The Relation Between Adolescent Creativity and Selected Variables: Sex, Adjustment, Art-Science Preference, Complexity-Simplicity, and Type of School.

Marie Guzell Kloss
Louisiana State University and Agricultural & Mechanical College

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THE RELATION BETWEEN ADOLESCENT CREATIVITY AND SELECTED VARIABLES: SEX, ADJUSTMENT, ART-SCIENCE PREFERENCE, COMPLEXITY-SIMPlicity, AND TYPE OF SCHOOL

A Dissertation

Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy in

The Department of Psychology

by

Marie Guzell Kloss
B.S., The Pennsylvania State University, 1963
M.A., Louisiana State University, 1967
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FOREWORD

Many myths and questions have been posed by psychologists, educators, and laymen regarding the all-encompassing concept of "creativity." Are males more creative than females? Are creative persons less well-adjusted than non-creative persons? Are school misfits more creative than students who conform to traditional instruction? Are scientists different from artists? Does a person have to be an intellectual genius in order to be creative? This dissertation addresses itself to many of these provocative questions. Though many interesting insights may be gleaned from the present work, these mythical questions still remain unanswered.

The writer gives her apology for the shortcomings in this dissertation. Rarely could a Ph.D. candidate "master" the domain of creativity. There exists the paradoxical necessity of bringing to closure phenomena whose intrinsic quality is "resistance to closure."

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ABSTRACT

Selected hypotheses on the relationship between creativity and other variables in adolescents were tested. Employing criteria provided by the researcher, high school teachers nominated 99 male and 59 female Juniors and Seniors as "creative." Subjects were given a battery of tests including: Guilford and Torrance divergent thinking measures, the Barron-Welsh Art Scale, the Maudsley Personality Inventory, the Socialization scale of the California Psychological Inventory, Smith & Schaefer Adjective Check List Creativity Scale, and a questionnaire on basic identifying data and miscellaneous items of interest to the researcher.

Relevant literature on creativity and adjustment, artist-scientist, sex differences, stimulus preferences, and criterion problems was reviewed; and the following selected hypotheses were tested:

(1) "Creativity" is more characteristic of males than females as seen by a sex bias in favor of males in teacher nominations; (2) Creativity varies inversely with adjustment in females, but adjustment is not relevant in male creativity; (3) Students with an orientation towards the arts are more maladjusted (more neurotic and less socialized) than those with a science orientation; (4) Subjects with an art versus science orientation perform better on tests of divergent thinking; (5) Complexity preference varies directly with creativity; (6) Smith & Schaefer's ACL Creativity Scale correlates significantly with tests of
divergent thinking, and therefore has construct validity; (7) Subjects in regular schools will perform better on verbal creativity measures, while "non-verbal" subjects in Continuation schools will perform better than the former on figural creativity.

It was found that a significant sex bias in favor of males did occur, though there were no sex differences on the creativity tests. Adjustment was significantly correlated with female creativity, but not in the direction predicted. The hypothesis that art Ss would outperform science Ss on divergent thinking tests did not bear out--art Ss did better, but not significantly so. Art-science preference was uncorrelated with adjustment in general; however female science preference was associated with neuroticism. The ACL Creativity Scale was a significant correlate of divergent thinking tests; complexity preference, however, was uncorrelated with divergent thinking. The predicted association between type of school and verbal-figural creativity was supported, but only for males. Sex was a significant moderator variable in several associations. Also, as might be expected, many sex differences appeared in responses to the questionnaire compiled by the researcher. Implications of the results were discussed.
INTRODUCTION

"Creativity" and "adjustment" are indeed very complex, multifaceted constructs. To define or operationalize either is to limit meaning severely, but this is what we must do to subject such domains to measurement and systematic observation. The reader will perhaps get an understanding of the many creativities and adjustments offered in the review below.

Historical Perspective: Adjustment in Genius, Eminence, Giftedness, and "Creativity"

Early commentaries on genius support (and perhaps effected) layman's stereotypes of the genius--the temperamental artist who cuts off his ear; the eccentric lone scientist who labors long hours in a cob-webbed laboratory; the absent-minded professor, his head in the clouds, his social graces limited. Laymen are apt to conceive of genius as weird, a bit mad, even scary. A few biographies of very great geniuses (van Gogh, Beethoven, Newton, Nietzsche, Max Weber) who are frankly "mad" gain a lot of mileage in perpetuating this view.

Plato in the Phaedrus describes "a madness which is a special gift from the heavens, and the source of chiepest blessings among men." "Divine madness" Plato thought comes from another world and was unlike our current conceptions of madness or insanity. Interestingly one of the qualities of potential genius is the ability not to be confused and tricked by man--closely akin to the valued trait of independence.
Seneca, too, implicated madness in genius, "there is no great genius without a touch of madness." And Dryden's famous verses tie the two, "Genius is to madness close allied, and thin partitions do their bounds divide." (Interestingly treatises on creative writers and artists are more apt to make reference to "madness" than are those on scientists. Emotional excitement, sensitivity to beauty, a certain "turned on," or sentient, quality is more apparent in the former. The reader is referred to a review by Donald Glad--1943--and a book Glad influenced, Ghiselin's The Creative Process, as a good introduction. Of course, mathematicians, scientists, and logicians can also be "turned on" to the beauty of balanced relations, but this aspect is merely less apparent in these areas. Thomas Carlyle's On Heroes and Hero Worship, sees genius as "the transcendent capacity for taking trouble first of all." Carlyle's genius is a profoundly sincere man often persisting against (and paradoxically for) the Zeitgeist as well as his own adversities. Though he has stalwart traits--honesty, sincerity, courage, persistence--the Hero is not "adapted" either to himself as he is now or to society as it is now.

Nineteenth and early twentieth-century psychiatrists (Lombroso, Kretschmer, Lange-Eichbaum, Freud) theorized creative genius was associated with abnormality. Lombroso (1896), with painstaking and probably biased selection and interpretation of biographies, concluded the genius suffered from disorders of the "epileptoid" group. Lombroso's anecdotes of well-known geniuses and obscure eminent Italians is by far the most amusing comment on genius this writer has seen.
Lombroso was bent on proving the genius was abnormal clinically to prove his theoretical speculation that there is a paradoxical, dialectical balance between the best and the worst in society. Kretschmer (1931), employing an equally restrictive typology but a more disciplined interpretation of the facts, characterized geniuses either of the "schizothymic temperament" or "cycloid temperament," and often, "somewhere in the transition between the two." (Does not that include all body types?) Unfortunately both Lombroso and Kretschmer evidence two methodological weaknesses: (1) crude classification systems for constitutional types, and (2) confounding constitutional traits with temperament traits. More profound social-psychological theorizing comes from Lange-Eichbaum (1932), who recognizes the importance of social recognition and makes distinctions among achievement-fame-genius. Based on his analysis of 800 geniuses, he concluded as many as 90% evidence psychopathology, and as many as one-third have been psychotic at least once during their lifetimes. Neurotic tension, immoderateness, excess of fantasy, drink or drugs, psychotic experience, etc. constitute the "ferment upon which the production of 'genius' appears to depend." The writer questions his liberalness in applying psychiatric diagnoses, though his percentages are impressive.

Freud (in Nelson, 1958) sees impulses for creative writing stemming from unsatisfied ambitious wishes (in men) or erotic wishes (in women). Unlike the neurotic, the creative writer "disguises" his egoism in formal and aesthetic phantasy, but the creative shares with the neurotic unsatisfied egoistical wishes from early childhood. Kris
(1952), is consistent with Freud in his "regression in the service of
the ego" concept, though he sees creative dynamics as more positive.
Kubie entirely negates Freud's link between creation and neuroticism
and sees the creative person as mentally very healthy.

Psychological studies of eminent persons (not specifically gen-
iuses) de-emphasized psychopathology, and focused on the genetic basis
of excellence. Galton defined genius as "eminence" which was deter-
mined by peer reputation. Galton (1869), concluded from his study of
eminent geniuses that genius did possess high intellectual gifts and
strong character traits (perseverance, truthfulness) which were
inherited. However, even Galton, who regretted using the term "genius"
because of its mystical and psychiatric connotations, later stated,

Still there is a large residuum of evidence which points to
a painfully close relation between the two (genius and insanity)
and I must add that my own later observations have tended in
the same direction for I have been surprised at finding how often
insanity and idiocy has appeared among near relatives of excep-
tionally able men. Those who are over eager and extremely active
in mind must often possess brains that are more excitable and
peculiar than is consistent with soundness. (Galton, 1874,
Preface; English Men of Science)

It should be pointed out, however, that psychopathology does not run
rampant in Galton's geniuses themselves (but in their relatives); he
merely points to a common impetus for illness or achievement and does
describe mostly positive qualities in the eminent scientists--independ-
dence, energy, perseverance, good memory, truthfulness, harmonious home
life, etc. (Galton, 1874). Galton proceeded to redefine genius as "a
man endowed with superior faculties" (p. viii, Hereditary Genius, 2nd
Edition). Fifty years later genius was still conceived in terms of
intellectual processes by British psychologists--notably Spearman, who
critical of creation as "splendid" or "supernatural," described it
thus

... the final act in creativity must be assigned to the third
neogenetic process; that of displacing a relation from the ideas
which were its original fundaments to another idea ... which
may be entirely novel ... . The credence of any such further
transcendent is unwarranted by any known facts whatever.
(pp. 77-78, Creative Mind)

American psychologists, like the British, were defining genius
as eminence, high achievement, high intellect, with somewhat more em­
phasis than Continental Europeans on the creative product (rather than
creative process). Also Americans paid more attention to achievement
in science than in the arts. Noteworthy are James McK. Cattell's
biographies of American Men of Science, wherein the eminent is seen as
rural, Protestant, hard-working and achieving and psychopathology is
absent or irrelevant. Even James (1890), Royce (1906), and Dewey
(1922), speaking on creative thought in general, saw creative impulses,
not wanton or maladaptive, but necessarily harnessed to abstract
thought and social needs. One does not get the picture of the eccen­
tric egoist described as "genius" by continental literary critics and
psychiatrists.

Terman in his classic Genetic Studies of Genius (1925, 1926,
1930, 1947, 1959), focusing specifically upon 1000 gifted children for
longitudinal study, concluded gifted are superior on virtually all
important (originality, achievement, willpower, conscientiousness)
physical and mental qualities and that superiority obtains in adulthood.
(Terman's "mental" traits were "intellectual"; also, he studied
"gifted" not creative). Cox's (Terman, 1926) studies revealed superior ratings of both intelligence and character traits in 300 highly eminent persons studied biographically and posthumously. Hollingsworth (1942), too, found "fortunate deviates" (gifted, I.Q. above 130) above average in ratings of character. Children above 180 I.Q., however, showed signs of maladjustment, were introverted and given to fantasy activity. Hollingsworth attributes this relation to errors in the educational system, as well as verities resulting from uneven development, rather than to any innate connection between excellence and pathology. Goodenough (1956) and D. C. Smith (1962) found pathology among gifted was more the exception than the rule.

Though we have by no means dispensed with the intellectual-cognitive approaches to creativity (cf. Guilford, Mednick, C. W. Taylor, E. P. Torrance, Lawshe and Harris) investigators following Terman have seriously questioned the equation of genius with giftedness. Certainly the bulk of Terman's gifted did not turn out to be creative or eminent. Nor were all eminent from the ranks of the gifted--Cox had found I.Q.s slightly above average among musicians, soldiers, and artists, though still very superior I.Q.s in writers, philosophers and scientists. Numerous studies of the relation between intelligence and creativity have come to one generally agreed-upon conclusion: The correlation between the two is .4 or thereabouts in an unselected population and .0 in a highly selected population, i.e., for I.Q.s above 120 intelligence and creativity are uncorrelated. Getzels and Jackson (1962), in their highly popularized study of "hi-I.Q.s-lo-creatives" and
"lo-I.Q.s-hi-creatives" were in fact studying children with above 125 I.Q.s in the "low I.Q." group. (Nevertheless, their showing that teachers do not "favor" creative students is a great contribution to the educational establishment, though the findings tended to place creativity with school misfits and social dregs in the minds of incompletely-informed educators).

