperature-time histories of fireballs formed by atomic explosions of this magnitude are not known, a condensation time of 20 to 30 seconds is a reasonable assumption. The 0.52 solubility of the strontium-90 observed for test number 8 is consistent with complete incorporation of the rubidium-90 and strontium-90 present in the fireball 20 seconds after the explosion. The data from test number 8 indicate that a small amount of material can incorporate strontium-90 in an insoluble form, provided that the fireball stays hot long enough for the krypton-90 to decay. The data from the Nevada tower shots indicate that the use of much larger quantities of material does not reduce the solubility.

It is reasonable to assume that the important requirements for incorporation of strontium-90 are that the greater part of the condensable material in the fireball be capable of forming insoluble particles and that the condensation of this material take place as long as possible after the explosion, to allow for decay of krypton-90. On this basis it is conceivable that a megaton burst at an altitude of several miles, involving several tons of aluminum or iron, would produce debris in which 80 percent or more of the strontium-90 would be insoluble. However, the likelihood of such an outcome should be regarded as a hypothetical possibility rather than as a distinct probability.

A megaton burst at ground level on a thick layer of magnetite should produce debris with a solubility equal to or less than the 0.65 solubility observed for test number 3. Such a ground-level environment would involve the disadvantage of a short condensation time, due to the heat capacity of the material engulfed by the fireball, and the possible advantage of increased local fallout as opposed to world-wide fallout. The choice of air versus surface environment would presumably be influenced by the amount of soluble strontium-90 which each would supply to the biosphere.

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Personality Attributes of Gifted College Students

Gifted students are less authoritarian and show more esthetic and intellectual interest than other students.

Jonathan R. Warren and Paul A. Heist

Education at all levels has been permeated in recent years with a tremendous concern for the adequate development of superior and gifted students. Most of the attention and effort has been directed toward identifying such students and devising educational processes suited specifically to their needs. Relatively few attempts have been made to re-examine personality attributes of such individuals with the improved assessment devices of the post-World War II period. This study (*1*) represents an appraisal of some major behavioral characteristics, as measured by objective personality inventories, of a large number of post-adolescent youth of exceptional mental ability.

Early studies of intellectually gifted children were undertaken, at least in part, to examine the notion then commonly held that extraordinary mental proficiency is usually accompanied by physical frailty, early and drastic decline of abilities, insanity, or other compensating deficiencies. These misconceptions were readily refuted by the work of Terman (*2*) and Hollingworth (*3*). But early success in establishing that certain traits are not characteristic of the gifted has not been followed by much success in determining what is consistently characteristic of the gifted, other than exceptional intellectual ability.

The term *gifted* is often used to

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include persons having exceptional musical, artistic, or other creative talent. In this article the term refers only to the intellectually superior as they are identified by a test of scholastic aptitude.

The level of scholastic aptitude, or the intelligence quotient (I.Q.), above which the classification of giftedness is considered appropriate is somewhat arbitrary, depending largely on the preference of the person applying the term and the context in which it is to be used. While Terman's lower limit was a Stanford-Binet I.Q. of 140, some investigators have set the limit at 120 or even lower. A majority seem to have settled on 130 as a useful lower limit for defining intellectual giftedness. Estimates derived from a conversion of College Entrance Examination Board Scholastic Aptitude Test scores to Stanford-Binet I.Q.'s indicate that the sample described below has a mean Stanford-Binet I.Q. approximating 150, with a minimum at about 130 (*4*).

Previous investigations have shown that the highly intelligent, as compared with those of average intelligence, are generally taller, heavier, physically healthier, and perhaps mentally healthier (*2, 3, 5*). The most frequently discovered psychological attribute of the intellectually gifted is a general self-sufficiency, a greater than usual degree of self-direction, independence, or autonomy. Such behavior is apparent both in intellectual pursuits and in more overt forms of behavior (*6–8*). Perhaps closely related is a tendency to dominate in social situations or, more accurately, a tendency not to be submissive. Here a sex difference has been noted, the lack of submissiveness being more characteristic of gifted men than of gifted women (*5, 7, 8*).

The greater cognitive scope and mental facility of the gifted seem to give them a greater command of themselves and their world, allowing them to be more adventurous and more creative—to engage in more varied and more difficult activities and to do so more intensely and more persistently—than the average person (*7, 9*). Notwithstanding their greater breadth of activity and more extensive contact with the external world, people of superior intellect are generally less tense, less anxious, and less given to feelings of insecurity and depression than are people in general (*5, 10*).

The broader, deeper interests of the gifted are directed toward themselves as well as toward the external world. Gifted men, particularly, engage in more self-evaluation and self-criticism and tend more toward social withdrawal than do ordinary people. Gifted women are closer to the norm in both these respects (*7, 8*).

