My Years in the M.I.T Experimental Study Group

Some Old Facts and New Myths

by George E. Valley, Jr., VIII, '35

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Thank You

People who've been around the E.S.G. long enough to remember the days when I drafted the annual report, will remember that the last part of the operation, after we'd all hashed it over for weeks, was for me to take the manuscript home so my wife, the former Shea LaBonté, VIII, '35, could edit out all the ambiguities. This is the last E.S.G. report she will edit, and on behalf of all who partook in the writing of our earlier reports, as well as for myself: Thank you.

I was slow in writing this paper, and my dilatoriness has made extra work for Margaret Norris, the E.S.G.'s new administrative assistant. It is only due to her unflagging perseverance, her rapid and nearly flawless typing, and her never-failing good humor that all these words can be distributed on time. Everyone else who played a significant role in the E.S.G. is mentioned in the report or in one of its appendices.

George E. Valley, Jr.
June, 1974

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Introduction

The reason this report was written at all is that in April Professor Hartley Rogers called up and put the arm on me.

"George," he said, "now that you are retiring, you can afford to tell the truth about the E.S.G.; it would be helpful to have the numbers, too—so we know all the details."

"Hartley," I replied, "we've written reports to the C.E.P. for five years, and in most of those reports the students have stated their opinion of the Experimental Study Group."

"Yes," said Hartley, "but that was sort of advertising; besides we ought to have your thoughts in the archives about what worked and what didn't work."

Well, that did it! I couldn't resist an opportunity to write for the archives; so here goes.

I have included excerpts from a number of papers in the main text; longer excerpts from the same papers are in the appendices. Where excerpts from papers are in my text, it is because the authors say what I would have written anyway; excerpts in appendices serve to amplify the text; and if you think you understand what I'm saying, they may be skipped.

Education is a business in which different people have different opinions based on partly understood statistics and their own prejudices. Education will probably continue to be talked about until a true scientific understanding of the brain is achieved.

The principal source of my prejudice about education are my observations that both kittens and babies try to learn all the time; and that children often stop trying to learn after they've been sent to schools. It is not possible to reawaken very much of his pristine wonder at the world, in a bright seventeen-year old who has been circumscribed and restricted most of his life by a public education system intended for the masses; and the E.S.G. has only partly succeeded in doing that—but at least it has succeeded a little bit.

What Some People Think About Adolescents

Detecting Future Technologists

A report by S.W. Bloom [1] on the origin and early detectability of technically oriented children impressed me. Bloom makes the following points, among others: (a) Technically oriented children are bright in all subjects, and can be detected with assurance as early as the fifth grade; (b) their out-of-school activities are oriented toward science and they prefer non-team sports (e.g. tennis, skating); (c) there is a constant out-migration from the original cohort of technically oriented children, but no originally non-technically oriented children ever join it; (d) school science clubs and counseling are ineffective in recruiting children into technology, but more attention paid to the fostering of out-of-school science activities might help.

So that you can get the flavor of Bloom's thesis I've put a few pages from it into Appendix A, together with a comment of my own.

Alienation

A topic of common interest these days is the alienation of youth—alienation from parents, and from society. I shall not write much about why young birds and mammals leave home, except to point out that the E.S.G. freshmen seemed to find a foster home here; and that among the staff many of them seemed to find congenial surrogate parents.

The effects of the Viet Nam War (more precisely the effects of the draft occasioned by that war) on alienating youth have been written about at length. All those effects were manifest on the M.I.T. Campus, and the E.S.G. had the luck to be born in the midst of the resulting unrest.

Another cause of alienation, about which I've heard relatively little discussion, is the coming of industrial society. To be sure, industrial society itself is widely criticized, sometimes justly: sometimes from the viewpoints of a resurgent Romanticism, and sometimes one fears by a new generation of Luddites. But may it not be that, just as the majority of people who found themselves morally outraged by the Viet Nam war were also persons very fearful of the draft, many persons critical of industrial society are people who find themselves disregarded by it and therefore frightened by it?

