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ABSTRACT

Unlike other organized social institutions, colleges and universities have paid little attention and seem to be little concerned with the long-term outcomes of their efforts, activities, and programs. No identifiable group of researchers has sustained an interest in the long-term student-based outcomes of institutional higher education. The field knows no unitary, well developed, validated methodology. Because it is the subject of limited and disconnected studies, it has no meaningful history. This review of the literature starts with studies under way at the turn of the century, examines in general chronological order the major studies and topics that, in turn, captured the attention of successive generations of researchers, administrators, and librarians, and concludes with a brief description of methodological problems. (Author/MSE)

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U.S. DEPARTMENT OF HEALTH,
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THE OUTCOMES OF HIGHER EDUCATION

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Unlike other organized social enterprises and institutions, colleges and universities have paid little attention and seem to be little concerned with the long term outcomes of their efforts, activities, and programs. The Educational Testing Service, the American College Testing Program, their predecessors, their contemporaries, and other agents of institutionalized higher education have well-developed instruments, procedures, and techniques for describing the pre-college characteristics of students. College counselors and psychologists annually conduct hundreds of studies of within-college changes in students. College faculties, and others, regularly test and record student progress toward degrees. Placement officers and the College Placement Council collect and report information describing the immediate post-college experiences of former students. Alumni officers, clubs, and foundations, operating, for the most part, on a social, emotional, and largely nostalgic basis, also make contributions to our knowledge. Much of what we know about the long term student based outcomes of higher education, however, grows from studies initiated by outsiders who sometimes use unrefined techniques and who often are not aware of what others have done or are doing.

No identifiable group of researchers has sustained an interest in the long term student based outcomes of institutional higher education. People doing institutional research have only recently (in 1965) formed a national professional organization (Rourke and Brooks, 1966). Those few scholarly studies which from time to time have caught the attention of college administrators have not been compiled, cross referenced, nor widely communicated.

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There are two broad and generally overlapping approaches used in reviewing research. One is primarily methodological, the other primarily substantive. The methodological approach focuses on the ways in which research has been done, pointing out the theoretical orientations and analytic strategies underlying the studies, and highlighting the attendant methodological problems and issues. Works by Feldman (1970), Taylor (1970), Straus (1969), Warmbrod (1968), Parten (1966), Harris (1963) and Hyman (1955) provide thorough discussions of the methodologies used in studies of the outcomes of higher education.

The purpose of the substantive approach is to describe the important results of the research which has been done to provide background and guidance to those entering the field, and to those who seek to apply the results in policy. The present effort emphasizes this second approach to twentieth century research on the long term student based outcomes of institutional higher education, and, except for the closing paragraphs, touches on methodological issues only coincidentally. Research and public service based outcomes, as well as the coincidental economic and cultural impact of colleges and universities on their communities, are not covered in this review of the materials in one of the nations largest university libraries.* If other studies exist, they are somewhat obscure at best, renegade at worst, but not generally available in any case.

The long term student based outcomes of institutional higher education is not an organized field of inquiry. It knows no unitary, well developed, validated methodology. Because it is the subject of limited and disconnected studies, it has no meaningful history. The following review starts with the studies underway at the turn of the century, examines in general chronological order the

*The working bibliography was provided by Dr. J. Stampen of the Central Administration of the University of Wisconsin System; additional materials were provided by Evelyn A. Bollinger of the American College Testing Program, Nancy Beck of the Educational Testing Service, and by the Research Office of the American Council on Education.

major studies and topics which in turn captured the attention of successive generations of researchers, administrators, and librarians (who make the final judgments on what is worth keeping), and concludes with a brief description of methodological problems. No extant study has been ignored, but only the major studies, and the important, original contributions are described. To the extent practicable, the results and conclusions of each study are left intact, and are reported in the words of the original researchers.

Pioneering Studies

The earliest study of long term student based outcomes, from which published data are available, was started by Richard T. Crane in 1901. Crane, who was interested in "the utility of an academic course for young men who have to make their own living and who expect to pursue a commercial life (Crane, 1909, p. 24)," wrote a letter to each of 1593 members of the graduating class of 1894 at Harvard, Wisconsin, California, Chicago, and ten other large colleges and universities. He asked the following questions, among others: (a) "Was your college education of any advantage to you in obtaining a situation?" (b) "Has it been of benefit to you in the performance of your duties and in securing advancement?" (c) "What is your present salary?" and (d) "If you had your life to live over, would you take a college course in preference to starting in business that much earlier? (pp. 40 and 41)."

Of the 38 per cent who replied, only 65 graduates fit the category which interested Crane. Their answers to the questions were as follows:

<u>Question</u>	<u>Affirmative</u>	<u>Negative</u>	<u>No Response</u>
(a)	32 (49%)	27 (42%)	6 (9%)
(b)	50 (77%)	7 (11%)	8 (12%)
(d)	60 (92%)	5 (8%)	0

In regard to the question concerning present income, (c) above, "nearly all . . . (were) doing very well on this score (p. 41)."

Apparently disappointed by these responses, and having asserted earlier that "The value of education is largely a matter of individual opinion, but its real value may be approximated somewhat by getting the preponderance of opinion, as to its utility, from unbiased men who are in the best position to judge (p. 16)," Crane also wrote to 100 prominent businessmen, 41 of whom replied. "The greater employers of the country, almost to a man," he reported, "showed no disposition to give preference to the products of higher education (p. 17)." Despite these attitudes, college graduates have, since 1890, realized high returns on their investments in higher education (Witmer, 1971B).

Crane later expanded his study to cover technical and special schools, law schools, schools of medicine, and even rural elementary schools. The general color of Crane's book, which was published in 1909, is revealed in these comments:

"The University of Wisconsin--like practically all of the higher educational institutions--is a great fraud and an imposition on the public. All these institutions resort to an immense amount of deception, but none of them, so far as I know, can be compared with the university at Madison in its barefaced misrepresentation of facts (p. 303)."

"To sum up this whole matter: All general schooling above the public grammar schools is worse than useless. This higher schooling not only does not improve a person for business, but it does not strengthen or develop his character. It has just the opposite effect, disqualifying him for a business career, weakening his moral structure, and highly demoralizing him in every way (p. 329)."

Crane's study contains lessons about the influences of biases, and the drawing of inferences. Sixty years later, we have tools not available to Crane, and we have biases which tend to be the opposite of his, but in making choices between hard data and soft data and in drawing inferences, we sometimes seem to have made little progress.