The large volume of material published in the last 30 or 40 years about the intellectually superior may suggest that more is known about the gifted than is indicated above. To be sure, other correlates of intellectual superiority, of a biographical or sociological nature, have been established: the proportions of gifted students from the various socioeconomic strata, the cultural levels of their homes, the steps in their educational progress, the vocations they entered, and so on. But as to generalizations about their way of thinking, their basic attitudes, and their manifest behavioral characteristics, there appears to be relatively little that can be concluded from the professional literature.

Generalized descriptions tend to obscure the heterogeneity of behavior known to exist among the gifted. Conversely, the diversity of the total population of gifted may not permit further generalization than has already been made. The data summarized here were assembled as a means of confirming what presumably has been established regarding gifted students in general and as a guide to further, more sharply delineated, studies of gifted students.

Sample

In the spring of 1956, high school principals across the nation nominated 58,000 senior students to take the College Entrance Examination Board Scholastic Aptitude Test in a competition for college scholarships administered by the National Merit Scholarship Corporation. These 58,000, selected as the best senior students in their respective schools, constituted 6 percent of the national population of high school seniors. Slightly over 5000 of the highest scoring students, drawn proportionately from the various states according to their high school senior populations, were subsequently rated with respect to rank in class, motivation, breadth of interests, accomplishments, personality, and leadership potential. These ratings were based on autobiographical reports and high school principals' recommendations. Using the Scholastic Aptitude Test scores and the various ratings as predictors, a selection committee then designated as National Merit Scholars the 556 contestants considered to show the greatest promise of achievement in college. The remainder of the 5000 finalists were awarded certificates of merit (*11*).

Through an agreement with the National Merit Scholarship Corporation, the Center for the Study of Higher Education at the University of California initiated a longitudinal study of the entire group of National Merit Scholars and a 10 percent sample of the students awarded the certificate of merit (the near winners). [In this analysis the National Merit Scholarship winners and near winners collectively will be termed National Merit Scholarship students.] Over 90 percent of this total group agreed to participate in the study, 659 men and 259 women constituting the final sample.

The estimated mean and minimum I.Q.'s of 150 and 130, respectively, for this sample clearly justify designating these students as gifted. Unfortunately, the sample cannot be considered representative of the total population of intellectually gifted students of the same grade or age level. The initial nomination of 58,000 contestants was undoubtedly biased against the nonachieving gifted student. Even capable students with good achievement can be neglected in teachers' recommendations, as Getzels and Jackson (*12*) have shown. Boys appear in the sample studied 2.5 times as frequently as girls. The number of subjects who entered scientific and technological fields in college was over three times the number who entered other fields. A boy with a good high school record and an interest in science seems to have had a greater chance of being selected than would be indicated by his scholastic aptitude alone. A gifted girl interested in literature, who for some reason did not excel in terms of high school grades, would have had little chance of being included in the sample studied.

Neglected in the above consideration of sample bias is the effect of proportional selection by states. Probably because of disparities among systems of education from one state to another, a student with a given aptitude score might be selected as a finalist in one state and not in another where the competition was stiffer. Whether this selection procedure offsets inequalities produced by the accessibility to some students of superior educational opportunities or introduces inequalities of its own cannot be answered.

Procedure

Among the several assessment instruments used in the study were the Omnibus Personality Inventory (*13*), administered in the summer of 1956, prior to the students' entrance into college, and the Study of Values (*14*), which was administered in the spring of 1957.

Personality inventory. The Omnibus Personality Inventory consists of an assemblage of personality scales that were considered to be particularly pertinent to the study of college students (*15*). The scales were drawn from other inventories and from research by other agencies. Brief descriptions of the attributes that the scales primarily measure and statements of the origins of the scales are given below.

The Thinking Introversion (TI) scale of Evans and McConnell (*16*) was incorporated into the Omnibus Personality Inventory unchanged with respect to content but with the original Likert response form replaced by a true-false form. High scorers show a liking for reflective thought, particularly thought of an abstract nature, and are interested in ideas and concepts; they tend to be less influenced by external conditions and commonly professed ideas than are low scorers.

The Complexity (Co) scale, adapted from the work of Barron (*17*), distinguishes between people who perceive and react to complex aspects of their environment and those who react to more simple stimulus patterns. High scorers are more independent, liberal, critical, unconventional, and potentially more original and creative; they welcome the new and different in their experiences. Low scorers tend to be compliant and conservative, accepting authority and tradition, and to respond to simpler perceptual patterns.

The Originality (O) scale, adapted from research by Barron (*18*) and Gough at the University of California Institute for Personality Assessment and Research, measures a tendency toward highly organized but individual ways of reacting to the environment. Characteristics of high scorers are independence of judgment, freedom of expression, rebelliousness, rejection of suppression, and novelty of insight.

The Responsibility (R) scale was initially developed by Gough, McCloskey, and Meehl (*19*) to measure responsibility as it pertains to social activity. High scorers tend to be thorough, planful, conscientious, socially progressive, and concerned with social and moral issues.