As American factor analytic psychologists have been reconceptualizing intelligence to include, not only the highly verbal, "ability to do abstract thinking," aspects, but also, to include numerous less-related intelligences--problem solving, figural, mechanical, behavioral; superior general intelligence is not seen as a prerequisite to creativity. Guilford, 1967; R. B. Cattell, 1968; C. W. Taylor, 1964, and other psychologists have focused upon creativity more broadly conceived rather than "giftedness." Oddly enough, in that Guilford's structure of the intellect model includes "behavioral" relations, "intellect" becomes synonymous with "personality"--the sum total of individual attributes, and one is free to investigate the myriad of relations among cognition, conation, values, interests, and temperament in creative persons.

Wallach and Kogan's (1965), careful well-controlled study of intelligence and other personality traits (they employed relaxed, informal administration of cognitive creativity tests versus speeded, formal tests) showed the high-creative but less-intelligent students to be introverted, socially isolated, disruptive, and having a low self-image, while the high creative-high intelligent were extroverted,
self-confident, socially outgoing, also disruptive, but all in all, more in keeping with the image of eminent persons gleaned from previous studies. The relation then among intelligence, creativity, and "adjustment" is exceedingly complex.

In addition to the development of test instruments to assess creativity (the cognitive approach) the last few decades has seen a resurgence of interest in (1) creative process versus creative product, and (2) "personality" characteristics of creative persons. Incidentally, the whole problem of genius and madness, or creativity and "adjustment," is seen as a "straw man" by most able investigators; the trait approach to personality negates using the concept of "adjustment" reminiscent of the German typological approach to personality. The writer feels that "adjustment" does exist and is a legitimate researchable question.

The creative process approach is reminiscent of European existentialism and Gestalt psychology, the self psychologists in Europe (Boss, Jung, Adler) and the self and encounter group psychologists in the United States--G. Allport, Rollo May, E. Schaeetel, S. Jourard, A. Maslow, Moustakas, R. D. Laing, H. Otto, Carl Rogers, W. J. J. Gordon. Becoming or realizing the self via free communication with self and other is in itself a creative act. Rogers makes no pronouncements on the "goodness" of that individual creation as a "product" (1961). Gordon (1961) is selective of participants for his "Synectics" groups--persons who are self-confident, not afraid of taking risks in groups, bright, and probably already creative--but focuses on the process of
the group creation (strangely enough) of some marketable group "pro-
duct." Though a few dialectically-oriented psychologists comment upon
the positive value of neurosis as a spur to creative growth, most self
psychologists see creation as very socially-dependent, not egoistic,
and requiring not only freedom from mental illness, (which is a regres-
sive notion), but the acquisition of "positive mental health," high
level wellness. Positive mental health and existentiality, are coinci-
dent with self growth, and hence, creativity.

Except for a few investigations to be discussed in the section
on creativity via temperament traits, the bulk of studies which focus
upon temperament, values, and attitudes of creative persons, first
select them on the basis of product--cognitive measures a la Guilford-
Christenson, Torrance, Mednick; peer ratings; number of publications;
performance on various projective techniques, etc. Studies have multi-
plied rapidly since Guilford's 1950 address to the American Psycho-
logical Association wherein he pointed out to psychologists their
insufficient attention to "divergent," or "creative" thinking. In the
next few paragraphs the writer will review some of these studies with
an eye to gaining a better understanding of creativity and adjustment.
(Studies pertinent to other topics in this introduction, will be omitted
in this section.)

Lehman (1953) showed creative production is higher in young
adults and middle-aged persons and declines in the 40's. Possible
hypothetical causes include death of loved ones, unhappy marriages,
hormonal changes, illness, poor health, decrease in motivation,
practical concerns and responsibilities, outright psychosis, powers sapped by alcohol, narcotics or other kinds of dissipation. One gets the impression creativity is inversely related to difficult adjustments in later years, but cause and effect cannot be separated. Guilford correlates different factors of creativity with tolerance of ambiguity, flexibility versus rigidity, and impulsiveness, ascendance, self-confidence, and appreciation of creativity, as well as the cognitive trait--divergent thinking. (The only possible maladaptive trait could be impulsivity; the other traits seem more appropriate to positive adjustment.) Barron and MacKinnon find creative architects, mathematicians, and writers, "both sicker and healthier psychologically than people in general" (Barron, 1969, p. 75). They are self-accepting, have higher ego-strength, intelligence, flexibility, yet share with clinical groups elevated scores on the MMPI, report less sense of well-being, are lower on socialization and self-control; scientists are seen as cool, detached, non-conforming, liking order, dominant, higher in femininity in the absence of homosexuality, higher in ego strength and emotional stability, control of impulse, strongly independent, and intelligent (IPAT, 1961). One gets the picture of a fairly well-adjusted person with a few quirks. Over half of Barron and MacKinnon's subjects would be described as the Jungian intuitive introvert--a type not considered healthiest in our "other-directed," pragmatic American culture. (Ann Roe, 1952, incidently, is highly critical of the American overemphasis on social extraversion in the assessment of psychological health.)
Lombroso states women are too conservative to become geniuses (Lombroso, 1896, Chapter 2, Part 2). Galton (1892) limited his studies to men, since his focus was on heredity and few women geniuses could pass down eminence to offspring since such women were "shy, odd-mannered, self-assertive, dogmatic, and therefore not attractive to men." We see by titles of scholarly works that genius is within the realm of men--The Psychology of Men of Genius; English Men of Science, American Men of Science, Heroes (not heroines) Hero Worship and the Heroic. (Simone de Bouviour, 1949, states "man" is a pronoun both masculine and neuter--including both man and woman--but that as the case may be the "man of genius" is specifically a male throughout history).

Admittedly women are attributed characteristics which are not conducive to high achievement. (The writer uses the term "attributed" because many of the attributes of women are the results of prejudicial stereotypes. Of course, others can be empirically grounded.) The woman may be seen as crafty, deceitful, lacking in "character" (very unlike Carlyles' hero); too fickle for concerted efforts; too emotional to exercise logic effectively; too conservative to innovate; too passive to assert herself in the face of criticism; too "faint-hearted" for the courage that leads to greatness; too concrete to exercise abstract abilities and hence, creativity; too inhibited to express creative urges; too involved with sex and love to focus energies on more important events. A more kind comment is "the woman behind the man" notion, wherein woman is seen as an essential auxilliary in male greatness. Idolizers of the motherhood role of women have claimed the
supreme creation is the creation of life, and women satisfy creative urges in childbearing. Alternatively, essentially low achievement of adult women is also being explained as suppressions from society as seen in outright discrimination in employment, the nuclear family with its duplicated and alienated labor of the housewife, restrictive sex-role training in childhood; sexual object glorification; the training of women for consumerism versus productivity; patriarchal type society with pervasive male preference. For insightful and scholarly discussion of the dilemma of women, the reader is referred to Millett (1969); de Bouviour (1949); Masters and Lea (1964); J. S. Mill (1869); Jesse Bernard (1966); Betty Friedan (1963); V. I. Lenin (1934); Amundson (1971) to name only a few. To reiterate, few women become eminent; therefore the few studies which cast light on sex differences in creativity are limited to less eminent women and school girls—a type of creativity not unimportant but less influential than genius or greatness.

Few studies focus on sex differences in creativity; however, selected findings will be reviewed here. Females do not gravitate to the sciences; they appear to prefer more the arts. Anderson found females use narrower categories than males, are more rigid, simple, and hence, cognitively less creative; Wallach and Kogan (1965) noted females are reinforced for restraint and are more cautious and dependent. Torrance (1962) and Guilford (1961) discovered females are less original on tests of divergent thinking; and originality is correlated most highly with creativity in general; females have a tendency to be more talkative and fluent, but fluency has a lower correlation with overall creativity.
Helson (1968) found different creative styles in the sexes among mathematicians. Males create in a patriarchal or Newmans "Alpha" style (more deductive); females, in a matriarchal, "Beta" style. Creative females were less confident and effective, more passive than male counterparts, and unlike male creative mathematicians, who did not differ from controls, differed from non-creative female mathematicians in being less conforming, less sociable, more introverted, less self-acceptant (Helson, 1966). Helson (1967) did not find that the Jungian procreative archetypes were influential in creative style (i.e., no cross-sexual identification). Women with imaginative and artistic interests were just as masculine as, but more original and need achieving than control Ss (Helson, 1966b). Creative women described themselves as ambitious, persevering, and serious on the Adjective Check List and negative adjectives were selected to describe their parents. Of childhood interest clusters, Helson (1965) noted "social interaction" was inversely related to adult imagination and artistic interests.

Vernon (1971) found a positive correlation between teachers' ratings of adjustment and sociability and creativity in girls but not in boys. Vernon is of the opinion convergent thinking accounts for much of the variance in divergent thinking tasks for girls, but not for boys; girls take these trivial tasks seriously, whereas boys do not. (Hence the validity coefficients of divergent thinking tests for girls are higher.) Getzels and Jackson (1962; p. 20) also found higher correlations between intelligence and divergent thinking tests for girls than for boys.
School achievement, Kagan learned, is higher in females in the lower grades, but higher in males in the later school years. Kagan claims the primary school, seen as "feminine" encourages obedience, decorum, inhibition of aggression, causing boys to suffer from sex role conflicts (Kagan, 1967; p. 156-158). Justifiably he sees need for change in the primary school to give boys greater advantage, but neglects the problems arising for girls in later years in a male dominated society. Females shy away from competition and achievement in later years and turn to love and security needs.

Terman was unable to assess the "achievement" of gifted females because most often they gave up careers and became housewives. The consequent loss to the arts and sciences, Terman states, "must be debited to motivational causes and to limitations of opportunity rather than to lack of ability" (Terman; Vernon, Ed., p. 58).

Helson's studies (in Barron, 1969) of female Mills college students with the live-in assessment techniques yield interesting results: The creatives are seen as a highly independent non-conforming sort, who share with males elevated MMPI scores coupled with high level integration on the California Psychological Inventory. However, from interviews one gets the impression they are more subjectively unhappy than either creative males or non-creative females. They cry more often, report overwhelming feelings of emptiness, aloneness, and desolation, and are quite commonly preoccupied with thoughts of death and suicide. Barron empathically surmises the dynamics:

Perhaps these findings simply reflect greater emotional intensity in these potentially creative women, but perhaps they also tell
us something of the existential reality deeply experienced by young women who sense their own potential and yet despair at the prospect before them when they move out into a world which demands that they either sacrifice their femininity or their intellectual activity (Barron, 1969, p. 111).

Perhaps, their unhappy response is to their "condition" rather than to emotional instabilities, for on all personality traits in the IPAT studies they were equal to males and unlike other non-creative females.

As in all studies of sex differences, Terman, too, found numerous differences between the sexes, but many differences were mediated by giftedness. For example, gifted women who did not go to college had less satisfactory mental adjustment and a higher divorce rate, whereas in males adjustment was inversely related to schooling. The percentage of suicides was below the expected in the case of males, but above expectancy for gifted females. A greater frequency of females than males had more liberal political attitudes (more Democrats vs. Republicans) and Terman found a positive relationship between liberalism and less satisfactory mental adjustment (Terman, Vol. IV, V, 1947, 1959). Though reports of "worrying" and "griefs" are just as frequent in the gifted as in controls; females reported these subjective states more and nervousness increased in frequency in later school years in females but not in males (Terman, Vol. III, 1930). In childhood gifted females are rated highest of all groups on character traits, except "trustworthiness," so there is some validity to the "deceit" attribute in women (Terman, Vol. I, 1925; Hartshorne and May, 1928).