In 1906 the Reverend William DeWitt Hyde published the results of the second extant follow-up study of student based outcomes. Taking the reports of the 774 Bowdoin College graduates who replied to his inquiry (about half), he made a table showing the 1905 earnings level by decades since graduation, and by vocation. Interest in the relationships among cost, quality, and outcomes in higher education was greatly stimulated in 1925 by William C. Bagley's report that a correlation of .92 existed between his index of quality based on five units of expenditure for education in 1880 and the number of graduates listed in Who's Who in 1924. During the first third of the century, reports of a number of other studies of outcomes appeared (Gifford, 1928). President Lowell of Harvard University commented on "College Studies and Professional Training." President Foster of Reed College gave an affirmative answer to the question, Should Students Study? Everett W. Lord (1928) explored The Relation of Education and Income as revealed in the reports of members of Alpha Kappa Psi fraternity. Maurice Leven (1929) reported on "Average Annual Earnings of the Harvard class of 1904." Donald B. Prentice and B. W. Kunkel (1930) counted the alumni listed in the 1928-29 edition of Who's Who . . .; Margaret Elliott and Grace Manson (1930) of Michigan studied the Earnings of Women in Business and the Professions; and Leven (1932) analyzed the Incomes of Physicians.

Few of the pioneering studies are particularly noteworthy for design, sample size, analysis, or results. Typically, data collected at class reunions from a few hundred alumni were sorted, combined, and averaged to show that the more education a person has, the more money he earns; earnings peak between the 25th and 30th years after graduation from college; physicians earn more than lawyers who earn more than businessmen who earn more than teachers who earn more than clergymen, etc.

The Survey of Land-Grant Colleges and Universities

The first massive study of former students was conducted in 1928 as part of the Survey of Land-Grant Colleges and Universities (Klien, 1930). At a response rate of 48.5 per cent 37,342 former matriculants of the classes of 1889-92, 1899-02, 1909-12, and 1919-22 at 48 institutions returned mailed questionnaires which were tabulated and summarized by a special U.S. Office of Education staff. The findings having to do with student based outcomes indicated that: (a) about 47 per cent of the graduates engaged in post-college work, (b) 6.6 per cent earned master's degrees in the same institution, (c) 9.9 per cent earned master's in other institutions, (d) 1.0 per cent earned the Ph.D. in the same institution, (e) 1.1 per cent earned the Ph.D. in another institution, while (f) 28.4 per cent pursued other kinds of study. (g) Women had lower average annual salaries than men in comparable occupations. (h) The average annual salaries of graduates were:

<u>Years since Graduation</u>	<u>Average Annual Salary Men and Women</u>	<u>Ratio</u>
1	\$1,802.11	1.00
2	2,088.54	1.16
5	2,919.28	1.62
10	4,630.26	2.57
15	5,918.78	3.28
20	7,234.92	4.01
25	7,811.72	4.33
30	8,375.97	4.65

An important concomitant of this study was the decision to make the data (on punched cards) available for analysis by others. A subsequent study, and the first to acknowledge precedent work by others, was conducted by Donald S. Bridgman (1931) of the Personnel Department of AT&T. Using only the data on men, he and

his associates worked out the following additional conclusions concerning outcomes: (a) Between 1904 and 1928, beginning annual median earnings of college graduates increased 100 per cent while the cost of living went up 105 per cent and industrial wages climbed 175 per cent. This is noteworthy as the first case in which data describing former college students was compared with that describing a population which included persons who did not enter college. (b) Though the range of annual median earnings during the first year following graduation was narrow (from \$1300 to \$1600 in 1928), men in professional (excluding teaching) occupations earned median incomes of about \$5900 annually in the fifteenth year after graduation while those in business, teaching, and farming earned, respectively, about \$1,000; \$2,000; and \$3,000 less. (c) By the thirtieth year following graduation, the range in annual earnings had widened even more. (d) During the fifteenth year after graduation, annual median earnings of college graduates in the industrial Northeast were about \$900 or 20 per cent higher than those in the South and in the West. This \$900 gap persisted through the thirtieth year following graduation. (e) Though they started at about the same level, graduates in arts and sciences, fifteen years after graduation, earned \$600 more (\$5600 vs. \$5000 in 1928) than graduates in engineering, while thirty years after graduation engineering majors earned \$1000 (\$6900 vs. \$5900) more than arts and science majors. (f) Finally, postulating that age on entry to college was a proxy measure of native ability, Bridgman uncovered a pattern which indicated that the younger the person (i.e., the higher his ability) as a member of his college graduating class, the higher were his earnings. Indirectly elaborating on this latter point, Dael Wolfle and Joseph G. Smith (1956) found that rank in class (presumably reflecting academic aptitude and motivation) was a better predictor of higher income than intelligence test scores (academic aptitude alone), and that, contrary to common belief, father's occupation had little predictive value.

Curriculum Building and Evaluation

The first student based outcome study designed with recommendations for changes in college programs as a goal was part of W. W. Charters' (1923, 1938, and Johnson, 1947) monumental contribution to the art and science of curriculum building. As Director of Research at Stephens College from 1920 to 1945, Charters was instrumental in making the shift from the traditional curriculum to one organized in terms of the outcomes women students needed to meet their common human needs, to solve their persistent problems, and to live most effectively in contemporary society. To determine what the needs and problems of contemporary women were, Charters and his associates asked 300 graduates of Stephens College, one-half of whom were married and one-half of whom were engaged in seventeen different vocations, to keep detailed personal diaries of their everyday activities for one week, and to comment freely on their reasons for engaging in each activity. With the commentaries as elucidating guides, the 7500 reported items were analyzed and classified in 24 categories of activities. These categories were described in terms of needed principles, facts, and skills and then integrated into seven fundamental subjects of instruction: communications, physical health, mental health, appreciation of the beautiful, social adjustment, consumer problems, and philosophy of living. Later, three other subjects--natural science, home and family relationships, and vocations--were added to form the new Stephens College curriculum.