The Ego-strength (Es) scale was originally developed by Barron (*20*) to measure some aspects of the ability to function effectively as a person. The version of the scale used in this study is a short form of the original (31 rather than 60 items). High scorers are more alert, adventurous, determined, independent, outspoken, persistent, and resourceful than low scorers.

The Social Maturity (SM) scale, derived from research with the Authoritarian scale of Adorno, Frenkel-Brunswik, Levinson, and Sanford (*21*) but scored in the reverse direction (toward nonauthoritarianism), measures the more indirect, more personality-centered elements of the authoritarian construct, avoiding most items having a political or ideological connotation. This is also a short form of the originally developed Social Maturity scale. High scorers, in contrast to low scorers, are more culturally sophisticated and more confident as well as less compulsive, less submissive, less conventional, and less punitive.

The original Authoritarian (F) scale (form 45/40) was also included in the Omnibus Personality Inventory, but with two of the original 30 items removed and with the responses altered from the Likert to the true-false form. This Authoritarian (F) scale correlates highly but negatively with the Social Maturity scale, as would be expected. High scorers on the Authoritarian scale have an in-group orientation and tend to be repressive, rigid, conventional, emotionally cold, and prejudiced.

The Impulse Expression (IE) scale was developed by Sanford, Webster, and Freedman (*22*) at Vassar. High scorers tend to be impulsive, irrepressible, impatient, erratic; low scorers are generally reserved, dignified, cautious, and dutiful, sometimes to the point of being placid or taciturn.

The Social Introversion (SI) scale was developed by Drake (*23*), who used items in the Minnesota Multiphasic Personality Inventory (*24*). High scorers show relatively little active interest in people; low scorers appear to be primarily socially oriented.

Four scales in the Omnibus Personality Inventory, borrowed from the Minnesota Multiphasic Personality Inventory, measure some aspect of adjustment or maladjustment. They are the Hysteria (Hy), Psychopathic Deviate (Pd), Schizophrenia (Sc), and Hypomania (Ma) scales.

Study of values. The second personality inventory, the Allport-Vernon-Lindzey Study of Values, measures six value orientations (*14*). A high score on the Theoretical (Th) scale indicates a person with a dominant interest in the discovery of truth, one who is concerned with cognitive approaches to reality and who is critical, rational, and given to intellectualizing. (Findings at the Berkeley center show interest in scientific fields to be a strong correlate of this orientation.) The person who scores high on the Economic (Ec) scale is interested primarily in the utilitarian and the practical, in the accumulation of material goods and associated activities. The high scorer on the Aesthetic (Aes) scale places greatest value on form and harmony. His major orientation is toward a pleasing organization of sensory experience, toward the esthetic aspects of the environment. The high scorer on the Social (Soc) scale is oriented toward people as such, without regard to theoretical, esthetic, or practical attitudes, which he may regard as cold and inhuman. A person who scores high on the Political (Pol) scale is not necessarily interested in the field of politics but is chiefly concerned with power and influence over others and the struggle and competition with which power is commonly associated. The person who scores high on the Religious (Rel) scale is something of a mystic, seeing the highest values in a search for the meaning of life and in comprehension of the cosmos (*25*).

The Allport-Vernon-Lindzey items are forced-choice alternatives, high scores on any one scale necessitating low scores on some other scale or scales. The six scores can therefore be interpreted only in relation to each other; a high score indicates only that that orientation is more highly valued than the others.

Results

Comparison groups of college students. The Omnibus Personality Inventory was administered in 1957 to samples of unselected freshmen at two branches of the University of California. Scores from the two samples were combined to provide a single reference group more broadly representative of college students than either sample would have been alone. Study of Values scores for half the subjects in one of the University of California samples

were obtained at the same time. Allport-Vernon-Lindzey scores of two other college groups were available for purposes of comparison. The Study of Values manual provides means and standard deviations for a large sample of college students of both sexes, and Lehman and Ikenberry (*26*) report Allport-Vernon-Lindzey scores for a random sample of Michigan State University (MSU) freshmen of 1958. Since students in all four undergraduate years are represented in the data presented in the manual, and since the testing reported in the manual was done at least seven years before the National Merit Scholarship group was tested, the California and Michigan samples probably provide more appropriate comparisons for this study.

The mean aptitude of the Michigan sample is slightly higher than the national college freshman mean. The California freshmen, however, show a mean aptitude score a full standard deviation above the national mean. Although more than the usual amount of overlap therefore exists between the distributions of aptitude of the University of California and the National Merit Scholarship samples, their means are still sufficiently different (about 1.5 standard deviations apart) to permit meaningful group comparisons.

Results on the personality scales. Means and standard deviations for males in the National Merit Scholarship and University of California samples on the various personality scales in the Omnibus Personality Inventory are shown in Table 1. Similar data for women are shown in Table 2. The males in the scholarship sample are differentiated fairly sharply from the California male freshmen on all the scales except the four "adjustment" scales of the Minnesota Multiphasic Personality Inventory. Results for the women are very similar, with the exception of the mean scores on the Social Introversion scale, which do not differentiate the very bright women from the less bright.