The relationships among creativity, giftedness, achievement and eminence are complex, sex being an important moderator variable. We
might conceive of males as higher "need achievers" (MacClelland, 1953) functioning in a social environment which encourages achievement. The "need to be loved" takes precedence over "n Ach" in females, who function in a social environment which discourages achievement and produces conflict in high need achieving women. In any case, it appears that high potential is not brought to fruition in females; and we can hypothesize some unfortunate personal consequences.

The Artist-Scientist Distinction in Creativity

Opinion among researchers is divided on the question of whether there are different personality structures and creative processes for scientists and artists. Gordon's "synectics" research purportedly demonstrates that artists and scientists alike freely exercise fantasy in the creative process (Gordon, 1961); he sees them as more alike than different. Anne Roe (1952) has shown creative scientists use considerable story-like fantasy in creation that we might not have expected in cool, logical minds.

Cattell's (1968) scientist profile (cool, detached, slightly introversive, logical, independent, stable emotionally) is consistent with findings of other investigators (Roe, 1952; Knapp, 1963; Taylor, 1964; MacCurdy, 1956; McClelland, 1953; Barron, 1969); however, on the basis of artist-writer biographies, Cattell is skeptical about applying this profile to artists. Both Cattell and Butcher (1968) expect more impulsivity, subjectivism, and aestheticism in artists and more objectivism and "verification" (Wallas, 1926) in scientific creativity. Babarick (1967) describes the creative process in
physical scientists as one of "subordination" (genus to species),
while those in the visual arts use "super-ordination" (species to
 genus). Babarick (1952) further relates "superordination" to maladjust­
ment.

Hudson (1966; 1970) devotes himself specifically to the artist-
scientist distinction. English school boys who have a preference for
the scientist role have greater respect for authority, see science as
more masculine (valuable, dependable, intelligent), are more convergent
(i.e., score higher on intelligence tests and lower on tests of
divergent thinking), and do not admit to neurotic traits, excepting for
those traits associated with excessive emotional control. On the other
hand, Hudson found boys oriented to the arts were more unconventional
in attitudes to authority, more feminine (smooth, soft, imaginative,
exciting), more divergent (lower on I.Q. tests, higher on "creativity"
tests), and are more willing to admit to neurotic traits, especially
guilt and depression. Hudson sees "frames of mind" developing from a
complex interplay of bio-genetic, educational, and cultural determinants;
therefore, an artist orientation or science orientation is deeply in-
grained.

Writers who have made speculations about race and eminence
(Galton, Lombroso, Kretschmer, Carlyle, Barron) see the "impulsive,
"aesthetic" Mediterranean peoples as producing more artists; and the
more "controlled," "intellectual," "ascetic" Nordic peoples as produc­
ing more scientists. We might also speculate that America, a more
"Nordic" culture, is more attentive to creativity in the sciences than
in the arts, not because art creates more methodological problems, but because the study of scientists is more valued in America.

Albeit data on the artist-scientist distinction is sparse and conflicting, the writer maintains the distinction in this study in order to learn more about it. Certainly there is enough experimental evidence and informed speculation (which has much to commend it) so that the distinction cannot be discarded.

Perhaps a word should be said about the artist-scientist distinction as it relates to intelligence and adjustment. Almost all researchers describe the scientist as "highly intelligent" while the artist is merely "intelligent." Cox (1926) found lower I.Q.s in artists than in scientists, statesmen, and critical writers (though still above average); Buckhart (1967) also found a similar pattern. Wallach and Kagan (1967) found a poorer adjustment in highly creative students when they were less intelligent than more intelligent creatives. Both research findings and speculation shows more willingness to implicate observable maladjustment in artists than in scientists. Might not our definitions of adjustment (especially "control") and intelligence, (especially "functional adaptation") both be saturated with a scientific orientation? The writer thinks they are inseparable. If this hypothesis is so and if we do apply the cultural definition, we might conclude the artist is both less intelligent and less well adjusted. The writer recalls a humorous incident when she was conducting her M.A. thesis research: She asked art department secretaries "Is it true what they say about artists being neurotic?" Both secretaries burst out
laughing and stated almost in unison, "In this department it is!"
Later contacts with other artists have been consistent with the "neurotic" stereotype, though admittedly such "evidence" is anecdotal.

Complexity-Simplicity in Creativity

Perceptual "complexity vs. simplicity" is a phenomenon discovered by factor analysis of a specific research instrument—the Welsh Figure Preference Test (Welsh, 1959). Though numerous temperament tests are far superior to art preference tests in diagnosing personality, (Kloss and Dreger, 1971) and though tests specifically designed to assess talent are far superior to the WFPT in assessing talent, still researchers continue to find suggestive correlations between aesthetic preferences and personality traits. For example, Child (1965) found complexity preference correlated to "tolerance of ambiguity," greater self-report of anxiety, more flexibility, and independence of judgment; Child failed to show a relationship between complexity and originality. Pryon (1966) found greater rigidity and dogmatism in students who preferred the simple rather than complex designs. Knapp (1959) found both younger children and lower class persons (both less "socialized") preferred the simple versus the complex. Weber (1927) demonstrated a positive correlation between complexity and I.Q. and grades. Eisenman (1968) showed low anxiety persons reject complexity; while those with moderate anxiety, females, and later-borns prefer complexity. A correlation between creativity as measured by the Personal Opinion Survey and preference for complexity was also demonstrated by Eisenman (1967).
In a study of the artistic productions in ten cultures, Barry (1957) discovered a direct association between "severity of socialization" and preference for complexity. Barron and Welsh (1952, 1952a) found a difference between artists and non-artists, the artist preferring more complex-asymmetrical designs and being more psychopathic, cynical, pessimistic, depreciative, overtly hostile, socially dissident, and more tasteful. Barron (1952b) also found students preferring simple designs to be more stable, regular, balanced, traditional, and authoritarian; those who preferred the complex and assymmetrical showed opposite traits.

In the decade of the sixties Barron conducted intensive and extensive studies of eminent persons and creative college students at the Institute of Personality Assessment and Research. The following review of many studies is consistent with Barron's earlier studies of complexity and aestheticism (Barron, 1963, 1968, 1969). Complexity preference on the WFPT is significantly correlated with independence of judgment; "complexity Ss describe themselves as 'quick' and 'temperamental' on the Adjective Check List, while "simple Ss" choose "deliberate" and "dreamy"; complexity preference is significantly related to originality in graduate work and "tolerance of ambiguity"; a "sane" attitude to disarmament correlates with complexity; more original scientists vs. less original scientists, like artists, score high on the WFPT, show more aestheticism; the WFPT can predict creativity in men, but not in women since the latter have higher scores in general (McWinnie, 1967); Barron was able to demonstrate the genetic
basis of stimulus preferences via twin studies, but additionally, he showed that "creativity training" produced a positive shift in WFPT scores.

How then does complexity preference and tolerance of ambiguity relate to artists and scientists? It is unfortunate that many researchers equate "artist" with "creative," and do not make a distinction between creative and non-creative artists. In the case of scientists such distinctions have been made, with the finding that the scientist's "need for order" is combined with a "resistence to closure" and tolerance of ambiguity. Less creative scientists have a need for order but have less tolerance of stimulus complexity (Barron, 1969). Research showed (IPAT, 1961) that physical scientists are aesthetically sensitive to music but not the visual arts. We might hypothesize that more scientists than artists-in-general are "uncreative" as Barron conceptualizes creativity. Indeed, one writer the researcher encountered went to the extreme of concluding scientists, unlike artists, cannot be creative because they merely analyze facts that are already there. (This extreme view is coincident with the layman's approach to creativity--when you ask him to take a "creativity test," having no other information, he says, "But I can't draw."

Relationships between complexity preference and adjustment are very complex. Those who prefer more complexity and are more creative share with neurotics and psychopaths elevated scores on various adjustment scales (MMPI, CPI, Welsh Adjustment Scale, Rorschach, Thematic Apperception Test), yet, unlike clinical groups, show higher ego
strength. Barron (1969) employs the "creativity paradox" to explain these findings. In a similar vein, the present writer implicates Jung's "tension of opposites" which generates creative energy.

Creativity via Temperament Traits: The Adjective Check List

The reader may have noted from preceding discussion that researchers are definitely interested in discovering temperament traits of creative persons, but generally temperament is assessed after the creative person has been identified by cognitive abilities or peer reputation. Very few studies concern themselves with the identification of creative persons via temperament, itself, though many consider this approach promising.

Eisenman (1967) developed the 30-item "Personal Opinion Survey" to select "creatives." The test is composed of five "personality tests" taken from Child's findings on aesthetic judgment and personality correlates in college students (Child, 1965). Though the test correlates with complexity preference and aesthetic judgment, validation studies are needed to determine its efficacy in identifying creatives-in-general (if there is such a "type").

Recently several investigators have attempted to develop and validate a scale of creativity from the Adjective Check List. Domino (1970) developed a 59-item creativity scale by contrasting adjective selections of male college students selected by teachers as "creative" compared to controls. Smith and Schaefer (1969) administered the Domino and other adjectives scale to 800 male and female high school students
in art-science-writer groups in developing a 27-item creativity scale, which held up in cross validation. The creativity scales of Domino, and Smith and Schaefer are presented in Table I.

As would be expected the Domino scale "shrunk" when applied to a different validation group. However, nineteen adjectives held up in cross validation, a remarkable agreement considering the different composition of the validation groups. Many of the adjectives are consistent with findings of other investigators who have employed other personality tests. (Interestingly most of these adjectives do not appear on a list developed by Barron contrasting high and low scores on "complexity preference" Barron, 1968. More characteristic of radical aestheticism, Barron's adjectives are decidedly more negative, for example, "gloomy," "unstable," "pessimistic," "irritable," "pleasure seeking," "temperamental," etc.).

No sex differences appeared in the cross-validation study (Schaefer and Anastasi, 1968); the Schaefer creativity scale discriminated between creatives and controls in both sexes. Also, though some differences appeared between art and science groups, these differences were not statistically significant. So it appears the Adjective Check List creativity scale is a promising instrument in discovering "the creative personality."
### TABLE I

#### ADJECTIVE CHECK LIST CREATIVITY SCALES

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The Criterion Problem in Creativity

All generalizations made from studies of creativity must be hedged by the statement, "creativity, as measured in this study." Creative samples range from elementary school pupils to highly eminent geniuses, and there is no one agreed upon criterion of creativity. In the case of eminence, creativity is determined by peer recognition via number of citations in "Who's Who" type collections. Non- eminent "low level" creativity is studied mostly by peer or teacher nominations and performance of the Guilford-type divergent thinking tests. When a creative product of non- eminent creatives is assessed, its merit is judged by raters rather than by "recognized" merit in the real world.

Outstanding reputation is probably the best criterion of creativity, but few research subjects can meet this criterion; it is difficult to study highly eminent persons in that they are either inaccessible or deceased. Certainly there is a need to identify potentially creative persons in a society beset with numerous technological and social problems.