I am impressed by a remark made by the Concord Superintendent of Schools a few years ago. Speaking in defense of the "open-campus" system employed by the Concord-Carlisle High School, he said, "Modern society has no use for adolescents." These words were evidently intended to shock; and they shocked me into reading about the history of youth in Concord.

About a hundred years ago, in a privately printed memoir, Edward Emerson (a son of Ralph Waldo Emerson) wrote:

> "after the railroad came (in ∼1848)—the Town, instead of living mainly its own life, became largely a sleeping-place for persons who exercised their professions or business in Boston." [2]

He notes further on that the young men "have an amateur look their fathers never had." [2]

What then did those fathers do when they were boys? What did their fathers do before them? What did boys do at the time of the Revolution?

They worked hard on the farm and eventually inherited it; or

They were apprenticed to a tradesman in town or in a near-by town; or

They left home at the early age of 14 with what little food and clothing their parents could spare; or

They went to Harvard to become clergymen.

It was the coming of factories and railroads that changed and enlarged the options for grown men; but whereas the industrial revolution took poor boys off the farms and put them into even more brutish factory jobs, many of the children of the new class of well-to-do commuters were left with nothing to do at all.

The superintendent of schools was correct. There just aren't, in an industrialized society, any jobs that really need to be done by adolescents.

The cognitive character of adolescent mentality has also been explored in many books. The folk-wisdom of the E.S.G. is that William Perry [3] says it best. Perry's book cannot be incapsulated into a paragraph—but, very roughly, he says: the immature adolescent tends to see the world in black or white terms, e.g. them guys vs. us guys; and he expects to be assigned worthwhile things to do. Perry and his colleagues regard the mature person as one who sees the world as a continuum of grays, so that good and evil are

not absolutes but relative positions on a gray scale; and a mature person commits himself to worth-while tasks.

The emotional problems of adolescents have been extensively described; since the reader has only to pick up his M.I.T. phone to get a speech on the subject, no books will be cited.

The Engineering Schools

The Archetype

Since M.I.T. is generally regarded as the world's leading engineering school, it is worthwhile to explore its origins. According to Professor Artz of Oberlin College, [4] the first engineering school was set up in Paris:

> "The new school, at first called the École des travaux publics and after 1795 the École polytechnique, was designed to take the place of the older higher technical schools for military and civil engineering of all types. It opened in the Palais Bourbon, just across the Seine from the Place de la Concorde, in November 1794. The three hundred and eighty-six students, ranging in age from sixteen to twenty, had been selected by competitive examinations in algebra, geometry, trigonometry, and physics, held in twenty-two cities of France...."
>
> "Though it was really more of a mathematical and scientific university than a technical school, it has, nevertheless, had a far greater influence on technical education than any other school. It attracted international attention from its very first years; it was visited by Volta, Rumford, Humboldt, and the leading scientists and educators of the German and Italian States, of England, Russia, Poland, Sweden, and the United States. Only the incessant wars prevented its immediate influence from being more extended. The French system of organizing the highest technical education separate and apart from the universities has been followed everywhere. It is interesting to see how the details of its entrance examinations, its curriculum—always with a pronounced emphasis on mathematics—its laboratories and its work rooms, its textbooks, methods of teaching, and its examinations began to be imitated in the technical schools of every European state. One of its capable graduates, Crozet, who fled to the United States, brought its methods to West Point. There Thayer enlarged upon his methods after he had gone to the Virginia Military Institute at Lexington, Virginia. At the same time, Greene introduced the same ideas at Rensselaer Polytechnic Institute at Troy, New York."
>
> "One interesting result of all the improvements in technical education that had been made in France since the time of Colbert was the fact that by the early nineteenth century France was the only country in the world where engineering was clearly and definitely established as a learned profession." (pp. 159-161) (emphasis by G.E.V.)