For both sexes, the two scales showing the greatest differences between the gifted and the unselected students are Thinking Introversion and Responsibility. Interest in reflective thought, interest in working with ideas and concepts, and intellectual independence, all of which contribute to high Thinking Introversion scores, are characteristics of the intellectually superior that have been noted before (*2, 27*). Conscientiousness, thoroughness of planning, and concern with moral issues, traits measured by the Responsibility scale, have been less clearly indicated in previous research with the gifted.

Table 1. Omnibus Personality Inventory scale means and standard deviations for National Merit Scholarship (NMS) men and for University of California (UC) male freshmen.

Scale	NMS (*N*, 659)		UC (*N*, 191)	
	Mean	S.D.	Mean	S.D.
TI*	45.1	8.7	34.2	10.6
Co*	14.7	3.9	13.2	4.1
O*	24.9	4.5	22.2	4.8
R†	41.5	4.3	36.6	8.3
Es*	22.5	3.1	21.5	3.1
SM*	36.0	5.4	31.0	6.8
F*	8.3	4.2	11.3	4.4
IE*	21.2	6.8	24.2	6.9
SI*	24.7	9.0	27.2	9.2
Hy	20.2	4.1	20.4	4.5
Pd	21.1	4.1	22.1	4.3
Sc	26.8	7.1	27.6	7.0
Ma	20.2	4.2	20.8	3.9

* $p < .001$. † Because of the difference in variances of the two groups, no test for significance was performed.

The gifted students observed by Brandwein (*9*) showed a considerably higher degree of persistence and more thorough planning than did the less bright. Hollingworth (*3*) noted an early concern with and continued interest in moral issues in the gifted. Both of these rather distinct traits contribute to high Responsibility scores. A difficulty of interpretation is introduced, however, by the combination, in Brandwein's subjects and in the subjects of the present study, of high intelligence and unusual success in school. The thoroughness and persistence that seem characteristic of these students could therefore be considered functions of achievement, a learned and rewarded form of behavior, rather than of intellectual superiority as such. A heightened moral awareness may or may not be contributing to the higher Responsibility scores of the gifted; its influence cannot be separated from that of conscientiousness and thoroughness.

Table 2. Omnibus Personality Inventory scale means and standard deviations for National Merit Scholarship (NMS) women and other female college freshmen (UC).

Scale	NMS (*N*, 259)		UC (*N*, 197)	
	Mean	S.D.	Mean	S.D.
T*	46.9	7.4	36.5	9.4
Co*	14.7	3.8	12.8	3.8
O*	25.6	3.7	23.0	4.3
R*	42.5	3.9	39.1	5.0
Es*	22.5	3.1	21.4	3.1
SM*	35.0	5.1	32.6	6.6
F*	7.7	4.0	9.5	4.2
IE*	18.6	7.6	21.4	7.8
SI	25.3	8.6	26.4	8.6
Hy	20.9	3.5	21.9	4.0
Pd*	20.5	3.4	21.6	3.9
Sc	26.4	4.9	27.6	5.3
Ma	19.1	4.1	20.3	4.4

* $p < .001$.

Again for both sexes, the differences between the two groups with respect to originality support the observation of Hildreth (*27*) and others (*2, 3, 7*) that the gifted show unusual originality, imagination, inventiveness, and resourcefulness. Other correlates of high Originality scores—freedom of expression, rebelliousness, and lack of suppression (*13*)—have not commonly been ascribed to the gifted. Moreover, their low Impulse Expression scores seem, at first glance, to contradict the picture of the gifted implied by high Originality scores as freely expressive and unsuppressed individuals. The scores on these two dimensions, however, are not actually contradictory. People with high Impulse Expression scores tend to be impulsive, irrepressible, and ready to express their impulses in overt action when the content of the impulse tends to be emotional or affective. The freedom of expression indicated by high Originality scores is essentially of a cognitive or attitudinal nature. (There is a positive correlation between the Impulse Expression scale and neurotic patterns on the Minnesota Multiphasic Personality Inventory. Correlations between Originality and Impulse Expression are virtually zero.) The high Originality and low Impulse Expression scores of the gifted, then, show the gifted to be, by comparison with average individuals, more original, imaginative, rebellious, and expressive with respect to cognitive material but somewhat more reserved and cautious with respect to affective material. To the limited extent that human behavior can be dichotomized, the distinction might be made that the gifted are intellectually and conceptually imaginative and "impulsive," whereas emotionally they are more controlled. From the psychoanalytic standpoint, the gifted seem to "operate" more at the ego level than at the id level.

The studies of both Hollingworth (*3*) and Terman (*2*), as well as of others (*7, 8*), strongly suggest that the greater intellectual powers of the gifted, in comparison with average students, permit them to react to their environments with greater imagination, resourcefulness, and flexibility, to be less bound by conventional modes of reacting, and to have greater confidence in their own ability to cope with their environments. The results on the Social Maturity and Authoritarian scales confirm this view.