A second curriculum-oriented outcome study most noteworthy because it illustrated the use of comparison groups, and the dramatic effects that well done research can have, was that of the graduates of thirty progressive and experimental high schools completed by the Commission on the Relation of School and College of the Progressive Education Association (Chamberlin, et al., 1942). Prior to World War II, admission to college was based almost exclusively on the successful completion of a prescribed set of preparatory courses. It was widely held that

students who had not earned the required set of Carnegie units could not succeed in college. To test this hypothesis, the graduates of 30 progressive high schools were admitted to college during a five-year period, beginning in September 1936, solely on the recommendations of their high school principals, all traditional requirements being waived. Of these students, 1475 were selected and followed into and through 38 colleges, by four college administrators who used questionnaires, student records, college records, interviews, reports from instructors, samples of student work, a variety of cognitive tests, and other instruments to compare the progressive students with 1475 traditional students matched in terms of pre-college scholastic aptitude, interests, and socio-economic background. On the criteria of grades, scholastic honors, and success in extra-curricular activities, the progressive students did better than the comparison group. Not only did progressive students succeed in college, but those from the most progressive schools were most strikingly successful. The effects of this evaluation of curricula were immediate, dramatic, and long lived. College admission standards will probably never revert to the rigid subject-matter basis which characterized them during the first third of the century.

Curriculum evaluation was the main focus of They Went to College, an outcome study of a selected group of 151 students who had come to the University of Minnesota before the General College was founded but who probably would have entered it had it been in existence in 1924, 1925, 1928, and 1929 by C. Robert Pace (1941), and of later parallel studies of former General College students reported by Ruth E. Eckert in Outcomes of General Education (1943). The latter studies also drew comparisons with students who had attended the traditional College of Science, Literature, and the Arts at the University of Minnesota.

By mailing various trial questionnaires to 300 former college students Pace found that the length of the instrument had very little effect on the percentage

returned. After using five follow-up notices--two post cards and three letters--he secured a 69 per cent return of a 52-page questionnaire which contained over 1000 items. In terms of academic persistence and academic success he found that the respondents tended to make slightly better grades and graduated in somewhat greater proportion than did the population as a whole. Analyzing the responses to four groups of questions on personal, home and family, vocational, and social and civic topics, he concluded that these former students of just moderate academic ability: (a) were self-centered and lacked interest in community affairs; (b) were apathetic, complacent, and focused chiefly on a desire for security and happiness at home and on the job; (c) engaged in leisure time activities which were almost entirely passive and rarely creative; (d) followed vocations for which they had received no specific preparation while at the University; and (e) valued prestige occupations, work which matched their abilities, and employment with good prospects for advancement. Pace suggested that, because process and content are inseparable, it is important to select the content of curricula from materials and problems that students will find continuously useful.

Eckert (1943) reporting on evaluations of the General College, from 1937 to 1943, claimed the evidence available did not unequivocally answer the basic question of whether or not General College young people were more generally competent than those educated in the traditional college. It was found that General College students did as well in subsequent studies as non-General College students of comparable academic aptitude. This was true even in biology and the physical science sequences where the General College students took non-laboratory courses. Eckert made the following summary statements about General College students compared with students in the College of Sciences, Literature,

and the Arts, after adjustments for differences in ability at college entrance:

- (a) General College students were superior in English usage and reading;
- (b) they made greater gains in personal and social orientation and adjustment;
- (c) they were superior in understanding contemporary affairs; (d) they showed no gain and no difference from SLA students in social attitudes, personality traits, and recreational interests; (e) their career expectations at departure were more unrealistic than those of SLA students but much more realistic than they had been on entrance to college; and (f) the two groups could not be distinguished in terms of subsequent occupation or job satisfaction.

Though the General College failed to achieve many of its goals, its failures were the same failures experienced by traditional liberal arts colleges. The Minnesota studies revealed "that the only area of out-of-school living differentiating the interests and activities of students who received bachelor's degrees from those who dropped out of school was the vocational one. The largest differences among college graduates and non-graduates concerned the amount of money earned (p. 209)." Eckert concluded, "It is possible that college programs of general education need to be accompanied by specific job training, actual work experiences, and more frequent and varied contacts with the community and the world beyond the campus (p. 210)."

The TIME Studies

The first study of a statistically valid sample of all living college graduates in the United States was made in 1940 by the Credit Bureau of Greater New York under contract with the Reader Research Department of TIME magazine (Babcock, 1941). With the help of the U. S. Office of Education and 1048 (90 per cent of the total at the time) institutions of higher education, a one-half of one per cent sample was obtained--a sample large enough (10,146 persons) to be statistically useful, and so distributed as to age, sex, geography, and other

factors, as to be faithfully representative of the whole body. The study, conducted through a simple, two-page census-type field sheet, was premised on the belief that "the rewards earned by the Graduate Bloc as a whole must be regarded as a fundamental evaluation of the social dividends yielded by higher learning, as the measure of the extent to which college education contributes to a higher standard of living in a competitive society (p. 27)."

The report by Franklin L. Babcock (1941) included the following findings:

- (a) The graduate bloc was 63 per cent male, but trending toward parity. Of graduates over 60 years old, 76 per cent were men; of those under 30 years old, 59 per cent were men.
- (b) Women college graduates were only half as likely to marry as were U. S. women as a whole, and much more likely to be divorced, while college men were much less likely to be divorced (divorce rates: all women, 18 per 1000 marriages; college women, 26; all men, 17; college men, 10).
- (c) College graduates averaged smaller families (about 3 persons) than did all U. S. families (about 4 persons).
- (d) The percentage of all U. S. women gainfully employed was 25 per cent; but of college women, 56 per cent were gainfully employed.
- (e) Employment in the professions represented the most extreme variation of the College Bloc from any statistically determined norm for the U. S. adult population as a whole. Of college men working, 62.8 per cent were in the professions (the largest group--16.8 per cent--were in education) as were 82.7 per cent of the college women (68 per cent in education).
- (f) Graduates who lived outside of the area where they went to college earned more than those who stayed near their college.
- (g) Although all U. S. families earned about 60 per cent more in large cities than in rural places and villages, college graduate families only earned about 25 per cent more in urban places than in rural places.
- (h) Male working graduates of Yale, Harvard, and Princeton earned more (\$4,700) than those of other "Ivy League" colleges (\$3,240) who

earned more than those of "Twenty Selected Eastern Colleges" (\$3,010), the "Big Ten" (\$2,850), other New England and Middle Atlantic colleges (\$2,580), other Middle Western Colleges (\$2,360), and all other U. S. colleges (\$2,310).

(i) "The oldest group of working women graduates (40 years and older) . . . (attained) a median earning level less than 50 percent higher than that of the youngest (under 30 years), while the older men . . . (earned) nearly two-and-a-half times as much as the young (p. 31)." (j) The median earnings of all employed men graduates (\$2,620) were substantially higher than those of all employed women graduates (\$1,590).