Other than "outstanding reputation" several creativity criteria have been employed in studies, and any of these alone have questionable validity. Several investigators confuse "talent" with creativity, when they study "creative" artists vs. non-artists. Creative persons are often talented in many areas but talent, per se, is not a sufficient condition for creativity. Peer recognition in industrial creativity is not sufficient; often the person who gets the credit for research productivity is not the staff member with the most creative ideas.
Analysis of contributions of team research members indicates all kinds of research styles, not only creativity, eventually result in a creative product (Gough, 1960; Taylor, 1963). Tests of divergent thinking correlate with teacher and peer criteria, but have not been shown to be predictors of eminent creativity (MacKinnon, IPAT, 1961). Rather, tests of divergent thinking have construct validity, but not demonstrated predictive validities. Also, there is serious question about whether speeded tests of divergent thinking are measuring convergent rather than divergent thinking; Wallach and Kogan showed these tests have greater validity when administered under relaxed, informal, non-speeded conditions (Wallach and Kogan, 1965). Also, female students get higher scores on many divergent thinking tests, yet females do not actually demonstrate creativity in later life; how can we say these tests are any different from any other trivial convergent ability tests (Vernon, lecture, 1971). An additional problem with divergent thinking tests is unreliability of scoring; the reliabilities of scoring open-ended responses are lower than those for objectively scored responses. High scoring reliabilities have been demonstrated, but they are not uniformly high on divergent thinking tests. (Torrance reports reliability coefficients ranging from .60 to .90; Guilford, .60 to .85.) Those who seek to develop objectively scored creativity tests (Mednick, et al., 1967; Lawshe, et al., 1957) measure convergent intellectual abilities, not divergent thinking and hence, creativity. Vernon (1971) questioned whether several for the Guilford tests used by Torrance measure divergent thinking at all.
Over and above the question of whether divergent thinking tests measure divergent thinking, is the question of whether divergent thinking, itself, sufficiently measures creativity. Creative scientists themselves (Golovin, 1963) question this assumption, stating that convergent thinking is also important in creative production. And, of course we know that intelligence (convergent thinking?) correlates positively with creativity in unselected populations. To reiterate, the validity of divergent thinking tests is still questionable, and more research needs to be done.

Several researchers have shown peer nominations and teacher nominations of creatives suffer halo effects. Teachers prefer high-achieving conforming students and do not select many potentially creative, and behaviorally divergent students (Getzels and Jackson, 1962; Torrance, 1966; Yamamoto, 1964; Wallach and Kagan, 1965). Yamamoto (1964) has shown that the validities of teacher nominations can be improved when teachers are provided with criteria of creativity. Torrance has advanced several criteria for nominations, for example, "comes up with the most ideas in class," "has unusual ideas," etc. These criteria are coincident with Guilford's factors of flexibility, originality, fluency, and elaboration. When teachers employ these criteria, then, nominations correlate with performance on divergent thinking tests.

Jackson and Messick (1965) developed a criterion of creativity based upon the aesthetic response of the observer. The creative activity produces in the observer "surprise," "satisfaction," "stimulation,"
or "savoring." Who can deny that an Einstein, Keats, or Van Gogh produce these aesthetic responses in the appreciative observer? Though purely theoretical at this point, Jackson and Messick's model is provocative.

More recently exclusive focus on the creative "produce" has been criticized, and researchers claim we need to look at the creative "person" and creative "process." There are numerous sticky problems in universal application of process concepts. Creative production in the real world does not follow the sequence advanced by Wallas (1926). Creative processes themselves do not always result in creative production. There is much difficulty in identifying and measuring creative process; what merit process has must be gleaned from anecdotal essays (Ghiselin, 1952; Poincare, 1952; Bergson, 1946; Koestler, 1964). Gordon's analysis of "synectics" is provocative but difficult to measure (Gordon, 1961).

Personality characteristics of the creative person are more promising. However, most studies of creatives merely show personality correlates of creativity, and do not show that these characteristics are sufficient for creativity. Few have attempted to develop temperament scales of creativity. Adjective Check List creativity scales (Smith, D. C., et al., 1969; Domino, 1970) and Eisenman's (1967) Personal Opinion Survey are among the few scales designed to identify creativity via non-cognitive measures. Personality scales of creativity are promising, but very little research has been done with them.
What researchers have demonstrated however, is the need for approaching creativity complexly. Taylor's (1955, 1957, 1959, 1963, 1964) research with scientists and Guilford's (1967) research with the structure-of-the-intellect model have pointed to the need for analyzing many different "creativities." Researches by Babarick (1966) and Hudson (1970) have shown that creativity in scientists and artists is different. Taylor (1971) even ranks "creative" ability ultimately as high as other intellectual abilities in creative production, which makes the construct of creativity more specific and less meaningful in the ability hierarchy. Generally investigators recognize a need to look at specific creative abilities, but when they do so, they do not do justice to the larger phenomenon of "creativity."

The question posed for this study, then, was how could creative high school students be identified? The researcher chose the Torrance-Yamamoto approach of nominations with specific criteria, but included in the criteria Messick and Jackson's aesthetic response criteria (Appendix B). To encourage teachers actually to use the criteria provided, they were asked to circle the criterion they used in selecting students. It was hoped that the selection of creative students would be improved by use of multiple nominations, however this plan could not be applied since the majority of Ss were nominated only once; multiple nominations were a function of teacher-student familiarity and occurred only in the small Continuation schools. Creativity was measured by several tests of divergent thinking; another measure of creativity--the ACL creativity scale--(since it was less well researched),
was treated as a predictor variable, not a criterion of creativity. In this more-or-less creative sample of students (5% of the total school population), creativity as measured by divergent thinking tests was treated as a variable. In view of the selection process and the absence of norms for 16 and 17-year olds on creativity measures, one can only state that the variance in the creativity tests consisted of a range of "moderate creative abilities" to "moderately high creative abilities." So-called "non-creative" students were not studied; nor can one make the claims he is studying "creative" students.

Cognizant of the fact that creativity might better be studied as specific creativities rather than undimensionally, the researcher analyzed two creativities. The creativities identified in this study were not pre-selected but grew out of the research. Individual "factors" of creativity correlated more with verbal or figural tests than with each other across these tests, so "verbal" and "figural" creativity were selected for analysis, rather than Guilford's "factors." The figural test was uncorrelated with the verbal measures, and the latter two measures were positively correlated with each other.
HYPOTHESES

The researcher investigated the following selected hypotheses on the basis of suggestive elements in past studies and theories of creativity:

1. Creativity, in general, is more characteristic of males than of females. It is expected that there would be an overall bias in favor of males even at the adolescent level. Teachers will nominate males as "creative" significantly more often than females.

2. Females high in creativity will show greater maladjustment than creative males. It is expected that creative females will have higher neuroticism scores on the Maudsley Personality Inventory, and lower socialization scores on the Socialization scale of the California Psychological Inventory. Adjustment is not a relevant variable in male creativity.

3. An occupational orientation towards art will be associated with greater neuroticism and lower socialization; for science, the converse is expected.

4. Art vs. science is a significant variable in creativity: Those with an "art" orientation are expected to have a more divergent life style as well as higher scores on tests of divergent thinking; the "science" orientation may be associated with a more convergent life style and lower scores on tests of divergent thinking. That is, those with art preference should be more creative than those with science preference as creativity is measured by divergent thinking tests.

5. Preference for complexity on the Barron-Welsh Art Scale is associated with higher creativity for both sexes, however, creative females should have higher complexity scores.

6. Creativity should vary directly with Schaefer's creativity scale, regardless of sex or type of creativity. More creative Ss will select more "creativity" adjectives than their less creative peers.

The following hypothesis is advanced as a hunch or "best guess" about creative styles as these relate to type of school and
socio-economic status. Traditional schools favor verbal abilities and deemphasize figural abilities. It is known that "non-verbal" students who fail in the regular schools are able to experience success in schools stressing non-verbal abilities, more industrial arts, less abstract, but more direct purposeful, experience--stressing abilities more akin to "figural" creativity. It is also known that students in "continuation schools" have lower socio-economic status in general; and lower SES in general is often characterized by lower verbal ability or as "non-verbal." Therefore,

7. It is expected that type of school and concomitant socio-economic status affects differentially verbal and figural creativity.
   a. Verbal creativity should vary directly with SES and be higher in the regular schools.
   b. Figural creativity should vary inversely with SES and should be higher in students in the continuation schools.
METHODODOLOGY

Subjects

Subjects were 99 males and 59 females selected from Junior and Senior classes in five high schools in the San Juan School District in suburban Sacramento, California. Three of the schools were traditional in curriculum, instruction, and student personnel, while two were special "Continuation" schools with non-traditional curriculum, instruction, and pupil personnel. Generally, continuation schools are for students who do not "fit" into the regular schools--students are described as "acting out," more "neurotic," and are not able to succeed academically or socially in traditional schools. Continuation school students are characterized as both troublesome and troubled; their problems are emotional-social, not organic or physical as seen in other specialized schools. (It is interesting to note the reactions of administrators in the continuation schools when the researcher confronted them with her study. Their first response was "I doubt you'll find creative students here." Later response, after reading creativity criteria was of the nature, "Students here are more creative than in the regular schools--for example, they are creative in knowing how to pick a lock and get out of work--but you might not call that creative by your definitions.")

The three regular schools were selected with an eye to a wide sampling of socio-economic statuses. Two of the schools were the
"cream of the crop," and the third regular school represented a good cross section of the white suburban population. All of the schools were predominately white, with a mere handful of Mexican Americans and Oriental Americans, and virtually no Blacks.

**Procedure**

A letter was written to teachers (Appendix A) introducing them to the research. The researcher provided forms for teachers with the following instructions and criteria for nominating creative students:

Please study carefully the following statements in order to nominate students from your classes; refer back to all statements when you think about each student you nominate:

1. This student has WON PRIZES OR AWARDS in science, art, speech, composition, or music.

2. This student has PRODUCED IN CLASS (or elsewhere) specific apparatus, mechanical inventions, essays, poems, music, drawings, or paintings, etc. which appear to have CREATIVE MERIT compared to his peers.

3. This student occasionally SAYS or DOES things in class which make YOU feel SURPRISED, SATISFIED, AMUSED, OR STIMULATED TO THINK.

4. This student often SAYS or DOES things in a new and UNUSUAL way.

5. This student seems to come up with the MOST ideas in class.

Now, think of each class period and list any students you think fit one or more of the above statements. Beside each student's name be sure to circle the number or numbers of statements you used in selecting that student. If you used more than one statement, circle more than one number.

Students had been enrolled in classes for about twelve weeks so it was expected that teachers knew their students well enough to select students thoughtfully. Teachers returned their nomination forms after
one week to the researcher.

Students were invited to participate in the research voluntarily in a letter acquainting them with the research and the researcher (Appendix C). According to District rules, students had to obtain parental permission in order to participate. (Almost all parents returned signed permissions to the researcher in an envelope provided them.) To encourage student participation, the testing sessions were held during school hours, and a majority of students preferred to get excused from classes for the research.

Materials

Excepting for timed creativity tests, students were permitted to work on questionnaires at their own pace. Students responded to the following battery of tests and questionnaires:

1. **Personal Data Sheet.** The PDS is a questionnaire designed by the researcher to get basic identifying data—sex, SES, grade, etc. and other information of interest to the researcher.

   One question was employed to learn art-science orientation:

   "If you had to choose only one which would you choose to be: (a) artist or writer, (b) scientist?"

2. **Barron Welsh Art Scale, Short Form** (Welsh and Barron, 1959)

3. **Adjective Check List, Creativity Scale** (Smith and Schaefer, 1969)

4. **The Alternate Uses Test** (Guilford, *et al.*, 1960)

5. **Thinking Creatively with Pictures, II.** (E. P. Torrance, 1966)

6. **Consequences Test** (Guilford, *et al.*, 1961)

7. **California Personality Inventory, Socialization Scale,** (Gough, 1964)

8. **Maudsley Personality Inventory** (Eysenck, 1962)
The three creativity measures were selected with several considerations: They were interesting to adolescents. Both verbal and non-verbal abilities were tapped. Scoring systems and data on reliability of scoring were provided by the test authors. All three tests could be administered in less than one hour, or one class period.