Table 3. Allport-Vernon-Lindzey means and standard deviations for National Merit Scholarship (NMS) men, for other male college freshmen (UC and MSU), and for other male college students (norms.)

Scale	NMS (*N*, 604)		UC (*N*, 82)		MSU (*N*, 256)		Norms (*N*, 851)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Th	48.1	8.4	48.8	7.6	44.8	6.6	43.3	7.6
Ec	36.0	8.9	38.8	9.0	43.7	6.4	42.1	9.1
Aes	39.3	10.3	37.3	9.7	31.8	7.2	37.2	9.7
Soc	34.2	7.6	35.4	7.5	35.0	6.2	37.7	7.2
Pol	40.4	7.1	41.5	7.3	42.8	6.0	42.7	6.8
Rel	41.7	11.0	38.1	9.3	41.9	8.3	37.0	10.4

In addition to indicating greater maturity and less authoritarianism, scores on these scales indicate greater flexibility and less compulsiveness and conventionality in the National Merit Scholarship subjects than in the University of California subjects. The higher Social Maturity scores of the gifted indicate more sophistication and greater self-confidence as well.

The distinctive performance of the gifted subjects on the Social Maturity and Authoritarian scales is noteworthy for a more general reason. These two scales, more than any others, denote what a number of personality theorists would consider a basic personality dimension. The more advanced psychological development of the gifted, indicated by results on these scales, and the correspondingly greater potential for growth and positive change may, as much as superior mental ability, provide the basis for superiority both in achievement and in more general forms of behavior in an academic environment.

Two more scales add elements to the picture of the personality organization of the gifted that complement these findings. The higher Ego-strength scores of the National Merit Scholarship subjects suggest that they operate at a higher level of personal effectiveness and, again, that they are more self-confident, resourceful, and independent than the less bright. Their higher Complexity scores indicate, once more, greater intellectual independence and a tendency toward original, unconventional ways of responding to the environment as well as greater tolerance of ambiguity and greater potential for creativity.

The intellectual rebelliousness, the experimenting attitude toward ideas, the freedom to express somewhat deviant forms of thinking (characteristics associated with high Originality scores); the intellectual independence and affinity for scholarly pursuits of those scoring high on the Thinking Introversion scale; the ego strength, potential for creativity, and associated qualities just mentioned —all these, added to the psychological maturity indicated by the Social Maturity and Authoritarian scales, describe a personality "structure" and a way of thinking which would be highly conducive to intellectual achievement.

The only marked difference by sex is found on the Social Introversion scale. The lower Social Introversion scores of the gifted men, as compared with university freshmen, indicate a greater interest in people and less of a tendency to withdraw from social contact. No such difference appears between gifted and more typical college women.

The last four scales in Tables 1 and 2, taken from the Minnesota Multiphasic Personality Inventory, all measure some aspect of maladjustment. For men, the National Merit Scholarship subjects as a group score lower on all four scales than do other university freshmen, the differences being significant at the 0.05 level or better. For women, although the means of the National Merit Scholarship group are slightly lower than corresponding means of the comparison group, the only significant difference is on the Psychopathic Deviate scale. Scores on this group of scales indicate clearly that the gifted students of both sexes in this sample have no higher incidence of maladjustment than do unselected university freshmen. In fact, they suggest the contrary. The original selection procedure, however, may have operated to exclude from the sample gifted students who would show evidence of some emotional disturbance or maladjustment, thus biasing these results somewhat toward an overestimation of the mental health of the gifted.

Results on the study of values. Means and standard deviations of scores on the Allport-Vernon-Lindzey Study of Values for the National Merit Scholarship students and for two other contemporary samples of college freshmen, as well as norms from the Allport-Vernon-Lindzey manual, are presented in Tables 3 and 4.

Because of the interdependence of scores on the six Allport-Vernon-Lindzey scales, tests of significance were not applied to the differences between groups on individual scales. Standard deviations have been included in Tables 3 and 4 to permit a superficial evaluation of the relative magnitudes of the differences observed. A statistical comparison (discriminant function analysis) of the total sets of six value scores for the National Merit Scholarship and Michigan State University groups confirms the impression that these two profiles are significantly different. Interpretation of the differences between all four profiles is facilitated by reference to the complete profiles presented in Figs. 1 and 2.

For both sexes, the profiles diverge most sharply on the Theoretical, Economic, and Aesthetic scales. The gifted students value the theoretical and aesthetic orientations relatively higher and the economic, or utilitarian, relatively lower than do the students in the comparative samples. The only exception appears in the Theoretical scores of National Merit Scholarship and University of California men, which are virtually equal. Here, though, the high scores of the men in the University of California sample may be attributed to their high level of aptitude and the large proportion of science majors found in the sample. No undergraduate sample presented in the manual approaches the

Table 4. Allport-Vernon-Lindzey means and standard deviations for National Merit Scholarship (NMS) women, for other female college freshmen (UC and MSU), and for other female college students (norms).