A second TIME magazine study was originally conceived as an analysis of its reading public. Two mailings of a 13-page questionnaire plus 419 interviews provided data from about 62 per cent of the sample, net of bad addresses. Data from 9,064 of 17,953 graduates of U. S. colleges and universities with surnames beginning with the letters "Fa" were later turned over to the Columbia University Bureau of Applied Science and Social Research for analyses which were reported in The College Graduate in America . . . (West, 1951), and They Went to College (Havemann and West, 1952). The findings of previous studies were generally corroborated and the following elaborations and additional generalizations were placed in the growing body of knowledge: (a) A disproportionately large share of college graduates came from the East, the Midwest, and cities and villages with populations of from 2,500 to 100,000 while the South, West, and rural places contributed a disproportionately small share. (b) There was a long term trend away from programs of study in the humanities and the professions toward the social sciences and business. (c) One-third of the graduates who majored in pharmacy, history, literature, and the languages, and 25 per cent of all graduates, wished they had chosen a different major program

of study. (d) Most (83 per cent) of the men and about half (55 per cent) of the women had earned all or part of their way through college. Self-help students had scholastic records as good as those of the others. "More than a third of the students who worked their own way reported that they had taken part in three or more campus activities, compared with only 28 per cent of those who did not work (Havemann and West, p. 168)." There were practically no differences in the post-graduate earnings of those who avoided extra-curricular activities and those who did not. Although men who worked their way through college started at the same earnings level as family-supported graduates in business fields, they lagged farther and farther behind as they grew older. (e) "Jewish graduates make the most money and the Catholic graduates the least, (Havemann and West, p. 187)." (f) Financially successful men were more likely to be married, fathers, and to have large families. (g) There was a strong positive correlation between spinsterhood and earning one's way through college. (h) The marriage rate of career women was related to religion: 23 per cent for Jewish career women, 31 per cent for Protestant, and 48 per cent for those who were Catholic. (i) "Once a working wife, always a working wife . . . and seldom a mother . . . The average graduate who tries to be both wife and career woman is not fully successful either way (Havemann and West, p. 91)." (j) "Among the graduates who definitely gave themselves a party label, the Republicans outnumbered the Democrats 3 to 2 (Havemann and West, p. 109)." (k) Small-town dwellers participated in more civic activities than city (over 100,000) dwellers. (l) Migration by the graduate to live in a community other than the one he grew up in was associated with leaving home to go to school, relative poverty, majoring in a scientific field, and high academic standing. (m) "The general type of college attended makes no difference in graduates' social and political bents, the differences that occur being attributable to the influence of their political backgrounds (West, p. 179)." (n) The kind of

college women attended made no differences in career choices, marriage rates, fertility, nor stability of marriage. (o) The most common complaint of graduates was how little guidance or advice the colleges offered on programs, careers, and vocations.

Shane J. Hunt (1963) applied multiple regression analyses to this second set of TIME data. Reflecting on the results of nine iterations, he concluded that about 50 per cent of the income differentials between high school and college graduates was attributable to education and 50 per cent to ability, quasi-rents (caused by unforeseen shifts in supply and demand), differences in non-monetary income, occupational restrictions, work experience, returns to capital, and motivation. Hunt's research revealed that the degree of self-support while attending college, the prestige level of the college, participation in extracurricular activities, and the prior educational attainment of the student's family all had negligible influence on post-college income.

"Most if not all of the income differences which Havemann and West attributed to prestige are more properly assigned to ability . . . The golden touch is possessed not by the Ivy League college, but by its students (p. 340)."

Although many others had made original contributions, and some had denied widespread and popular misconceptions, Hunt, along with Alexander W. Astin (1962), was one of the first and few analysts of long term student based outcomes of institutional higher education who actually overturned the results of earlier research.

Does College Change Student Values?

Certain of the data from the Progressive Education Association follow-up study of matched progressive and traditional high school students, and from the Minnesota studies, indicated that college had substantial, tangible effects. Upper classmen evidenced substantial growth over college freshmen in knowledge, intellectual curiosity, scientific objectivity, competence in intellectual work,

vocational orientation, interest in contemporary affairs, social consciousness, and emotional stability. During the 1930's and 1940's many investigators sought evidence that the collegiate experience also changed student attitudes and values: Philip E. Jacob (1951) devised a framework in which to summarize and interpret the evidence from the several hundred studies available in 1950. As a political scientist Jacob was particularly interested in possible correlations between changes in students' values and their major programs of study.

The results were disappointing. Some student attitudes changed as an apparent result of going to college, but basic values did not. Confirming the Minnesota studies, Jacob found that 75 to 80 percent of college students (a) were gloriously contented, (b) valued sincerity, honesty, loyalty, religion, etc., and (c) regarded vocational preparation and experience in social relations as the greatest benefits of college education. "There is more homogeneity and greater consistency of values among students at the end of their four years," he reported, "than when they began. Fewer seniors espouse beliefs which deviate from going standards than do freshmen (p. 102)." These findings were generally sustained in a questionnaire survey of the views of students in ten countries by J. M. Gillespie and G. W. Allport (1955). There was no evidence of important relationships between changes in students' values and their major programs of study.

"The quality of teaching," Jacob continued, "has relatively little impact upon the value outcomes (p. 111)." Patterns of value tend to be similar at American colleges regardless of location, administration, size and background of the student body, or character of the educational program. This is not to

say, however, that the values of college students are the same year after year, generation after generation. On the basis of Vassar studies dating back to 1904, Mervin B. Freedman (1960) claimed that the values of college students changed with the spirit of the times. Furthermore, some more recent research has partially challenged Jacob's conclusions. In their study of college students volunteering for a program of service to mental patients, R. H. Knapp and J. D. Holzberg (1963), for example, found evidence which suggests the possibility that special programs increased students' religious interests, and R. W. Hites (1965), in a study of change in religious attitudes during four years of college, found evidence of change, and large individual differences in the amount of change.

In the most comprehensive undertaking ever, and one generally analogous to that of Jacobs, Feldman and Newcomb (1969) reviewed, analyzed, and summarized almost 1500 studies of The Impact of College on Students, and concluded that declining authoritarianism, dogmatism, and prejudice, together with decreasingly conservative attitudes toward public issues, and growing sensitivity to aesthetic experiences, are particularly prominent forms of changes in students during the college experience. These changes, however, may very well be the result of maturation with age and experience rather than the outcomes of efforts, activities, and programs in institutional higher education (Lenning and Johnson, p. 9).