The CPI, So Scale and the MPI were chosen for this study for the following reasons: The investigator sought to tap adjustment in a non-clinical population; therefore, available adjustment questionnaires measuring clinical syndromes were not appropriate. The scales employed measure two major kinds of maladjustment focused upon in this study—a subjectively uncomfortable, "neurotic" type with anxiety symptoms, and an acting-out or anti-social type of maladjustment, neither of which need reach clinical proportions in a more-or-less normal population. The scales are appropriate for adolescents and norms have been provided by the test authors. Both scales have been well-researched. These scales were less time-consuming than lengthier, equally-good tests. (After careful consideration, the researcher felt these tests could measure "adjustment" better than an experimental scale she had been designing for the study. There was approximately a 66% overlap between her own questions and those on the MPI and CPI, So Scales.)

Statistical Analyses

Frequency counts on all variables were taken to determine general characteristics of the sample. Also, frequency counts on all variables were made on males and females, separately and on "art" student and "science" students with an eye to discovering differences in groups.
All variables were subjected to correlational analysis in order to (1) determine the significance of correlations predicted by hypotheses; (2) preselect significant variables for further analysis; (3) determine what, if any, analysis of creative abilities would be most appropriate. (Would an analysis of Guilford's factors of fluency, flexibility, originality, and elaboration be justified by the intercorrelations of creativity measures? Or would Torrance's "verbal" and "figural" creativity provide a more reasonable analysis?)

Means and standard deviations were derived on all variables for males and females, and art and science groups, in order to discover significant differences among these groups.

Additional correlational analyses were performed for male, female, art, and science groups. In this way, sex and art-science preference could be treated as "moderator variables," i.e., moderating the relationship between other pairs of variables.

Finally, variables were selected from the correlation matrix and treated as predictor variables in canonical correlation. Total verbal, figural, and total creativity scores were treated as criterion variables. From this analysis the relative strengths of variables in predicting creativity could be evaluated.
RESULTS

Characteristics of the Sample

Type of School

Approximately 75% of the subjects were in regular schools, and the remaining 25% were continuation school students. This is not surprising since the regular schools had much larger enrollments.

Ethnic Background

Determination of ethnicity was incomplete in that 50% of the subjects claimed "mixed, other." Of the half who chose one category, 80% were Anglo-Saxon and German, and the remaining 20% were "Mediterranean" and "Slavic." Interestingly only 2% of females (compared to 16% males) claimed a German heritage; it may be that females do not identify with the German "patriarchal" culture, rather than a chance occurrence. Terman, also, found a predominance of Nordics in his study of gifted 50 years or so earlier.

Religion

Roughly 46% of students claimed Protestant religion, 15% chose Catholic, and 3% claimed Jewish. More than a third of subjects claimed no religion, atheist, other, or did not respond at all to the question. A "no religion" response is not surprising for many of these students are descended from early pioneers who had no church, and in a sense, no religion. It may also be that students today are
questioning established religion (established anything), and resist being "labelled" or "slotted" on any criterion.

Age

All but 3% of subjects were ages 16, 17, and 18. Most students in the continuation schools were 18.

Socio-economic Status

Sixty percent of fathers were in the managerial-professional occupational categories; 40% were distributed equally among seven other occupational categories of U.S. Census Bureau classification system. Mothers' occupational status, since most were housewives, did not influence significantly socio-economic status. Though the distribution of father's occupational status is skewed in the direction of higher occupational status, both father's and mother's education is normally distributed from "elementary school" to "Doctor's or Professional degree."

Socio-economic status variables (father's occupation, mother's occupation, father's education, mother's education, and total SES score--sum of the preceding four variables) correlated significantly with about one-third of all other variables. The following generalizations can be made from statistically significant correlations.

Higher socio-economic status (combined SES scores) is associated with:

1. being enrolled in a regular vs. continuation school;
2. higher scores on the CPI Socialization scale;
3. lower preference for Simplicity on the BWAS;
4. higher total creativity test scores (combined);
5. higher scores on verbal creativity measures;
6. preference for science vs. art;
7. less drug use claimed.

Variables associated with higher SES of the father, but not the mother include:

1. higher scores on the CPI, Socialization scale;
2. identification with the mother vs. the father;
3. greater fluency on the figural test of creativity;
4. lower Neuroticism on the MPI.

Variables related to higher SES of the mother, but not the father are:

1. preference for science vs. art;
2. report higher grades in school work;
3. greater flexibility on the figural test of creativity;
4. higher self-ratings of intelligence.

The differing influences of mother and father are not as one might predict. Science preference, for example, is not ordinarily attributed to mother influences. Socialization is father-related; yet it is the mother who is the primary agent of socialization. Also, that high father SES is associated with a mother identification indicates the mother influence, not the father, may be responsible for socialization in families with higher SES fathers.

Residence

Seventy-five percent of Ss had lived in Sacramento most of their lives. Another 13% had lived within California most of their lives, while only 12% were from out of state. This population, therefore, had more "roots," stability than was expected, since the Sacramento population in general is characterized by high mobility and instability.
Sports

Approximately 76% of males and 80% of females claimed a liking for sports. There were no significant sex differences on this variable, then, in the creative population.

Parent Identification

Fifty percent of all Ss selected the mother as the parent they are most like, 36% chose the father, and 13% did not respond to the question. Greater mother identification among creative adolescents has been found in past studies. Significant sex differences in parent identification appeared, however; both males and females identified with the opposite-sex parent and the difference was statistically significant (see Table II). Jung's bi-sexual hypotheses has not been supported in other researches, but it bears out in this study.

<table>
<thead>
<tr>
<th></th>
<th>Mother</th>
<th>Father</th>
<th>Non-response</th>
</tr>
</thead>
<tbody>
<tr>
<td>females*</td>
<td>20 (34%)</td>
<td>29(50%)</td>
<td>10 (16%)</td>
</tr>
<tr>
<td>males*</td>
<td>61 (62%)</td>
<td>28(28%)</td>
<td>10 (10%)</td>
</tr>
</tbody>
</table>

*Chi Square significant at .01 level, with df =1.

School Subjects Liked/Disliked

Half of all Ss dislike academic school subjects, i.e., science, humanities, and prefer instead non-academic subjects--arts and crafts,
vocational-mechanical courses, etc. As would be expected, more males than females liked science subjects, and more females than males preferred the humanities. Both sexes ranked humanities above sciences, however.

**Drug Use**

Half the Ss claimed no drug use, and the other half admitted drug use in varying degrees. More males admitted experimenting with drugs. Also, Ss in the continuation schools admitted more drug usage. This latter finding is consistent with school administrator's assessments. Lower drug usage was associated with higher scores on the verbal Consequences Test, but not other creativity measures. (The Consequences Test requires more abstract verbal intelligence than do the other creativity tests.)

**Grades in School**

Only 15% of Ss report school marks of "C" or lower. Even students in the Continuation schools report high grades, because they are in fact awarded high grades in their new school, whereas they were failing in the regular school. Females report grades of "A" significantly more often; males report "B's." The creative Ss can be described as above average in school achievement, a finding consistent with other studies of creative adolescents.

**I.Q. Self-report**

Sixty-five percent of Ss rate themselves as having above average intelligence. Males rate themselves as "Superior" three times
as frequently as do females. Although empirical data on actual intelligence is not available, the researcher feels female self-report was influenced by a tendency to devaluate one's own abilities. Conversely, a tendency among males to over-evaluate their own abilities is suspected.

**Giftedness**

Only 13% of Ss had been identified by the school district as "gifted," i.e., scores above 135 on I.Q. measures. None of the subjects in continuation schools were gifted. The researcher surmises from comments from administrators and teachers and from Ss self-reports of intelligence that the Ss as a group were above average in intelligence, but, for the most part, not superior in intelligence. This finding is consistent with research on the relationship between intelligence and creativity. More males were identified as gifted, a finding consistent with Terman's work.

**Nominations**

Roughly 7.7% of the total school population was nominated as creative; 5% of total population actively participated. Eighty-three percent of Ss were nominated by only one teacher. Multiple nominations occurred more often in the continuation schools where teachers have fewer pupils and greater familiarity with them. One cannot conclude therefore that continuation Ss were more creative than Ss in the regular schools. Teachers employed multiple criteria in nominating students in half the cases. Single criteria most frequently used were
"outstanding class work" and "saying or doing amusing or stimulating things." Single criteria used infrequently were "outstanding merit," "unusual ideas," and "most ideas." From talks with teachers the researcher has the impression they found many of their students "amusing" but were not impressed by anything they would call "creativity."

Ss were nominated from the following school classes: Social Studies-28%; English-Journalism-23%; Arts and Crafts-18%; Music-5%; Science and Math-5%; Commercial-5%; more than one subject-11%; other than teacher-4%. It is interesting that most Ss were nominated in academic subjects, in view of the fact that 50% do not choose these subjects as "liked most."

Sex Bias in Nominations

Hypothesis #1

Taking into account the actual ratio of males to females in the school population, males were nominated as "creative" significantly more often than females. As would be expected, there were significantly more males among the students who participated in the study (Table III).

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominated*</td>
<td>Expected 123</td>
<td>Expected 115</td>
</tr>
<tr>
<td></td>
<td>Observed 152</td>
<td>Observed 86</td>
</tr>
<tr>
<td>Participating*</td>
<td>Expected 82</td>
<td>Expected 76</td>
</tr>
<tr>
<td></td>
<td>Observed 99</td>
<td>Observed 59</td>
</tr>
</tbody>
</table>

*Chi-Square significant at .01, where df = 1.
The male-female ratio in the school population is about 1.1/1, but males were selected by their teachers almost twice as often as females. The ratio for those participating is reduced (though still significant) to 1.5/1 because females were apparently more willing to participate in the study. To see whether this sex bias was due to the predominance of male high school teachers, the nomination patterns of each sex were analyzed (Table IV).

**TABLE IV**

**SEX OF TEACHER AND SEX OF SUBJECT**

<table>
<thead>
<tr>
<th></th>
<th>Male Teacher Nomination</th>
<th>Female Teacher Nomination</th>
<th>Both Sexes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females</td>
<td>34 (58%)</td>
<td>20 (34%)</td>
<td>4 (7%)</td>
</tr>
<tr>
<td>Males</td>
<td>68 (69%)</td>
<td>23 (23%)</td>
<td>8 (8%)</td>
</tr>
</tbody>
</table>

Female teachers nominated both sexes about equally but male teachers selected male students twice as often as females. The sex bias, then, may be attributed to male preference for males. However, it should be remembered that Terman (1925), too, found a bias in favor of males in his studies of giftedness, and in that case, the nominations came predominately from female teachers. One can conclude the predominance of males in this study is due to (1) bias, per se, or (2) actual superiority of males. The writer favors the former in that males were not superior to females on the creativity tests, though admittedly such an interpretation may rest also on selective biases in the two sub-samples.
Hypothesis #2: Sex-adjustment-creativity

The prediction that females higher in creativity would evidence more maladjustment (lower socialization; greater neuroticism) was not supported. Results indicate adjustment is a relevant variable in female creativity (not male creativity) but that the direction of influence is opposite that predicted. For figural creativity only, higher scoring female Ss are less Neurotic on the MPI and have higher Socialization scores on the CPI, So Scale (Table V). The relationship between adjustment and figural creativity in males is opposite that for females. High scoring males are "less socialized" students in the Continuation schools. Adjustment scores were not associated with verbal creativity tests in either sex.