More details of the Ecole Polytechnique, strikingly similar to M.I.T. today, as it was in 1795, are given in Appendix B. I wrote to Professor Artz asking him about the particular sources of W.B. Rogers' inspiration for M.I.T. He replied that he thought Rogers knew mostly about V.M.I. and West Point.

Common Criticisms of Engineering Schools

The most common attack on the form of education invented by the French Technologists of the late eighteenth century is that it is inhuman and amoral. A recent expositor of this view is an ex-professor of humanities at M.I.T., W.I. Thompson. [5]

Thompson sees M.I.T.'s grandiose reinforced concrete architecture from the point of view of Chicken-Little. He uses all the cliches: "hubris," "lust for power," and so on. [The M.I.T. Press has published a funnier and more erudite criticism of our Building 10 copy of the Pantheon, and of our half-scale model of the Hagia Sophia at 77 Mass Avenue. [6]] When the main buildings were being designed, M.I.T. was fighting hard to preserve its independence of Harvard University, and it is entirely understandable that the M.I.T. Faculty should have wished to demonstrate the permanence of the Institute by adapting the then common neo-classical style of architecture (M.I.T. is not a unique example of this style in Boston; the Public Library in Copley Square is a close reproduction of an ancient Roman granary).

People like Thompson, besides being afraid that the sky will fall on them, also often subscribe to a Bogeyman explanation of public events, i.e. that there is a cabal behind every event which happens that he doesn't like. You cannot win an argument with a paranoid; and to convince some critics that engineering schools do not exist to create amoral zombies willing to do the unquestioned bidding of industrial Mammon is equally futile. I shall not therefore argue with this point of view; it is held primarily by people who cannot understand technology, feel lost in the modern world, and long for some earlier golden age.

There are bad effects of this kind of criticism, however, for it tends so to inflame emotions that needed criticism of engineering schools is unheard. Engineering schools are not perfect. It would be surprising if a system so nearly unchanged for almost two hundred years had no faults (and I assume that the reader has already seen the close parallel between the École Polytechnique of 1795 and M.I.T.).

Those faults, when seen by unprejudiced and unfearful people, are certainly not faults of motivation—the aim of technology is to feed people and keep them well. Rather the faults of the engineering schools are those of ineffectiveness and inefficiency. They are ineffective in that they drive too many good students out of the fields of technology; and they are inefficient in that they spend too much effort doing their job.

I believe both these faults are due to a failure to recognize that the Western World is now industrialized, and that the job which the Ecole Polytechnique was intended to do, has in fact been accomplished. Undeveloped countries may still need these places in their original form, but in the West they need to metamorphose.

The Experimental Study Group was a test of such a metamorphosis. But before describing the E.S.G., I must give examples of those valid criticisms of effectiveness and efficiency which I've mentioned above. Here are criticisms by two great men, each the alumnus of an engineering school operated according to the École Polytechnique formula.

Criticisms of The Effectiveness of Engineering Schools

> "...at the age of 17, (in 1896) I entered the Polytechnic Institute of Zurich as a student of mathematics and physics. There I had excellent teachers (for example, Hurwitz, Minkowski), so that I really could have gotten a sound mathematical education. However, I worked most of the time in the physical laboratory, fascinated by the direct contact with experience. The balance of the time I used in the main in order to study at home the works of Kirchhoff, Helmholtz, Hertz, etc. The fact that I neglected mathematics to a certain extent had its cause not merely in my stronger interest in the natural sciences than in mathematics but also in the following strange experience. I saw that mathematics was split up into numerous specialities, each of which could easily absorb the short lifetime granted to us. Consequently I saw myself in the position of Buridan's ass which was unable to decide upon any specific bundle of hay. This was obviously due to the fact that my intuition was not strong enough in the field of mathematics in order to differentiate clearly the fundamentally important, that which is really basic, from the rest of the more or less dispensable erudition. Beyond this, however, my interest in the