Seymour Martin Lipset and Everett Carl Ladd, Jr. (1971) recently commented on college related changes in political values of college students. After re-analyzing data from the 1947 TIME study (West, 1951) (Havemann and West, 1952), and other surveys made earlier and since, they concluded that the historical slope of political attitudes among American college generations (as among Republican presidents) has been toward a more liberal position as history is extended. The future politics of students, they predicted, will reflect larger movements in

American political culture, and aging will not necessarily be accompanied by growing conservatism, in any fixed ideological sense of the term. The college cohort of the late 1960's will, however, be relatively less receptive to the dominant social change-directed thrusts of the 1980's, and in that sense more moderate or conservative than succeeding cohorts. The moderating effects of the experiences associated with growing older, they claimed, are more predictive than the long term consequences of the particular early political experiences of college cohorts. The classic French riddle (Does the world change, or does it only seem to change because we change?) is resolved: The world changes and we change, however, we change more slowly, hence cultural lag, future shock, and the conservative political attitudes and values of the older generations.

Institutional Productivity

Institutional productivity has long been reported in terms of student enrollment, credits earned, and degrees granted. John R. Tunis (1936) in his widely read twenty-fifth anniversary description of the trials and accomplishments of the members of the Harvard graduating class of 1911, made comparisons with the 1911 classes of Yale, Princeton, Nebraska, and the 1811 class of Cambridge. Donald B. Prentice and B. W. Kunkel (1930), following the path pioneered by Bagley (1925), devised an index of quality and productivity by describing former students listed in Who's Who . . ., as a percentage of all living alumni, which showed that small liberal arts colleges were most productive. Robert H. Knapp and H. B. Goodrich (1952), noting the undergraduate origins of doctorate holders listed in the third and seventh editions of American Men of Science, confirmed the mediocre and inferior achievements of large institutions of high cost and reported that the most productive colleges were those of modest cost, middle and far western location, drawing their

students from "semirural" regions. Knapp and G. G. Greenbaum (1953) studied the records of 7000 graduates of colleges and universities between 1946 and 1951 who either won scholarships or fellowships for advanced study or subsequently earned doctoral degrees. Developing separate production indices for men and women based on the number of such graduates per thousand total graduates, they found high cost eastern liberal arts colleges and universities highly productive, while southern and Catholic institutions were decidedly underproductive.

Although similar productivity indices are still popular (Parente, 1970) they have given way, in serious studies, to measures of value added and outcomes per unit of input (Weinfeld, 1966). Investigation by Alexander W. Astin (1962) revealed that when expected outcomes based on intelligence, sex, major program of study, etc., were compared with actual outcomes, "public institutions were found to be significantly overproductive and eastern men's colleges and universities were found to be significantly underproductive (p. 135)."

R. C. Nichols (1964) assessed the relative institutional impact on the Graduate Record Examination Verbal and Quantitative test scores of National Merit Finalists. His results indicated that institutional factors made little difference and that most of the variance in GRE scores could be attributed to initial differences in freshman aptitude. Astin (1968) using GRE Area Tests and a more heterogeneous sample of students got similar results: student achievement was not enhanced by institutional factors such as greater selectivity of the student body, academic competitiveness, high expenditure levels per student, the number of faculty holding the Ph.D., size of library, faculty-student ratio, etc. Indeed, he found that although the 30 most affluent institutions in the country were spending more than four times as much per student as the least affluent,

students attending the high spending colleges, taken as a group, scored lower on the GRE humanities subtest than predictions indicated by their National Merit Scholarship Qualifying Test performance indicated they would. A superior spread between outcomes and inputs turned up in colleges and universities which were large, technically-oriented, had few required courses, and were lenient on such matters as sexual behavior and cheating on tests.

In related research, A. W. Chickering, J. McDowell, and D. Campagna (1969) studied student development in thirteen small colleges with different climates, varying focuses, values, degrees of authoritarianism, and educational orientations. In each of the colleges student development proceeded (a) toward an increase in degree of autonomy, awareness of emotion, impulse expression, estheticism, and practical orientation; and (b) away from concern for practical achievement and material success; with (c) little change in intellectual interests, social extroversion, and altruism. The change was highly consistent for all colleges with no distinctive influences related to institutional differences.

In a large scale 1965 follow-up study of students who had entered a representative sample of accredited colleges and universities in the fall of 1961, Astin and Robert J. Panos (1969) found: (a) Students were more likely to drop out if they attended large, public, coeducational institutions, or extensively engaged in work for pay. (b) Students at technological institutions and teachers' colleges were less likely to move into other fields than students initially planning the same majors within liberal arts colleges or universities. (c) Student's achievement is neither improved nor impaired by the level of financial resources available to the institution, by the level of academic competitiveness, nor by the intellectual level of his classmates. Similarly, no evidence was obtained to support the common belief that the student with

high academic aptitude benefits more than the less favorably endowed student from exposure to these traditional features of "high-quality" institutions. This confounded Learned and Wood's (1938) earlier finding that students who went to colleges where the average ability was high performed significantly better on comprehensive achievement tests than did students of comparable ability who went to colleges where average ability was low. In general, differences among students in their achievement at the senior level were much more closely linked to variations in ability that existed prior to the student's entrance to college than to any characteristic of the undergraduate institutions (Astin and Panos, 1969, p. 145).

In a study of 95 (typically small and private) colleges, Donald A. Rock, John A. Centra, and Robert L. Linn (1970) found that a proportion of the differences among colleges in student academic achievement was predictable from the academic aptitude of students at entrance. However, colleges with higher income per student and larger proportions of faculty with the doctorate tended to have higher mean student achievement levels than would have been predicted on the basis of academic aptitude at entrance alone. It was also found that among colleges with relatively high income per student, the smaller colleges had higher mean student achievement (with entering student aptitude controlled). Among colleges with low income per student, however, size had little relation to achievement.

In later, related research by Centra and Rock (1971), selected aspects of the college environment were related to student academic achievement at 27 small liberal arts colleges. Academic achievement was measured by senior students' scores on the Area Tests of the Graduate Record Examination. The Scholastic Aptitude Test (Verbal and Mathematics) scores of these same students prior to college entrance were used as a control measure for differences in

initial aptitude. The social and academic environments of the colleges were assessed through students' perceptions and included five scales describing the extent of (a) faculty-student interaction, (b) curriculum flexibility, (c) cultural facilities, (d) academic challenge, and (e) student activism.