TABLE V
CORRELATION BETWEEN ADJUSTMENT AND CREATIVITY IN EACH SEX

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Verbal</td>
<td>Figural</td>
</tr>
<tr>
<td></td>
<td>AU Consq.</td>
<td>PC</td>
</tr>
<tr>
<td>CPI, So</td>
<td>.11 .05</td>
<td>-.09</td>
</tr>
<tr>
<td>MPI, N</td>
<td>-.12 .02</td>
<td>-.02</td>
</tr>
<tr>
<td>MPI, E</td>
<td>.01 -.01</td>
<td>.01</td>
</tr>
</tbody>
</table>

Note: Au=Alternate Uses Test; Consq.=Consequences Test; PC=Picture Completion; MPI, N and E=Neuroticism and Extraversion, respectively. *Significant at the .05 level.
MPI, Extraversion was unrelated to all creativity measures in both sexes. Correlations between verbal creativity and MPI, E are higher in females, but they are not statistically significant. Extraversion, however, cannot by itself be considered an index of "adjustment."

Other relationships moderated by sex include:

1. Creativity was more homogeneous in males than females. All three creativity measures (Au, Consequences, Picture Completion) correlated positively and significantly in males, but were uncorrelated in females.

2. Art-science preference correlates with SES data and Figural creativity, and Socialization in males, not in females. For females only, Science preference is associated with higher Neuroticism. (That females with "male" interests should be more neurotic is interesting; it shows some consistency with Helson's findings in female mathematicians.) The difference between male and female in science-art are not significant.

3. SES is related in female creativity as well as several other variables--personality measures, grades, drug use; but is not associated in male creativity for most subtests.

4. BWAS complexity preference is higher in females than males, but the difference is not statistically significant. Lower occupational status of the same sex parent is associated with simplicity in males and complexity in females. (Barron's finding on SES and
simplicity-complexity preference holds for males but not for females.) In males only both simplicity and complexity preference is associated with MPI, Introversion; male complexity preference is associated with higher ACL Creativity scale scores.

5. Self-report of grades and I.Q. are correlated with creativity and personality measures in males, but not females.

6. As has already been stated in discussion of hypothesis #2, sex moderates the relationship between type of school (continuation vs. regular) and figural creativity. Figural creativity is higher in males in the regular schools; higher in females in the continuation schools. (Verbal creativity is higher in the regular schools for both sexes.)

Art-Science Preference and Creativity

Hypothesis #3: Art-Science Preference and Adjustment

The hypothesis that art preference is associated with greater maladjustment than science preference is only partially supported. Science preference is associated with higher socialization on the CPI. So Scale, as predicted; but neuroticism is unrelated to art-science preference in the total sample. When the data is analyzed separately for the sexes; different patterns emerge (see Table VI). Socialization and science preference are correlated for males only; neuroticism and science preference are correlated for females only. The results, then, concerning relationships between art-science preference and adjustment are equivocal.
Hypothesis #4: Art-Science Preference and Divergent Thinking

There is support for the prediction that the "art" Ss do better than "science" Ss on tests of divergent thinking; however, an analysis of all creativity subtests suggests this difference occurs on only one sub-test which happens to have had a heavy weighting in the total creativity scores (Table VII).

TABLE VII
MEANS AND STANDARD DEVIATIONS OF ART AND SCIENCE STUDENTS ON CREATIVITY MEASURES (n=109)

<table>
<thead>
<tr>
<th></th>
<th>Art (109)</th>
<th>Science (49)</th>
<th>Art</th>
<th>Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternate Uses</td>
<td>19.35</td>
<td>18.61</td>
<td>6.67</td>
<td>6.11</td>
</tr>
<tr>
<td>PC-Fluency</td>
<td>8.06</td>
<td>8.59</td>
<td>1.83</td>
<td>1.92</td>
</tr>
<tr>
<td>PC-Flexibility</td>
<td>6.50</td>
<td>6.28</td>
<td>2.23</td>
<td>1.80</td>
</tr>
<tr>
<td>PC-Originality</td>
<td>8.89</td>
<td>8.67</td>
<td>3.12</td>
<td>3.80</td>
</tr>
<tr>
<td>PC-Elaboration</td>
<td>16.97**</td>
<td>13.00**</td>
<td>6.45</td>
<td>4.46</td>
</tr>
<tr>
<td>FC-Total</td>
<td>40.31**</td>
<td>36.61**</td>
<td>9.52</td>
<td>7.66</td>
</tr>
<tr>
<td>Consequences</td>
<td>21.73</td>
<td>21.39</td>
<td>6.14</td>
<td>6.74</td>
</tr>
<tr>
<td>Creativity Total</td>
<td>81.50**</td>
<td>76.61**</td>
<td>15.10</td>
<td>14.79</td>
</tr>
</tbody>
</table>

** Alpha = .01.
Art Ss do not score better than science Ss on any verbal creativity subtests. Only on pictorial elaboration are art Ss superior, and the elaboration score is heavily weighted both in the total Picture Completion score, and ultimately in the total creativity score. One can speculate that science types are deductive-synthesizers who resist elaboration, and that art types are inductive-elaborators; but no reasonable explanation is available for this finding, which possibly could be due to chance. The researcher cannot conclude art subjects were superior to science subjects on tests of divergent thinking in general; analysis of subtest scores shows this is not the case, and the total creativity test score is misleading. Nor can we suggest "tendencies," for the differences in sample sizes make such interpretation risky. There were no differences between art and science Ss on the ACL measure of creativity.

Correlates of Figural, Verbal, and Total Creativity

Hypothesis #5: Simplicity, Complexity and Creativity

The hypothesis that complexity preference is associated with higher creativity for both sexes is not supported (see Table VIII). Neither simplicity nor complexity preference was associated with cognitive measures of creativity. Oddly enough preference for both stimulus categories were inversely related to the "temperament" measure of creativity--the ACL, Creativity Scale. (Barron's findings concerning creativity and complexity preference are not consistent with this surprising finding.) As Table VIII indicates, stimulus preferences
correlate more with temperament measures than creativity. The ACL creativity scale is a temperament measure of creativity and correlates more with other temperament measures than with cognitive measures. The pattern of significant correlations with the CPI and MPI suggests simplicity and complexity preference is associated with greater socialization and greater introversion in males and in the total sample, but that simplicity-complexity and temperament measures are unrelated in females. The degree of association between complexity, creativity, temperament measures is greater for females than males, but none of these correlations are statistically significant. (The correlations are positive for figural creativity and negative for verbal.) Also, as in previous studies, females have higher mean complexity scores than do males.

TABLE VIII

CORRELATIONS BETWEEN SIMPLICITY-COMPLEXITY, CREATIVITY, AND ADJUSTMENT

<table>
<thead>
<tr>
<th>Simplicity</th>
<th>Complexity</th>
</tr>
</thead>
<tbody>
<tr>
<td>AU</td>
<td>.05</td>
</tr>
<tr>
<td>Conseq.</td>
<td>.09</td>
</tr>
<tr>
<td>P-C</td>
<td>.02</td>
</tr>
<tr>
<td>Total Cr</td>
<td>.07</td>
</tr>
<tr>
<td>ACL,Cr</td>
<td>-.24*</td>
</tr>
<tr>
<td>CPI,So</td>
<td>-.10</td>
</tr>
<tr>
<td>MPI,N</td>
<td>.08</td>
</tr>
<tr>
<td>MPI,E</td>
<td>-.29**</td>
</tr>
</tbody>
</table>

* Alpha = .05; ** Alpha = .01.
Hypothesis #6: Cognitive Creativity and ACL Creativity

This hypothesis is supported. Both verbal measures of creativity correlate significantly and positively with the ACL creativity scale (see Table IX).

### TABLE IX

**CORRELATIONS BETWEEN TESTS OF DIVERGENT THINKING AND ACL CREATIVITY**

<table>
<thead>
<tr>
<th>Test</th>
<th>ACL Creativity Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternate Uses</td>
<td>.258**</td>
</tr>
<tr>
<td>Picture Completion</td>
<td>.029</td>
</tr>
<tr>
<td>Consequences</td>
<td>.208**</td>
</tr>
<tr>
<td>Total Creativity</td>
<td>.218**</td>
</tr>
</tbody>
</table>

**Significant at the .01 level; N = 158.

Figural creativity is uncorrelated with the ACL "temperament" measure of creativity. There are no significant sex differences in this analysis. The significant correlations between tests of divergent thinking and ACL creativity give further evidence of the validity of the ACL Creativity Scale.

Hypothesis #7: Type of School, SES, and Creativity

Type of school and concomitant SES proved to be perhaps the most significant variable in the research. It had more significant correlations (16 in all) with other variables than any other variable (other influential variables were creativity, ACL creativity, drugs,
grades, I.Q., and socialization); less influential were parent-
identification, simplicity-complexity, MPI scales, age, grade, and art-
science.

The prediction that continuation school students (with lower
economic status) would be inferior to regular school students in verbal
creativity is supported (Table X). Regular school students were superior
on both verbal creativity measures as well as the ACL Creativity
scale. However, the prediction that continuation Ss would excel others
in figural creativity is only partially supported. Continuation Ss
showed more "flexibility" on the Picture Completion task, though they
did not have higher scores on other factors on the figural test.

TABLE X

CORRELATIONS BETWEEN CREATIVITY, ADJUSTMENT,
SEX AND TYPE OF SCHOOL

<table>
<thead>
<tr>
<th>Type of School: Continuation-Regular</th>
<th>Males (99)</th>
<th>Females (59)</th>
<th>Total (158)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternate Uses</td>
<td>.118</td>
<td>.343**</td>
<td>.197*</td>
</tr>
<tr>
<td>Picture Completion</td>
<td>-.212*</td>
<td>.286*</td>
<td>-.035</td>
</tr>
<tr>
<td>Consequences</td>
<td>.303**</td>
<td>.126</td>
<td>.241**</td>
</tr>
<tr>
<td>Creativity Total</td>
<td>.046</td>
<td>.380**</td>
<td>.171*</td>
</tr>
<tr>
<td>ACL Creativity Scale</td>
<td>.165</td>
<td>.182</td>
<td>.171*</td>
</tr>
<tr>
<td>CPI, Socialization</td>
<td>.446**</td>
<td>.666**</td>
<td>.526**</td>
</tr>
<tr>
<td>MPI, Neuroticism</td>
<td>-.063</td>
<td>-.374**</td>
<td>-.169*</td>
</tr>
<tr>
<td>MPI, Extraversion</td>
<td>-.031</td>
<td>.140</td>
<td>.038</td>
</tr>
</tbody>
</table>

* Alpha = .05; ** Alpha = .01.

Analysis of sex and types of school showed figural creativity
was significantly related to type of school for each sex, but in the
opposite direction. Females in regular schools do better on the PC test, while males in the continuation school do better than males in the regular schools on the Picture Completion task (see Table X). (Naturally these differences cancel each other, so that figural creativity and type of school are not related for the total sample. The prediction then that figural creativity is higher in the so-called non-verbal Ss in the continuation schools is true for males, but not females.

Correlations between adjustment measures and type of school are included in Table X, for comparisons on creativity. As would be expected socialization is a highly significant variable distinguishing between regular and continuation schools; Ss in the continuation schools are less "socialized" as indicated by lower scores on the CPI, So scale. Females in continuation schools were significantly more neurotic than females in regular schools, and these Ss did not perform better on any measures of creativity. Continuation school females, therefore, are significantly less socialized and more neurotic than females in the regular school; continuation school males are merely less socialized. Adjustment may be a relevant moderator variable in female creativity, while for males relationships are more complex.