knowledge of nature was also unqualifiedly stronger; and it was not clear to me as a student that the approach to a more profound knowledge of the basic principles of physics is tied up with the most intricate mathematical methods. This dawned upon me only gradually after years of independent scientific work. True enough, physics also was divided into separate fields, each of which was capable of devouring a short lifetime of work without having satisfied the hunger for deeper knowledge. The mass of insufficiently connected experimental data was overwhelming here also. In this field, however, I soon learned to scent out that which was able to lead to fundamentals and to turn aside from everything else, from the multitude of things which clutter up the mind and divert it from the essential. The hitch in this was, of course, the fact that one had to cram all this stuff into one's mind for the examinations, whether one liked it or not. This coercion had such a deterring effect [upon me] that, after I had passed the final examination, I found the consideration of any scientific problems distasteful to me for an entire year. In justice I must add, moreover, that in Switzerland we had to suffer far less under such coercion, which smothers every truly scientific impulse, than is the case in many another locality. There were altogether only two examinations; aside from these, one could just about do as one pleased. This was especially the case if one had a friend, as did I, who attended the lectures regularly and who worked over their content conscientiously. This gave one freedom in the choice of pursuits until a few months before the examination, a freedom which I enjoyed to a great extent and have gladly taken into the bargain the bad conscience connected with it as by far the lesser evil. It is, in fact, nothing short of a miracle that the modern methods of instruction have not yet entirely strangled the holy curiosity of inquiry; for this delicate little plant, aside from stimulation, stands mainly in need of freedom; without this it goes to wreck and ruin without fail. It is a very grave mistake to think that the enjoyment of seeing and searching can be promoted by means of coercion and a sense of duty. To the contrary, I believe that it would be possible to rob even a healthy beast of prey of its voraciousness, if it were possible, with the aid of a whip, to force the beast to devour continuously, even when not hungry, especially if the food, handed out under such coercion, were to be selected accordingly...." (emphasis added by G.E.V.)

Some theoretical physicists, when this autobiographical statement by Albert Einstein [7] is read to them, casually remark that "Einstein wouldn't have fit into any school;" then they go on ruining their students' appetites for learning by answering hundreds of questions the students aren't yet mature enough to ask.

But it is a fault to put forward so much knowledge that the student gags on it. More is not better; and this has been recognized for a long time by those who say that "getting an education at M.I.T. is like getting a drink from a fire-hose."

In the hope of catching the attention of some of those who pump firehoses, I now quote from a book about a graduate of R.P.I.; an engineer M.I.T. would be proud to claim as her own.

He was Washington A. Roebling, class of 1857 at R.P.I. and the builder of the Brooklyn Bridge. [8]

"The work itself [i.e. at R.P.I.] was extremely difficult. Once in a letter to Charles Swan he mentioned swimming the Hudson, but otherwise he seems to have done little else but study, which was not surprising, considering what was expected of him at home and what was required by the institution. His senior thesis was to be on Design for a Suspension Aquaduct, but in three years' time he had also to master nearly a hundred different courses, including, among others, Analytical Geometry of Three Dimensions, Differential and Integral Calculus, Calculus of Variations, Qualitative and Quantitative Analysis, Determinative Minerology, Higher Geodesy

(the mathematical science of the size and shape of the earth), Logical and Rhetorical Criticism, French Composition and Literature, Orthographic and Spherical Projections, Acoustics, Optics, Thermotics, Geology of Mining, Paleontology, Rational Mechanics of Solids and Fluids, Spherical Astronomy, Kinematics, Machine Design, Hydraulic Motors, Steam Engines, Stability of Structures, Engineering and Architectural Design and Construction, and Intellectual and Ethical Philosophy."