The results of this study indicated that: (a) Faculty-student interaction tended to be related to achievement in that students at colleges with high scores on this scale more often overachieved on the GRE Humanities and Natural Science Area Tests. In contrast, students underachieved on all three of the tests at colleges with low scores on this scale. Students seemed to learn more than predicted if they felt that instructors were readily accessible, interested in teaching, and interested in students as individual persons. (b) Curriculum flexibility tended to be related to overachievement on the Natural Science and Social Science tests, with students overachieving where college environments were perceived as allowing students freedom in choosing courses and major programs of study. (c) High scores on the cultural facilities factor which indicated perceptions that facilities in music and art were excellent, and that the college had what students viewed as a rich cultural program (true only for five colleges for women), were related to overachievement in the Humanities but to underachievement in the Natural Science tests. (d) The academic challenge scale was crucial in only the Humanities, with challenging colleges producing students who overachieved on this test. (e) The fifth environmental scale, student activism, which measured the degree of student-perceived student concern about controversial political, social, or economic issues, was not related to achievement in any of the subjects.

In a more recent study of the effects of college environments on student achievement in GRE area tests, when the entrance ability as measured by SAT scores was controlled, Rock, Leonard L. Baird, and Linn (1972) used twenty-six

descriptive measures but found that only four were importantly related to the effectiveness of groups of 95 colleges. In the humanities, the most effective group of colleges was characterized by a higher proportion of faculty with doctorates, a larger total budget, and greater estimated selectivity. In the social and natural sciences, emphasis on program as measured by proportion of students in the respective fields of study was the only variable which demonstrated some discrimination between the most and least effective groups of colleges.

In a recent study of the student based outcomes of institutionalized higher education, Astin (1972) analyzed data describing students, who had entered 217 institutions in the fall of 1966, in terms of 50 student input variables, the institutions they attended in terms of 65 between-college variables and 14 within-college variables, and a one-fifth sample (5,091) of the students in 1970 in terms of 152 dependent outcome variables. Using a series of regression analyses and comparisons of actual with expected scores, he confirmed earlier findings, for example: "in almost every case, the best predictor of a particular outcome was the freshman response to the pertinent item (p. 10)," and added the following: "Students' commitments to most life goals became weaker during college (p. 12)." The principal changes during the undergraduate years include "a sharp decline in formal religious behavior and an increase in drinking, smoking, political activism, and irregularity of sleeping habits . . . Such changes are much more likely to occur if the student lives on campus and is not married. The decline in religious activity is most likely to occur in large universities and in selective private institutions. The increase in political activity is much more likely to occur in selective institutions and in women's colleges and least likely to occur in public and in technological institutions (p. 20)."

C. Robert Pace and Mary Milne (1971) of the UCLA Center for the Study of Evaluation are currently analyzing 1969 (19 years after college) data from the class of 1950 at 74 different colleges and universities selected as examples of eight different major types of institutions. About 8400 alumni, 60 per cent of those queried, returned an 18-page questionnaire describing their general characteristics, activities and interests, opinions and viewpoints, and judgments about education. Two-thirds of the respondents were men, most were between 40 and 45 years old, 90 per cent were married and had children, 62 per cent reported annual incomes greater than \$15,000 twelve per cent had earned advanced professional degrees or a doctorate, 24 per cent held a master's degree, 75 per cent were in professional or managerial occupations, 54 per cent were Republicans and 25 per cent were Democrats.

These alumni appeared to be especially active in the church, the school, and the community. They were pro-business and pro-competition. Among the benefits of higher education, the alumni valued those related to academic disciplines and skills. A contrasting sample of 1969 upperclassmen at 80 colleges and universities placed value on personal and social development-- "a genuine value difference between generations (p. 6)." Among the alumni, the general level of satisfaction with college was similar regardless of the type of institution attended.

Colleges and universities appear to have some impact on their students, even after controls are made for academic aptitude, socioeconomic status, and other important background factors outside the purview of institutionalized higher education. This seems to be true in terms of both cognitive and non-cognitive outcomes. The influence of colleges and universities has however been extremely difficult to associate with the influence of particular

characteristics of institutions and the degree of influence of particular institutions has been almost indistinguishable (Hartnett, 1971). Substantiation of claims of institutional distinctiveness, and justification of different levels of expenditure, seem to require greatly improved measures and techniques--measures which are more institution-specific but which are also relevant to post-college life.

Recent Studies of Vocational and Economic Benefits

Hundreds of studies during the past seventy years have yielded only limited evidence that the outcomes of college experiences differ importantly from those of the noncollege experiences of comparable persons. College attenders are demonstrably different from nonattenders before they enter college (Keniston and Gerzon, 1971) and almost all of the characteristics of college graduates are attributable to causes precedent to and outside of the classroom. Most prominent among the few demonstrable outcomes of higher education are (a) commitment to vocations not generally open to the less educated, (b) the substantially greater productivity associated therewith, and (c) the concomitant higher earnings.

The economic benefits of college education have been strongly emphasized in recent studies (Witmer, 1970). Data from college follow-up and cost studies has been supplemented with data, such as the following, from current population surveys by the U. S. Census Bureau (Johnson and Jennings, 1971):

Median Annual (1966) Earnings of Male College Graduates
in Selected Categories

Field of Study: Law	\$13,404
Occupation: Medical and Health Services	13,400
Field of Study: Health Sciences	13,298
Degree Level: Doctorate and Professional	12,900
Occupation: Other Professional Services	12,600
Field of Study: Engineering	11,555
Occupation: Government (excluding teachers)	10,500
Occupation: Private Industry	-10,500
Region: West	10,277
Field of Study: Business	9,870
All Graduates	9,489
Level of Degree: Master's	9,339
Level of Degree: Bachelor's	9,096
Region: South	8,711
Field of Study: Education	7,783
Occupation: Education, Welfare, and Related Services	7,500
Field of Study: Religion	6,171