Scale	NMS (*N*, 174)		UC (*N*, 59)		MSU (*N*, 197)		Norms (*N*, 965)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Th	43.7	8.6	39.1	8.4	39.0	6.9	36.4	7.4
Ec	30.5	7.7	35.1	7.1	38.3	6.6	38.8	7.5
Aes	45.0	9.6	43.0	10.2	38.3	7.1	42.2	8.7
Soc	37.5	7.6	39.5	7.0	39.2	6.7	41.3	7.0
Pol	36.7	6.6	39.2	6.7	39.3	6.3	38.1	6.1
Rel	46.5	9.7	43.8	10.2	45.8	7.7	43.2	10.5

mean of 48 established by the National Merit Scholarship men.

The gifted, then, take greater interest than do the more typical students in cognitive and intellectual pursuits. They are more concerned with harmony and form in sensory experience and have a greater appreciation of the artistic. These higher theoretical and esthetic values appear in connection with a lower interest in the utilitarian and the practical.

While the comparisons just given hold equally well for both sexes, the differences by sex that appear within the comparison groups are also present in the National Merit Scholarship sample. The unselected males in all the comparison samples evaluate the three orientations with respect to which the major differences occur, in decreasing order, theoretical, economic, esthetic. The gifted males evaluate them theoretical, esthetic, economic. For the unselected women, no consistent ordering of these three values appears. The gifted women, in contrast to the men, value the esthetic orientation slightly higher than the theoretical, while sharply rejecting the economic.

Differences on the other three scales —Social, Political, and Religious— between gifted and unselected students are slight but provide some information when considered in conjunction with other measures. For both sexes, the lower Political scores, indicating relatively little value placed on a power orientation, find support in the differences obtained in the measures of authoritarianism (Social Maturity and Authoritarian scales).

Scores on the Allport-Vernon-Lindzey Social scale indicate that gifted college students of both sexes may be slightly less socially oriented than unselected college students of the same sex. The Omnibus Personality Inventory Social Introversion scale, however, indicates the reverse, particularly among the men. The apparent contradiction may be due to depression of the Allport-Vernon-Lindzey Social scores by the strong theoretical orientation of the men, while the depressing effect of the women's high scores may have operated on Economic more than on Social scores. Among males, then, the economic orientation seems to take precedence over the social orientation, while the reverse seems true for the women.

Among these six interdependent scales, the Religious scores are often the ones depressed by high theoretical or esthetic values. Yet the gifted of both sexes score as high on the Religious scale as do any of the groups used here for comparison (in some cases the gifted score higher), while scoring high on the Theoretical and Aesthetic scales as well. The extensive religious interests and commitments observed in the National Merit Scholarship students are clearly evident in the results of the test.

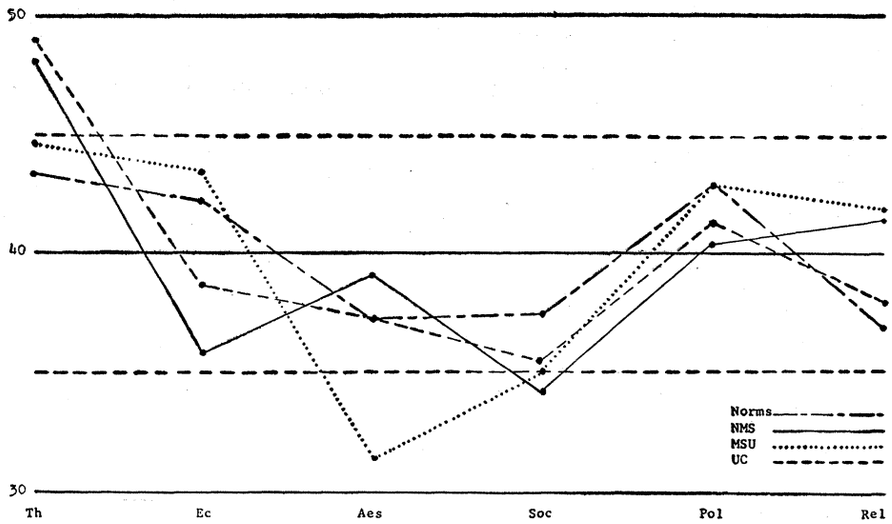

Fig. 1. Mean score profiles on the Study of Values from groups of men students: a normative group, National Merit Scholarship sample, Michigan State University, and University of California.

Discussion

Integration of some of the Omnibus Personality Inventory and Allport-Vernon-Lindzey results brings sharply into focus a major conclusion of the study. Accompanying the high scholastic aptitude of the gifted is a strong attraction to intellectual activity combined with high levels of esthetic awareness and appreciation.