"A century later, D.B. Steinman, a noted bridge-builder and professor of civil engineering, would write, 'Under such a curriculum the average boy of today would be left reeling and staggering. In that earlier era, before colleges embarked upon mass production, engineering education was a real test and training, an intensive intellectual discipline and professional equipment for a most exacting life work. Only the ablest and most ambitious could stand the pace and survive the ordeal.'"

"Roebling, however, would take a different view when he came to appraise the system long afterward. He saw no virtue whatever in what he called 'that terrible treadmill of forcing an avalanche of figures and facts into young brains not qualified to assimilate them as yet.' 'I am still busy,' he said, 'trying to forget the heterogeneous mass of unusable knowledge that I could only memorize, not really digest.'"

The remarks of Steinman about the superior strength and character of Roebling's generation of students as compared to his own contemporary generation may be taken seriously by some readers. However, other people have made similar remarks at other times and about other people:

"Modern Harvard, (1880) even delivered from the Greek fetiche, and with the freest election of studies, may be a more comfortable place for the study of the humanities. But is it a better school of character?" [2]

These criticisms of "modern" education are particular examples of a more general tendency of people to say, in various ways, that "things ain't what they used to be," for instance:

"...which of the ancients can be found to have used vermilion other wise than sparingly, like a drug? But today whole walls are covered with it everywhere." [9]

The tendency to believe that education, particularly professional education, must be harsh if it is to be good, is very ancient. Among the libraries of Sumeria (c. 2500 B.C.) and of Egypt (c. 1500 B.C.) there are many student exercises from the schools for scribes (who were the professionally educated people in those days—they did the accounting, wrote the laws, designed pyramids, etc.). Throughout these ancient schoolboy exercise books there runs a history of whipping and other corporal punishment which would have satisfied the worst 19th century schoolmaster. Sometimes the ancient kids resented the punishment; more often as elders they admire the punishment and admonish their own children: "What was good for me is good for you!"

I must admit that for most of my life I thought that way, too. My views began to change while I was in charge of the Junior Physics Laboratory.

When I took over the Laboratory it was a place where students were made to do things for the good of their souls. They were shouted at by teaching assistants whose primary interests were theoretical, not experimental; their reports were severely graded for errors in spelling; and most of the experiments couldn't be made to give even an approximation to the expected result—some would not even work qualitatively.

Now I had learned by that time (1960) that in a research laboratory, if you want to get good work you should see to it that people are happy. I saw no reason why this rule should not apply to the Junior Physics Lab. So I quieted the T.A.s, limited the amount of credit to be removed for poor spelling (two T.A.s immediately threatened to quit over this lowering of standards) and, with the invaluable help of Professor Jerome Friedman, set to work making the experiments work as advertised. This took us about two years to accomplish.

By this time I'd also discovered that if the relatively sophisticated apparatus in the Junior Lab was to work well, then I would often have to trouble-shoot it myself; so I came to spend about one day a week working in the lab, with students working all around me. Their remarks about the way the lab was run were, to my amazement, still acerbic; and, at first, my presence in their midst was resented. Later on I became accepted, but I do not recall ever at that time (during my third year on the job) being greeted with smiles.

However my acceptance in the lab began to pay off in a totally unexpected way: at the end of the Fall term seven or eight students (out of 150), mostly in tears, came separately into my office to confess they'd bibled their lab reports because they hadn't had time to do all the required work. I did not fail these students; what I did was to distribute a questionnaire to find out how much time the Junior Lab took from a student's weekly schedule. The results of this questionnaire indicated that the median time was twice that allotted; no student said he could complete the work in the allotted time.

I was at first unable to square this finding with another observation about student morale in the Junior Lab. Once a year, for about six weeks, it has always been the custom to allow each student or a group of students to do a project. After each project is approved, a small amount of money is appropriated for it and whatever help is needed, in scrounging equipment or rare materials, is given by the faculty. Students worked very hard and for very long hours over these projects; but while they were doing projects their morale was extremely high—everyone looked and acted happy.