"Predictors" of Creativity

Many significant and interesting correlations among the 30 or so variables have been discussed and many relationships have been shown to have significant differences when moderated by a third variable. Despite all this, a general question remains: Are the
variables focused upon in this research associated with creativity tests such that they have promise in predicting creativity? Canonical corre-
lation of 13 predictors of 3 creativity "criterion" variables, suggest all the variables combined are not significant in predicting creativity--
the canonical correlation of .536, with 0 eigenvalues removed is not significant. Inspection of the intercorrelations of 16 variables (see Table XI) indicates only achievement type data and the "temperament
creativity scale" (ACL) are significantly correlated with tested creativity. Type of school, self-report of marks in school, and self-report of intelligence are all "achievement"-related. For the total sample sex,
SES, art-science preference, the Barron Art Scale, and all adjustment tests do not have strength in predicting creativity as measured by tests of divergent thinking. It may be that several of our "non-achievement"
variables may predict creativity in the real world, but not on "creativity tests." After all, creativity tests themselves do not predict manifest creativity or eminent accomplishment in the real world. Therefore, the writer cannot generalize findings in this study to demonstrated creativity-in-general.
### TABLE XI
CORRELATION MATRIX, 1 (16 VARIABLES)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
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1Only significant correlations are listed.

*Significant at .01; all others .05.
CONCLUSIONS

Hypothesis #1 was supported in that a significantly larger number of males were nominated as "creative." On this basis one might say creativity is "more characteristic" of males; however, if performance of tests on divergent thinking is the criterion, then creativity does not "favor" either sex.

Hypothesis #2 was supported, but the results were in the opposite direction. That is, adjustment was relevant in female creativity (not in males), but the two variables have a direct association, and not an inverse relationship as predicted.

The prediction that art Ss would be more neurotic and less socialized than science Ss received only partial support. Science preference is associated with higher socialization, but neuroticism was not influential in the total sample. Analysis of the sexes separately revealed an association between science preference and neuroticism in females only.

Hypothesis #4, predicting more divergent thinking in art Ss was supported in the case of figural creativity, but not verbal creativity. Science Ss scored significantly lower on the pictorial "elaboration" factor, which was heavily weighted in the total figural score. There is not strong support, then, that art Ss are more divergent than science Ss. (The means on creativity measures were consistently higher for art Ss, but the differences were not statistically significant.)
Hypothesis #5, predicting a positive association between stimulus complexity and creativity, was not supported. In fact, the correlation between the two was negative though not statistically significant. As predicted, females had higher complexity scores than males.

The predicted efficacy of the ACL Creativity Scale (Hypothesis #6) was supported for verbal and total creativity, but not figural. This finding supports the validity of the ACL Cr Scale, and additionally, indicates a distinction between "verbal" and "figural" creativity is warranted.

Hypothesis #7, which stated type of creativity would vary with type of school is supported. Verbal creativity was higher in the regular schools; figural, higher in Continuation schools. The latter is moderated by sex, however; continuation school females received significantly lower figural scores than comparison Ss.

Correlations between creativity and several other measures show that "ability" or "achievement" type variables--type of school, grades, I.Q.--are potentially better predictors of creativity than any other "non-achievement" variable. This finding cannot be generalized to demonstrated creativity in the real world but only "tested" creativity.

The following observations were made about general and specific characteristics of the sample: About twice as many males as females were nominated as creative. Three-fourths of the subjects were from regular schools; one-fourth, Continuation schools. Roughly half the subjects claimed Anglo-Saxon-Nordic ethnic background; however, too
many Ss chose an indeterminate category to make ethnic analysis meaningful (it is thought the majority were Anglo-Saxon). About half the Ss were of Protestant faith, while a third chose "no religion" or "atheist." As for ethnicity, asking today's youth questions on religious preference is not particularly fruitful. Subjects were ages 16, 17, and 18; and age did not correlate with any other variable except "grade in school." Over half the subjects were of higher socio-economic status, as indicated mainly by father's occupation; the remaining Ss varied considerably in SES. Correlations between "father" SES, "mother" SES, and other variables suggested differing influences from each parent. Science preference, higher grades, and intelligence were mother-related; higher socialization, lower neuroticism, and mother-identification were father-related.

One-fourth the subjects did not claim Sacramento as their primary residence, indicating a fairly high degree of motility and instability.

Several interesting observations were gleaned from responses to miscellaneous questions: The majority of Ss, both male and female, claimed a liking for sports. With regards to parent-identification, Ss identified with the parent of the opposite sex, and this cross-identification was statistically significant. School subject likes and dislikes revealed half the students do not prefer traditional school subjects; humanities were preferred above sciences by both sexes though males preferred science more than females. School marks and intelligence as measured by self-report suggest the sample was above average
in both achievement and ability. Interestingly, females have a response tendency to rate themselves less-than-superior in intelligence. Overlap between "giftedness" and creativity was slight in this study--only 13% of the subjects had been identified as gifted. Multiple nominations of Ss occurred infrequently probably due to unfamiliarity of teachers with all students. Students were nominated, not on the criterion of outstanding achievement, but on the basis of classroom performance and behaviors. Students participating in the research represented a select 5% of the total school population; however, the actual creativity of the sample cannot be determined on bases other than performance on divergent thinking tests.
DISCUSSION

Criteria for "creativity" have not been determined satisfactorily, and the criterion problem is even greater for the non- eminent creativity of high school students. Tests of divergent thinking have construct validity but few demonstrated predictive validities. Validity coefficients range from .00 to .62, the higher validity coefficient being "factorial," or construct validities. From sparse data in the Guilford experimental preliminary manuals, it appears the "creative" adolescents in this sample have an average performance on tests of divergent thinking. (Norms for Torrance subtests--Picture Completion--are not available.) There is insufficient data to assess the creativity of our adolescent sample, when we consider low reliabilities and validities of creativity measures.

Sex bias in favor of males is highly significant in this research. Male bias in nominating "creative" students is much greater than bias found by Terman (1925) in selecting "gifted" students. Terman favored the explanation of "actual superiority of males" on the basis of genetic theory. (It is strange that Terman concluded female teachers could not have a male sex bias in their nominations.) Certainly, one cannot help but be impressed by the paucity of eminent females throughout history. The larger number of males in the present study may represent actual superiority of males, since males are more likely than females to demonstrate their creative potentials in later
life. However, the pattern of nominations for male and female high
school teachers and the absence of sex differences on divergent thinking
tests, suggests "bias" is a preferable explanation, not "superiority."

Guilford's demonstration that creativity is a complex construct
composed of numerous relatively independent abilities is important, and
the researcher sought to analyze these "creativities" in the present
study. In that both Cattell (1968) and Torrance (1962) have criticized
Guilford on the excessive specificity of his factors, alternative
analyses of creativity were employed. Intercorrelations of factor
scores across creativity measures showed that treatment of specific
factors was not warranted; rather separate analyses for "verbal" and
"figural" creativity (as Torrance advocated) was more appropriate. The
factor approach may have been more appropriate in large sample research
(1000 or more subjects), but it was inadequate for analysis in the com­
paratively small sample in this research.

The association between "genius" and "insanity" has not re­
ceived much attention in empirical studies, though speculation rages
on in more popular literature and psychiatry. Most creativity researches
focus on "male creativity" and "scientific creativity," neither of which
grossly implicate maladjustment. The alleged maladjustment of female
creatives and artist-creatives is still left open to speculation due to
lack of empirical evidence to the contrary. Anecdotal evidence on
artists and researches of Hudson (1970), Barron (1969), Nelson (1965,
1966, 1967), and Terman (1930, 1947, 1959) are suggestive of some mal­
adjustment in female creatives and artists. The present study,
however, does not reveal a positive association between maladjustment and creativity in females.

Horner, (in *Time*, 1972) employing special instructions to write about a successful man or woman on the Thematic Apperception Test, found more than 65% of the women associated the woman's success with depression, illness and even death, while 90% of the men equated the man's success with happiness and prosperity.

Perhaps, any association between art-science preference and maladjustment in this study cannot be applied to the larger issue, because students merely claimed an art or science *preference*, and were not actually artists or scientists, themselves. Nevertheless, the significant correlation between art preference and "socialization" is interesting and is consistent with past researches describing the artist as more unconventional and impulsive than are scientists, while describing the latter as more "controlled" and "civilized." (Interestingly, Barry--1957--equates "severity of socialization" to "degree of civilization" in societies; industrial-scientific societies have greater severity of socialization.)

That neurosis was not significantly associated with art-science in the total sample is not surprising due to the complexity of neurosis itself. Neurotic concepts of depression and lack of self-confidence could well fit the artist as Hudson's work suggests, but neurotic inhibition and over-control could well describe the scientist. The latter case may have been operative in the significant association between science preference and neuroticism in females in this study.
(Incidently, clinical psychology shows us repeatedly that females are more "inhibited" than males in general.) One can only speculate on causal relationships: Does a woman have to be neurotic (cerebral, inhibited) in order to have an interest in science? Does a woman with an interest in science "become" more neurotic due to negative sanctions in a male-dominated arena? Cattell's research (1968) on the personality of scientists is consistent with the former explanation; Barron's explanation of the female dilemma in creativity fits the latter (Barron, 1969).

The writer was stimulated by an article (she cannot recall the reference) in which the author claimed that only the artist-writer types, not scientist, could be truly creative; scientists, he theorized, merely analyze what is already there, while artists actually "create" something new from within themselves. (One is also reminded of the inductive-deductive and supra-ordination--subordination thinking styles applied to artists and scientists.) Recently Hudson restated this view (Hudson, 1966; 1970), empirically demonstrating that art-oriented students were more "creative" on divergent thinking tests and scored lower on "convergent" intelligence test measures, while for science-oriented students, the converse was true. In the present study art Ss did perform better on the creativity measures, but the difference between art and science Ss was not statistically significant, generally. Only on pictorial "elaboration" were art Ss significantly superior. (That art Ss should perform better on a drawing task has "face" validity.) The over-all analysis did not support the
speculation that art Ss are more "creative" than science Ss. Hudson's art-science distinction is not popular, as recent investigations show more similarities than differences between the two (Smith & Schaefer, 1969; Gordon, 1961; IPAT, 1961; Roe, 1952). Certainly, one is impressed by the novel and highly creative thinking of Einstein, Cavendish, Poincare, Newton, Freud, etc. Great scientists do much more than analyze what is already there; they must "project" onto a situation an imaginative structure from within themselves, or, as Einstein phrased it, "an imaginative leap into the darkness." There may well be differences in art and science "frames of mind" in high school students both in divergent thinking and temperament, but in the "greats" there are more likenesses than differences.

That better adjustment was associated with higher scores on all creativity measures in females was not predicted. The researcher expected that a female who is achievement-oriented or is unconventional in thought or behavior will suffer negative sanctions from others, and hence, develop at least an "existential neurosis." It is, however, a significant finding that "adjustment" correlates with "creativity" in females, but not necessarily so in males. As is the case for Negroes and other minority groups who have to be "super stars" to become eminent, a woman may have to be superior on many characteristics to overcome social handicaps and bring creative potential to fruition. Said another way, a second-class citizen has to be a star in many areas to achieve eminently; a "first-class" citizen does not have to be a star in "irrelevant" areas to achieve eminence. This trend may be
reflected in males and females even at the high school level.