Applying a variety of techniques which yield benefit-cost ratios, present values, and internal rates of return on investments in college education, these studies, pioneered by John R. Walsh (1935), included adjustments for native ability and other factors to hold precollege characteristics of attenders and nonattenders constant in order to focus on the independent effects of college. Although there is substantial variability related to factors such as (a) sex, (b) race, (c) major program of study, (d) post-college occupation, and (e) post-college mobility, the average annual rates of return to private and social

investments in college education, 13% and 16% respectively, have generally exceeded the private and social rates of return to business investments, which were 7% and 11% respectively. Annual rates of return to private investments in college education ranged from 8.5% for men majoring in architecture and 8.5% for men in foreign languages to 47.5% for women majoring in accounting, while social rates of return ranged from 12% for men in agronomy and 12% for men in industrial education to 36.5% for women in accounting and 35.5% for women in psychology education. Returns to investments in masters programs were lower, and to Ph.D. programs lower still (Stigler, 1963), (Jorgenson and Griliches, 1967), (Craft, 1968), (Stager, 1968), and (Witmer, 1971A). Relative rates of return to different levels and programs of study have held in a roughly constant pattern since the turn of the century (Hansen and Witmer, 1971) (Witmer, 1971B). The very high rates of return on social investments suggest a public policy of increased governmental investment in higher education with maintenance of low costs to students (Witmer, 1971A).

The discovery that vocation, related productive work, and concomitant earnings seem to be the predominant characteristics which differentiate college graduates from others of similar aptitude and socio-economic background has not signaled a decline in outcome studies, but rather a change in emphases. Many contemporary studies focus on relationships among college preparation, occupation, geographic mobility, mobility among occupations, and mobility within occupations. Noteworthy among such studies are those by Laure M. Sharp and her associates at the Bureau of Social Science Research (Sharp, and others, 1963, 1965, 1970). Also of interest are the doctoral dissertations of M. Felice Hickey (1968) and Edwin L. West (1968), the work of Leonard L. Baird and J. L. Holland (1968), and the National Opinion Research Center studies by James A. Davis and Norman Bradburn (1961) and Joe L. Spaeth and his associates (1965, 1970).

Sharp's (1970) analysis, of 1960 (two years after college) and 1963 (five years after college) data describing a random, cross-section 41,000 person sample of a nationwide cohort of 1958 college graduates, revealed that (a) "many students--including many with high academic ability--take themselves out of the running for graduate studies because they obtained mediocre grades in college . . . (b) It is the undergraduate major rather than the institution attended which has the greatest impact on career outcome (p. 116)." (c) "By far the best congruence and continuity (between college preparation and work) are achieved by those who choose to become teachers . . . (while) business majors are least likely to see a connection between their undergraduate studies and the work they do after graduation, and of course they are least likely to seek graduate education . . . (d) Sharp differences . . . exist between those students who majored in the humanities or sciences and those who majored in business, education, or health fields. The former group was geographically more mobile, more likely to have gone to graduate school, and much less likely to have seen military service. The latter group was likely to have remained in the same region all their lives, with the exception of the time spent in the military . . . (e) Only men who served prior to college or those who were inclined toward some form of voluntary service, which in turn conferred officer status, derived any personal satisfaction from the years spent in the armed forces (pp. 117 and 118)." (f) "Few differences were observed between survey respondents and . . . nonrespondent(s) (p. 122). The only puzzling difference is the slight salary advantage of the nonrespondents, which runs counter to the often-held belief that nonresponse is characteristic of the financially less successful members of a cohort (p. 128)." (g) Finally, and most importantly, salary data for both 1960, two years after college, and 1963, five years after college, are tabulated

and presented in this book by major program of study and by current occupation. "As far as salaries are concerned, there is a surprisingly low correspondence between type of college and earnings five years later. And at that stage in life, major seems to play a much greater role in predicting salary than does one's alma mater . . . Getting the best grades . . . also has little effect on getting the best salary . . . In the early career stages, work experience seems more important (p. 110)."

Joe L. Spaeth and Andrew M. Greeley (1970) analyzed 1968 data from a subsample of 4868 persons, 58 per cent male, 42 per cent female, who were 81 per cent of 6005 persons who, in turn, were 30 per cent of about 20,000 persons who represented about a 50 per cent return from 40,000 graduates of 135 colleges and universities in 1961. Seven years after graduation, over eight in ten were married, and this same proportion of the married had children. The average number of children was two. Nearly a quarter had met their spouses at their own college, and over a fifth were married to people who had not attended college at all. Of those working, 71% were in professional positions, and an additional 19 per cent were proprietors, managers, or officials. Three respondents in five had attended graduate school. A third held some kind of higher degree: 10 per cent had earned a professional degree, 21 per cent had earned a master's, and 4 per cent a doctoral degree. Thirty-seven per cent made a financial contribution to their college in 1967-68. The median gift was about \$10, and only 13 per cent had given as much as \$50. There seems to be some evidence that winning football teams help raise the level of contributions. Just over half of the alumni classified themselves as political liberals.

In exploring the relationships between education and occupation, Spaeth and Greeley used eleven variables. The best predictor of occupational prestige in 1968 (seven years after college) was occupational prestige expectations in

1964, which was strongly related, in turn, to plans and expectations in high school and college which were related to ability, parental SES, and assignment to a college prep track in high school (in that order of importance). The second strongest predictor of occupational prestige in 1968 was post-graduate study followed by college grades. College selectivity was a relatively minor determinant of occupational prestige.

In a concluding essay Spaeth and Greeley reiterated their findings that "colleges and universities do operate as sorting and screening agencies. As they progress through the system, bright men, or those who perform well, tend to become more oriented to the most demanding occupations. The reverse is true of the men with poorer records Men do change their career plans in response to their success or failure in college or graduate school, and the plans are important influences on the kinds of jobs actually held. The fact remains, however, that plans are a more important independent influence than academic performance (pp. 171 & 172)."

Frank S. Endicott since 1946, the College Placement Council (Finley, Horsley, and other, 1967) since 1959, and many colleges and universities make annual surveys of the salaries of former college students during the first year after graduation. In studies of beginning salary offers, Brian Finley, Wendell R. Horsley, and others (1967) found that employers' estimates of salaries being offered recent college graduates by other firms were almost universally on the low side and not reliable. Reports from students, on the other hand, showed remarkable dependability and correlated highly with actual salaries subsequently contracted for. No correlation, however, could be established between the former students who ranked highest in the salary scales and the following seven factors: (a) exceptional grades, (b) outstanding

leadership, (c) previous work experience, (d) older than average age, (e) marriage, (f) veteran status, and (g) five-year bachelor's degrees. A high degree of correlation was found among a number of salary surveys which, although measuring the same general subject, differed substantially in technique.