Fortunately at that time I was rereading some of Winston Churchill's books, and I reread his remark that he considered himself never to have worked a day in his life. This then was the message, "if you like what you're doing, you don't object to getting tired while doing it for long hours."

So I relaxed the requirements: I required fewer experiments, gave more choice, and got the allotted time for the subject increased. Sure enough, there were some smiles the following year.

But the punitive aspect of science laboratories is more general by far than the example I've given. It appears to be a common characteristic of physics laboratories that the apparatus doesn't work. This is "to teach the students respect for the difficulty of physics, etc. etc." (what it actually teaches is that physics professors are bastards).

Chemistry laboratories, particularly analytical labs, are sometimes operated according to a different punitive principle. In one case which came to my attention while I was Undergraduate Planning Professor, the professor in charge of an M.I.T. lab had the idea that it was good for students to be continually challenged. He operated this way: students who had difficulty analyzing an unknown sample were graded down, as perhaps they should have been; but students who succeeded easily were given another and more difficult sample; and if they succeeded with that one, yet another one still more difficult. The students perceived this professor as having the aim of making every student have a rough time learning analytic chemistry. Two students told me about this laboratory; their hatred for the professor was explicit, and their characterization of him showed their psychiatric erudition.

Convergent - Divergent

At about the time I was listening to these two chemistry students, I discovered an illuminating book [10] which introduced me to the ideas of "convergence" and "divergence." Getzels and Jackson put forward the idea that the degree of convergence or divergence of a child's mental activity could be estimated in roughly quantitative ways and that this characteristic was quite independent of IQ (which they, and I, believe to be a valid indicator of a person's ability to solve problems). Getzels and Jackson tested students in a good private school in the Chicago area. They divided the students into High and Low IQ groups (in this class the "Low IQ's" were still very substantially above the population's norm); and into Convergent and Divergent groups—thereby establishing four groups in all.

An example of a test for divergence/convergence was: "what can you do with a brick?"

A Convergent child would answer: build a wall.

A Divergent child would answer: hollow it out for an ash-tray; throw it at somebody; pile bricks on one end of a see-saw so you can ride by yourself; build a wall, etc.

A "Convergent" person is one who thinks conventionally—(he may or may not act unconventionally: write poetry, smoke pot, ride a unicycle, have many lovers, etc. etc.); a "Divergent" person thinks unconventionally (he may or may not always wear a suit and neck-tie, keep regular hours and generally act conventionally).

It was the assertion of Getzels and Jackson that "divergence" is associated with "creativity" and that "convergence" is associated with careful painstaking plodding, although possibly at a high order of required intelligence. They said they had evidence that the children as well as the wives of college professors often had high IQ's and were convergent; that high IQ kids who were divergent came primarily from the families of successful technological entrepreneurs, most of whose wives had only finished high school. Divergent children tended to have well developed senses of humor and to be disliked by their teachers even though they achieved A level grades.

Sometime later I came upon a survey book which discusses these ideas at length. [11] Hudson's Contrary Imaginations is the best book to read on divergence, etc.; he also gives a good bibliography.

As I thought about convergence, the "fire-hose" educational process of engineering schools, Einstein's experience, and the data I was beginning to accumulate on the actual workings of the M.I.T. freshman educational system, I slowly came to the following conclusion: If you want a relatively large number of people to make the minimum number of mistakes while being responsible for the welfare of very large numbers of other people, then you'd best select those who tend toward convergence, educate them in convergent ways, and weed out as unreliable the divergent. This, after all, is what the École Polytechnique was started for: to make sure that only the best of the received methods would be applied to the building of bridges and roads; and that the mines would not flood, nor cave in.