Both the Complexity scale of the Omnibus inventory and the Allport-Vernon-Lindzey Aesthetic scale, which correlate about 0.4, deal with the organization of experience. High Complexity scores, exhibited by the gifted of both sexes, indicate a preference for complex stimulus patterns and an inclination and ability to deal imaginatively and adequately with apparent disorder. High Aesthetic scores, exhibited particularly by the gifted women, indicate a re-

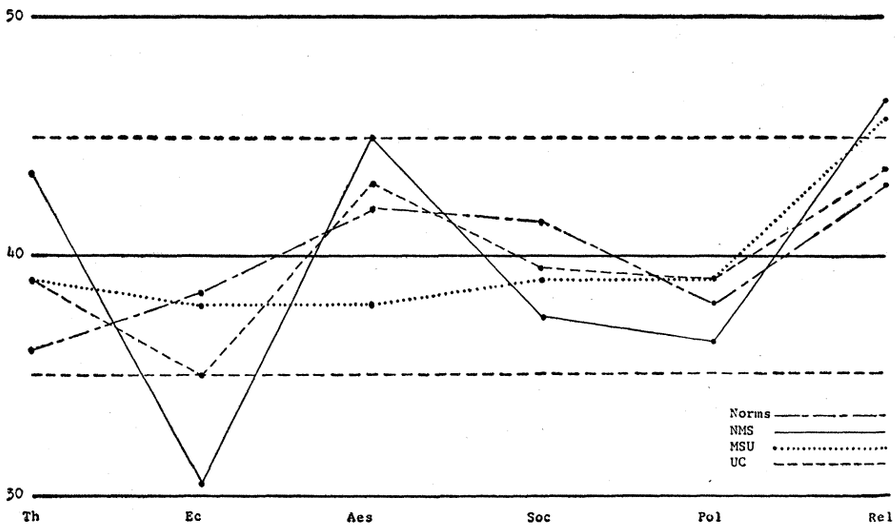

Fig. 2. Mean score profiles on the Study of Values for groups of women students: a normative group, National Merit Scholarship sample, Michigan State University, and University of California.

ceptive orientation toward sensory experiences and possibly a predilection for their harmonious organization. The two scales seem to measure somewhat different constructs: the cognitive approach to the organization of sensory experience is measured by the Complexity scale and the more affective approach is measured by the Aesthetic scale. The mean scores on these two scales, with support from the mean Theoretical scores, indicate that many gifted women value both approaches, while the gifted men place greater emphasis on the intellectual or cognitive approach.

Research on a number of student samples (*28*) has shown that high scorers on the Aesthetic scale are characterized by more than the traits attributed to them by the manual. High Aesthetic scores have repeatedly proved to be a strong correlate of scholastic and intellectual interests; the Aesthetic scale correlates with Thinking Introversion at a higher level than does the Theoretical scale. This orientation, often more than the theoretical, denotes a set of attitudes which serves as a strong component of intellectualism. A combination of high Aesthetic and high Theoretical scores is even more indicative of a strong intellectual orientation. One wonders whether the intellectual potential indicated by the combination of strong esthetic and theoretical orientations in the women of the sample will lead to intellectual and academic productivity or will remain undeveloped in the current cultural environment.

A reservation with regard to the differences between the gifted and the nongifted indicated by the foregoing findings should be restated. The gifted students who furnished the data which permitted the delineation of these differences are a select group of gifted, chosen partly because they possess desirable characteristics other than high academic aptitude. Criteria of sociability, responsibility, and emotional stability, in addition to achievement and aptitude, entered to some extent into their selection. Furthermore, high ability plus achievement is not a *sine qua non* of active, operative giftedness, and generalizations arrived at from patterns of mean scores are not necessarily typical of single individuals.

That personality characteristics other than high academic aptitude do distinguish the intellectually gifted from the general population seems clear. The results presented here for a large sample of contemporary youth generally confirm characteristics of the gifted previously reported. More detailed knowledge of the ways in which nonintellectual attributes operate within the ranks of the gifted and differentially between the gifted and the nongifted may result from study of selected subgroups of the gifted. One should ask whether the theoretical orientation of the gifted, for example, is uniformly high, regardless of field of study, be it engineering, a theoretical science, or the humanities. One also wonders what other qualities differentiate the individuals of high ability having a utilitarian orientation from those with a theoretical orientation. Are the effects of high intellectual ability nonlinear, as Hollingworth has repeatedly proposed, the most desirable correlates occurring in a moderately high rather than in an extremely high range of ability? These and other questions await further research.

Summary

Although considerable interest has been centered in recent years on ways to insure that intellectually gifted youth will develop their capabilities to the fullest, relatively little is known of the underlying personality characteristics common to the gifted. The study here reported was a re-evaluation, from objective personality inventories, of previously reported psychological attributes of the gifted and an attempt to identify additional personality characteristics that differentiate the gifted from the nongifted.