Former students who do not enter remunerative occupations because they do not persist through graduation are often not inferior in academic aptitude and socio-economic background to those who do. This discovery, evidenced in the seven-year follow-up study of admissions, by Everard Nicholson (1970) at Brown University, has stimulated renewed interest in follow-up studies of non-persisters. Robert G. Cope (1970) and others are using traditional personality scales with college environment measuring instruments developed by Henry A. Murray (1938), George G. Stern, Morris I. Stien, and Benjamin S. Bloom (1956), Pace and Stern (1958), Astin and Holland (1961), and the Central States Colleges and Universities (1971) to test the hypothesis that persistence and student based outcomes are affected by the relationships between the characteristics of student personality and the institutional environment.

Methodological Problems

These studies of economic outcomes explicitly compare data describing former college students with data describing analogous persons who did not enter college. Although studies of noneconomic outcomes have generally suffered from the lack of control and comparison groups, progress is being made (Lenning and Johnson, pp. 7, 8, and 17). Walter T. Plant (1965, 1966, 1967) included "noncollege" and "some college" comparison groups in his studies of changes in personality characteristics in bright young adults. He found statistically significant decreases in authoritarianism, dogmatism, and ethnocentrism associated with the passage of time irrespective of higher

educational attainment. This finding calls the whole body of literature describing the presumed effects of college experience on student personality development into serious question.

James W. Trent and Leland Medsker (1968) compared high school graduates of equal ability and social class some of whom did, and some of whom did not, attend college. They found that college tended to promote the growth of open-minded, flexible, and autonomous dispositions; that during college, students became more critical in their thinking, more tolerant, more flexible, and less prejudiced in their judgments. The college experience may, however, simply accelerate personality changes which are part of the maturation process of young persons eligible for college whether or not they actually attend.

In a secondary analysis of data from the Trent and Medsker study, Walizer and Herriott (1971) found that precollegiate background variables, and collegiate structure variables, made approximately equal (14.6% vs. 14.9%) contributions to the explanation of variance in social maturity of college students. Concluding that the colleges and universities have an impact "on the development of competence, after extraneous effects of precollegiate socialization background have been accounted for," and that "students do grow in a direction consistent with competence in a learning society," they nonetheless reported that disagreement exists "as to whether or not the college experience, per se, contributes to this growth or whether the selection processes of entrance into institutions of higher education merely provide a 'place' for development, which has already started, to reach fruition (p. 31)." Control of precollege and noncollege variables will be a major consideration in follow-up studies during the years ahead.

Cross-sectional studies of former college students continue as the predominant mode, however, the number of longitudinal studies of the type pioneered

by Lewis M. Terman (1925-59) is increasing. In Wisconsin, for example, files of longitudinal data are being accumulated and analyzed by J. Kenneth Little (1967 and 1970), William H. Sewell (1968), and their associates (Rossmiller, 1969). On the national scene, Project Talent, Project SCOPE, the USOE follow-up study of 1972 high school graduates, and the ACE data bank hold promise for the future. In the meantime, it is noteworthy that conclusions reached from cross-sectional and longitudinal studies have very often been similar and many valid cross-sectional studies which include much retrospective data are underway. (Feldman, 1970, p.5). The Central States Colleges and Universities are planning a cross-sectional study of the classes of 1962, 1966, and 1970, much of which will be retrospective in nature.

The most comprehensive critique of contemporary follow-up research methods is Alton L. Taylor's (1970) application of the S. Strauss (1969) criteria to 47 separate studies. Too many follow-up studies have tried to get information of dubious value, such as impressionistic opinions about the virtue of a particular course, the contributions of particular professors, or the value of attending a particular college (Pace, 1949). Often students participating in college environment and outcome studies are merely reporting rumors, engaging in wish-fulfillment, or stereotyping (Barton, 1961) (Turner, 1964) (Feldman, 1970). Marvin D. Dunnette (1966) provides a delightful summary of fads, fashions, and folderol in psychological research while Feldman (1970), Charles W. Harris, and others (1963) describe research strategies and techniques for studying the student-based outcomes of higher education. Inquiries designed to yield generalizations run rampant with invalidities and redundancies. Inappropriate methods, imprecision, lack of input controls, bad statistical controls, invalid and unreliable instruments, poor sampling, incomplete reporting, post hoc interpretation of unexpected

results, inadequate attention to interaction effects, ignorance of larger social-system contexts and the almost total inattention to control and comparison groups plague follow-up and outcome research. Nonetheless, methodological problems are overshadowed by general ignorance of long term student based outcomes of higher education which, in turn, forestalls adequate hypothesizing and good theorizing. Researchers reveal too little awareness of what others have done (Lenning and Johnson, 1972, pp. 14-19) (Feldman, 1970, pp. 5-23) (Gray, 1969). Though knowledge derived through isolated research is better than ignorance, one hopes that wider acquaintance with the literature will result through the use of ERIC, the Educational Index, College Personnel Abstracts, and the AERA's Review of Educational Research.

The larger problems associated with studies of the long term student based outcomes of higher education have to do with the substantive results rather than methodology. Because they vary greatly from what we believe and from what we think we know the results are painful for educators to contemplate. Reflection on Galileo's correspondence with Kepler provides insight on these problems:

Galileo wrote a letter to Kepler in which he referred to his calling on the professor of philosophy--which is to say, of theology--at Padua University. Galileo said he had asked the professor to look through the long, lensed tube--the newly invented telescope. The professor had said he could not do it. Galileo said: "You had better take an evening off. Come down and look through it. There is a new planet never before seen by mortal eyes."

"No," the professor said, "there is not such a planet."

"Well," replied Galileo, "come down and look."

"No," said the professor, "it is not there. I have read Aristotle carefully and I know the Bible backwards and forwards. The planet is not mentioned anywhere. I know it is not there."

"But I say come down and look at it, and see for yourself."

No, he was not going to do it because he was afraid that if he looked, he would see the planet, and he knew it was not there. The professor went on to say that if he looked and saw it, it wouldn't be real, but only an apparition--a temptation extemporized by the Devil to win him away from his faith (Smith, 1970).

Dare we put our good eye to the telescope? Dare we organize, hypothesize, and theorize on the basis of what we see? Dare we reflect on the policy implications? Or do we hold our current conceptions, images, and illusions more dear than truth?

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