I also concluded that if, contrary-wise, you wanted a few people who would do previously untried things, then in order to get those who could do untried things you needed to select students for divergence, and educate them accordingly. [12]

I doubt if there have been many societies wealthy enough to support many divergent people; and I doubt divergent people can at present compete against the convergent in practical affairs. Certainly classical Greece, where I suppose divergent personalities first appeared in numbers, supported at its best only a few of them; and Greece was easily conquered by the Romans who made a virtue of convergence. [13] But it seems to me that it is just in the post-industrial society now emerging in the West that the divergent personality will dominate; because in that society, if it is not still-born, one may hope for that freedom from those ancient apocalyptic terrors which make convergence so necessary for survival.

The Low Efficiency of the Engineering Schools

Since this section is based almost entirely on information about M.I.T. it is only by extension that it can be said to apply to engineering schools generally. This extension is safe because M.I.T., while not their archetype, has certainly become the paradigm of all engineering schools. The information is based on data collected by Wayne Stuart and me during my tenure as Undergraduate Planning Professor,[14] charged to "rigorously seek to establish the facts on what the consequences of different educational measures have been (at M.I.T.)."

We asked everyone we saw what he thought the M.I.T. educational process was like, made lists of the answers, and decided that everyone must be both right and wrong since every side of every question seemed to be taken by someone. We therefore counted students, took attendance by name, issued questionnaires, collected college board scores—we sought all the numbers we could get. We attempted to correlate these numbers in all reasonable ways.

We found that the characteristics of students entering M.I.T. were consistent with the statements in Bloom's thesis. [1] M.I.T.'s entering freshmen had higher mathematics and science grades than freshmen who enter all colleges except Cal Tech and Cooper Union; their verbal skills were higher than the freshmen who entered most of the Ivy League Colleges. Compared with freshmen entering schools like the Indiana Institute of Technology and the Clarkson College of Technology, the M.I.T. freshmen were more motivated toward learning for its own sake than toward being trained for a job; compared with freshmen entering the U.S. Coast Guard Academy, many fewer M.I.T. freshmen thought it highly important to have a full social life in college; compared with freshmen entering Yeshiva University significantly more M.I.T. freshmen were non-conformists and were rebellious toward society.

We judged that most of the efforts of the M.I.T. Admissions Office to significantly alter the personality profiles of entering classes were futile—a significant waste of time and money, in some cases resulting in a cruel exposure of students of inadequate ability to the rigors of M.I.T.

We found that the best predictors of freshman grades in mathematics, physics, and to a lesser extent chemistry were high-school (or College Board) grades in mathematics: the more advanced the mathematics and the higher the high school grade, the better the physics and chemistry grades at M.I.T. High school science grades were not good predictors of M.I.T. mathematics grades. This and other evidence caused us to conclude that a large amount of the testing which normally goes on at M.I.T. is wasted effort.

We concluded that previous grades are the best predictors of future grades, given that the subject matter is reasonably constant. We found little evidence to support the notion that grades are meaningless as predictors of success after college. While it is true that there are instances of college drop-outs or near failures who later succeed in life, your best bet is always on the highest graded person—in spite of the fact that some persons who achieve high grades are professional examination-takers.

Contrary to the folk-wisdom of teachers, we found that students who worked the longest over the homework assignments of a particular subject did not, on the average, achieve the highest grades. Students who achieve high grades take substantially less than the allotted time to do their homework, but they do it according to a methodical schedule. Contrary to the impressions of many faculty members the average freshman was not overworked. Contrary to the hopes of some faculty members, there was not much unrequired investigation of the subject matter by freshmen.

As expected, we found that students who fail a subject most usually had not attended its lectures; we judged that the direction of the causality could not be established—there were students who stopped attending after they'd begun to fail.

Contrary to expectation we also found significant numbers of freshmen who stayed away from the lectures but nevertheless achieved honors grades.

Contrary to recommendations of the Committees on Curriculum Content Planning and on Educational Policy, we found that in subjects where the subject matter was pitched at the level of the upper third of the class, remedial classes for the slower students were relatively ineffective. We judged instead that subjects should be pitched at the average student; and that extra and possibly more difficult material should be available to the best students.