Adjustment does not correlate uniformly with creativity in males in the present research. Less socialized males in the Continuation schools did better on figural creativity; more highly socialized males in regular schools performed better on verbal tasks. Neurotic trends were irrelevant for males, but not females. For males, then, adjustment concepts are still applicable, but relationships are complex depending upon adjustment concepts employed and type of creativity. For neither sex is the mythical genius-madness association apparent, but it should be remembered our sample is restricted in range. Means for Neuroticism of several groups--total sample, males, females, art Ss, Science Ss, regular school, and continuation school students--are all ten points above the mean Neuroticism score for the American college norm sample. Means for CPI Socialization are slightly below high school norms.

The Barron-Welsh Art Scale was not shown to be a good predictor of creativity as measured by divergent thinking tests. In fact, the scale correlated negatively with the ACL Creativity Scale! The larger issue of "tolerance of ambiguity" (Child, 1965) and preference for "complexity" (Barron, 1963; 1969) in eminently creative persons is still provocative. It is doubtful that complexity preference for art stimuli are generalizable to "complexity preference" in general. As Kloss & Dreger (1971), Knapp & Green (1960), Frumkin (1962), and others point out, art preferences are influenced considerably by art training, and are not central to personality structure. Complexity preference in
this study was directly related to socialization (and, hence, more cultural training in the arts), but it is not correlated with "creativity" as conceptualized here.

The validity of the ACL Creativity Scale was supported by significant positive correlations with verbal divergent thinking measures and the total creativity score. The high school population studied here was not unlike the original validation sample. Whether or not the scale is valid for more eminent creativity has not been demonstrated. However, many of the "creative" adjectives match temperament descriptions of eminent creatives in previous studies (Cattell & Butcher, 1968; Drevdahl & Cattell, 1958; Roe, 1952; Taylor, 1964; Barron, 1963, 1969; IPAT, 1961).

Although most creativity researches of the past twenty years have focused on ability and achievement, or "creative product" criteria, certainly the "personality" or temperament approach is also promising. The ACL temperament measure of creativity is a case in point. Virtually all researches on "personality" and creativity have yielded many significant associations between the two. Perhaps, a distinction between "ability" and "temperament" is artificial, when we note that "intelligence" is both an "ability," measured by I.Q. tests, and a temperament trait, measured by "personality" scales, such as Cattell's "16 P.F." A person who "thinks" (cognition) intelligently, also "behaves"(temperament) intelligently; and the distinction belongs to test theory, not actual functioning. In any case, significant correlations between the ACL "temperament" scale and divergent thinking tests give evidence to
the construct validities of both types of tests.

Selected questions on the general questionnaire designed by the researcher revealed many interesting differences in sex, art-science Ss, and type of school, and additionally provided a "portrait" of the creative adolescent. Generally, he is white, Anglo-Saxon and Protestant, in suburban middle-class schools, is above average in intelligence and achievement (as measured by self-report), and is most likely to be a male. This portrait fits in well with descriptions in previous studies conducted in England and America (Galton, 1892; Ellis, 1946; J. McK. Cattell, 1903; Terman, 1925; IPAT, 1961). As these references demonstrate, the present research also shows that a disproportionately large number of "creative" high school students come from the upper socio-economic classes. Teachers could be biased toward upper SES students and nominate them under the influence of the "halo effect," but, alternatively, upper SES homes may provide children with training conducive to creative achievement. The researcher favors the latter.

It should be of interest to educators, however, that "unfortunate deviates" in the Continuation schools were superior to "fortunate deviates" on at least some creativity measures, i.e., figural. Unlike Terman's "gifted" subjects who were described as superior on virtually all physical and mental traits, "creative" students are not uniformly superior. A creative student may be less-than-gifted, non-conforming, and troublesome (Getzels & Jackson, 1962; Wallach & Kagan, 1965) as evidenced in the present research. Generally our results show that the
diverse creative portraits of "superior-in-all-things" and "non-conforming-troublesome--low-achieving" are both extreme and mythical. Creative youngsters can be either, and neither portrait is the *sine qua non* of creativity. (Interestingly, the students who stood out most in this study were a champion chess player from the continuation school, who had been praised in the *Sacramento Bee*; a promising young artist from a continuation school whose work as art editor of the school newspaper was outstanding; and an Oriental girl from Japan in the regular school who stood out above others in several classes including music. None of these "stars" fitted the WASP image of creativity.)

The many positive associations found in this research could, of course, be due to chance in view of sample size and conventional methods for determining significant correlations. Making interpretation and generalization of findings more difficult, is the uncertain identification of the sample. One cannot assert the subjects were creative; the researcher wished merely to increase the probability of including "creative" in the sample, by employing "creativity criteria" in nominations. Furthermore, the sample is highly selected, homogeneous in some ways; therefore, many of the correlations between variables would be greater in an unselected, normal population.
SUMMARY

Several selected research questions on creativity were focused upon in this work--its relation to sex, adjustment, art-science orientation, complexity-simplicity, other measures of creativity, and type of school. The writer reviewed relevant literature on these topics and advanced selected hypotheses which were tested in an adolescent population via a battery of psychological tests and subsequent correlational analyses.

The following dispositions were made concerning seven hypotheses: (1) The predicted sex bias in favor of males in nominating creative students was demonstrated. Whether valid or not, this male bias shows "creativity" is thought to be more characteristic of males than of females. No sex differences appeared on divergent thinking tests. (2) It was hypothesized that creative females would be more maladjusted (less socialized on the CPI, Socialization Scale; more neurotic on the Maudsley Personality Inventory) than less creative females; no association was predicted for males. Adjustment and creativity were significantly correlated in female creativity, but the relationship was opposite that predicted; for males the associations were more complex and not uniform. (3) The prediction that art preference is associated with greater maladjustment; and science preference, with better adjustment, was not supported on all measures. Science preference was associated with higher socialization as
predicted, but, in the case of females, it was also associated with neuroticism on the MPI. Neuroticism was uncorrelated with male art-science preference. (4) That art versus science preference is associated with more divergent thinking, and hence, creativity, was not supported. Art Ss were uniformly superior on Guilford & Torrance divergent thinking measures, but the differences were not statistically significant. (5) Complexity preference did not correlate with divergent thinking measures, and had a negative association with the ACL Creativity Scale. Complexity is only peripherally related to the construct of creativity. (6) The validity of the Smith & Schaefer ACL Creativity Scale was supported by significant positive correlations with the verbal measures and total creativity score. Hence, temperament measures of creativity may be as efficacious as cognitive measures. (7) The prediction that "non-verbal" Continuation school Ss would perform best on "figural" creativity, and "verbal" regular school Ss would do best on "verbal" creativity, was supported, but only for males, not females. Females in regular schools performed better than comparison Ss on both types of creativity.

Intercorrelations of all variables focused upon in the research revealed that the best potential predictors of creativity are ability and achievement type measures. Crude measures of I.Q. and school achievement (self-report) had higher correlations with creativity than any other "non-achievement" variable, except ACL Creativity. This finding does not negate the many significant associations between non-achievement variables and creativity, but merely relegates them to
a position of less relative importance in predicting creativity.

General demographic characteristics of the sample were discussed, as were responses to miscellaneous researchable questions of interest to the researcher. Differences among sub-groups--males and females, art and science, regular and continuation--lead one to generate additional hypotheses far beyond the present research.
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APPENDICES
APPENDIX A

SACRAMENTO STATE COLLEGE

November & December, 1971

Dear Teacher:

I am conducting research in the area of "creativity" for my doctoral dissertation in psychology. I would very much appreciate your taking a few minutes to think of students in your classes of Juniors and Seniors who fit one or more of the criteria I chose to indicate "creativity," and write down his name. Creativity is not a well-defined concept, and one person's definition is as good as another's. However, please try to select students ONLY on the basis of statements provided on the following page. Write down also the number (i.e., circle the number) of the statement or statements you used in selecting each student. You may find several students come to mind, or, in some classes, none at all.

In return for your cooperation, I will give you a written summary of the results of my study in April or May of 1972. Thank you very much for your help. If you have any questions or comments, feel free to call me (447-1883).

Sincerely,

Marie G. Kloss, ABD
Lecturer in Psychology

mgk
APPENDIX B

TEACHER NOMINATIONS OF CREATIVE STUDENTS

Name of teacher ___________________________

Name of school ___________________________

PLEASE STUDY CAREFULLY THE FOLLOWING STATEMENTS IN ORDER TO NOMINATE STUDENTS FROM YOUR CLASSES: REFER BACK TO ALL STATEMENTS WHEN YOU THINK ABOUT EACH STUDENT YOU NOMINATE.

1. This student has WON PRIZES OR AWARDS in science, art, speech, composition, or music.

2. This student has PRODUCED IN CLASS (or elsewhere) scientific apparatus, mechanical inventions, essays, poems, music, drawings or paintings, etc. which appear to have CREATIVE MERIT compared to his peers.

3. This student occasionally SAYS OR DOES things in class which make YOU feel SURPRISED, SATISFIED, AMUSED, OR STIMULATED TO THINK.

4. This student often says or does things in a new and UNUSUAL way.

5. This student seems to come up with the most ideas in class.

NOW, THINK OF EACH CLASS PERIOD AND LIST ANY STUDENTS YOU THINK FIT ONE OR MORE OF THE ABOVE STATEMENTS. BESIDE EACH STUDENT'S NAME BE SURE TO CIRCLE THE NUMBER OR NUMBERS OF STATEMENTS YOU USED IN SELECTING THAT STUDENT. (IF YOU USED MORE THAN ONE STATEMENT, CIRCLE MORE THAN ONE NUMBER.)

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APPENDIX B (CONTINUED)

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3rd Period: Subject ___________________________ Senior ____  Junior ____

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4th Period: Subject ___________________________ Senior ____  Junior ____

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5th Period: Subject ___________________________ Senior ____  Junior ____

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Dear ________________:  

You have been selected by one or more of your teachers as a student who seems to be "creative." I am doing research for my doctoral dissertation in creativity, and I would appreciate your cooperation in taking part in my research. Your participation will involve activities in imagination, preferences for art designs, and some questionnaires on your interests, background, activities, and personality. You will probably find it interesting. Your answers—as is true for all social science research—will be treated confidentially (that means your answers belong to the researcher only).

You will be excused from classes for a total of three class periods in November or December. (Probably three 50 minute class periods on the same day.) Even if you have parent permission, the research participation is voluntary, and you do not have to take part in the study if you don't want to. However, you cannot be excused from classes without approval from your parents. All students from your high school will meet in one group. Your teacher will tell you in advance when and where to meet. If you have any questions, please see me then.

Sincerely,

(Mrs.) Marie G. Kloss  
Lecturer in Psychology
VITA

Marie Guzell Kloss was born in Lloydell, Pennsylvania, on August 23, 1941. Divided between a career choice in art and psychiatric medicine, she majored in psychology and biology at The Pennsylvania State University, graduating in June, 1963. Before entering graduate school in clinical psychology at Louisiana State University, Ms. Kloss worked in social welfare and mental hygiene in California.

During her graduate work she held positions in Headstart, community mental health, counseling, experimental special education, mental health clinics and hospitals, and teaching. Her research work includes: spontaneous activity in albino rats, VISTA research, synthetic foods and attitudes, and abstract art and temperament traits (Master's Thesis research). In 1968-1969 she interned at The Psychiatric Institute and the Community Mental Health Center of the University of Maryland School of Medicine in Baltimore. Currently the writer is teaching psychology courses in "personality" and "measurement" at California State University in Sacramento.
EXAMINATION AND THESIS REPORT

Candidate: Marie Guzell Kloss

Major Field: Psychology

Title of Thesis: The relation between adolescent creativity and selected variables: Sex, adjustment, art-science preference, complexity-simplicity, and type of school

Approved:

[Signature]
Major Professor and Chairman

[Signature]
Dean of the Graduate School

EXAMINING COMMITTEE:

[Signatures]

Date of Examination:

May 12, 1972