The attribute that most sharply differentiates the gifted of both sexes, as defined in this study, from groups of unselected college freshmen is a strong disposition toward intellectual activity. This can be described more explicitly as a liking for reflective and abstract thought; interest in ideas and conceptualization; a rational, cognitive approach to reality; and a positive, functional approach to scholarly pursuits. A second major differentiation, somewhat more pronounced in the women, appears in what seems to be a perceptual variable. The subjects of this study have a stronger esthetic orientation than is commonly found. The majority of them react preferentially to the artistic rather than to the utilitarian components in their environments.

Other differences in the two personality inventories, mostly confirmative of previous research, indicate that the gifted are independent, confident, and generally mature in their interactions with the external world. As compared to the normative groups, they have more complex perceptions and reactions. They are less authoritarian and less rigid, to the extent that many are free to become "risk-takers" in the world of ideas. Most of them also react with greater originality, imagination, and resourcefulness to the stimulation they receive.

Although intellectually imaginative, critical, somewhat rebellious, and free to express themselves, the gifted are neither as emotionally expressive nor as impulsive as the average individual. This repression of affective behavior, however, does not produce social withdrawal. The gifted men, in fact, appear more socially oriented than do unselected college men. In neither sex is there a higher incidence of emotional disturbance or adjustment difficulties among the gifted than is found in the general college population.

Among the gifted, the women appear much more like the men with respect to most of the personality traits measured than is true in more general college samples. As with other college students, however, the gifted women place greater value, relative to other measured values, on an esthetic approach to experience than do gifted college men. Again as in groups of more typical college students, the gifted women place greater emphasis on social than on utilitarian values, while the reverse is true for the men.

The procedures used in selecting the gifted sample limit somewhat the applicability of the conclusions. Studies of more restricted subgroups of comparable ability levels should be informative and valuable.

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Correlations of the Thinking Introversion with the Allport-Vernon-Lindzey Theoretical scale (two scales which may seem to be conceptually related) are low for the men of the sample, varying from 0.1 to 0.2. For women, the correlations between the same two scales are around 0.4. Correlations between the Complexity and the Allport-Vernon-Lindzey Aesthetic scale, for both sexes, approximate a value of 0.4. Intercorrelations for other scales on these two inventories are below 0.3. Both personality inventories are only minimally related to scholastic aptitude in terms of correlations for the sample studied. Correlations with Scholastic Aptitude Test—M uniformly approximate zero. A few correlations with Scholastic Aptitude Test—V are of the order of 0.2, most of them also approximating zero.
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Science in the News

The Republican Convention: Nixon's "Progressive Conservatism" More Progressive than Conservative

The Republican convention, like the Democratic, reflected the emergence of science and technology in national politics. Like the Democrats, the Republicans, for the first time, wrote into the party platform a pledge of continuing federal support for scientific research. Again the important news is not in the platform promises or in the routine references to the importance of science which appeared in so many of the speeches, but in the attitude of the candidate. And Nixon's attitude, like Kennedy's, is that the federal government should be spending more money on science and much more on programs to produce more well-trained scientists.

There are sharp differences between the two men, but in the areas of science and particularly education there is at least a basic common agreement. The agreement stems, if from nothing else, from the strong awareness of both men of the emergence of science as a major component of a nation's power and prestige, and the consequent awareness not only of the importance of federal support of science, but of federal support of programs to develop scientific talent. Nixon has gone out of his way to make it as clear as he can, short of outright criticism of Eisenhower, that he believes that, particularly in the area of programs affecting national security, the Eisenhower administration has tended to think too much in terms of how much we can cut the budget and not enough of how much we should be doing. And as noted above, Nixon, like Kennedy, has recognized science and education as areas with a direct effect on national security.

Nixon, so far at least, seems to be thinking of expanded research in more limited terms than Kennedy: he is inclined, by his personal beliefs and by his commitments as a Republican candidate, to think of spending less than the Democrats, and he seems to be concentrating his attention, more than Kennedy, on programs of obvious practical value, particularly defense research and development and the space program with its important propaganda value.

On education, again reflecting his personal and his party inclination to keep the role of the federal government smaller than Kennedy and the Democrats would be inclined to do, Nixon would spend less over-all than Kennedy, and again would tend to concentrate on areas of special importance in the area of national security. He would spend more than Kennedy, proportionately, on support for the gifted student as opposed to the average student; more, again proportionately, on aid at the college and post-graduate levels as opposed to aid to the public school systems.

In absolute terms, he may well be inclined to spend as much, or nearly as much, money as Kennedy on aid to the most promising students, but it is probably politically impossible to do a great deal for the gifted student while ignoring the average student. A big aid program for scientific education therefore implies at least a moderately big program of general aid to education.

Nixon vigorously supports federal aid to school construction, but not aid for teachers' salaries, although he has hedged a little on this by saying he is opposed to "direct" aid to salaries, which seems to leave open the possibility of indirect aid. Like Kennedy, he supports a greatly expanded federal student loan and scholarship program, and expansion of programs to help colleges build not only dormitories, as presently authorized, but laboratories and other non-revenue-producing buildings as well. On the other hand, he rejects the Democrats' belief that the federal government should accept continuing responsibility for the public