The teaching competence of a recitation instructor, as judged by other instructors, had no detectable effect on the average grades achieved by his classes. The principal and overwhelming reason why one section got higher average grades than another was because that group of students got higher average grades in high school. The registrar, when he schedules students to the different classes, produces non-random fluctuations in these averages (the really bright kids are usually in that section which meets at an unusual hour).

We came to the conclusion that student evaluation of teachers, particularly as it is performed at Harvard University, has practically no effect on the teaching competence of the faculty; year after year you can read [15] that Professor X doesn't know anything about Dante or that Professor Y's voice is so hypnotic that even those students who want to stay awake go to sleep.

Contrary to the belief that the principal causes for declining lecture attendance are the particular lecture room used, and the time of day at which the lecture is given, we found that these two causes while important are not the dominant cause of poor attendance. The dominant cause of poor attendance is the students' judgement that the lecturer is not worth listening to. We concluded that the most objective way to estimate the teaching ability of one of our instructors was to take attendance in his class toward the end of the term.

But when we tried to correlate attendance with grades we got no results. One thing we should have tried was to correlate grades with students' opinions of the teaching ability of various instructors. Such studies have recently been published. Short descriptions of these papers are given in Appendix C. [16][17][18] My conclusion is that the last paper (Frey) is the best one; and that while it is true that the student's own ability is the largest factor in determining his grade, the ability of the instructor should not be ignored.

We judged that the principal function of the lecture-recitation system was to coerce the majority of the students into reading a textbook and doing homework. At the time, it seemed to us that this was an extravagantly expensive way to get the homework problems done.

The drift away from science into engineering, and away from either into the verbal disciplines described in Bloom's thesis [1] was very noticeable during and after the freshman year. It was as though the first year at M.I.T. was deliberately designed to have that effect.

Students who entered the different disciplines had significantly different average grades. Mathematics and physics were always highest; architecture and management always lowest. [19]

Students entering the different disciplines had significantly different personality profiles, [20] architecture students seeming to have substantially more divergent personalities than management students; mathematics and physics students seemed closely grouped somewhat above the average in divergence for the entire class. [21] The general picture is that the personalities of engineering and management students tend to fit the overall adjective "convergent;" while those of science, humanities, and above all architecture, tend to be "divergent."

A General Impression

When it came time to plan what was to become the Experimental Study Group, my impression of M.I.T. was that of an enormously expensive and powerful organization trying, and often failing, in the rather modest task of educating freshmen: many of them were not getting a drink from the firehose, they were being flushed down the drain.

The Genesis of the Experimental Study Group

It was Howard Johnson's idea. One day in 1967 he called me into his office. "George," he said, "you ought to stop all this statistical work. What we ought to have is an experimental college in an enclave someplace on the campus. I'd like you to set up a student-faculty committee to plan it."

Wayne Stuart and I hadn't quite finished the last two chapters of our report, [14] so I didn't start working on this task right away. What really held me back, I now see in retrospect, was my own need to decide if I wanted to run an experimental college.

Experimental Colleges

Everyone of course had his own idea of what an "experimental college" was. Sarah Lawrence and Bennington were the most often referred to; but in fact the experimental-college concept really meant the kind of thing mentioned to me by President Johnson—some kind of a different system of education usually embedded in an otherwise orthodox campus.

They were springing up all over the country: A Berkeley effort, led by Joseph Tussman, was simply called "Experimental College Program." Time magazine asked of it: "What happens when you take one of Berkeley's liberal-minded philosophy professors and give him complete freedom to fashion an experimental liberal-arts program that lets students talk endlessly with talented teachers?" [22]

Other places gave fancier names to their efforts: Fordham University set up "Bensalem;" Antioch had its "Inner College." Some experimental colleges were also set up independently on their own campuses, for instance the College of the Potomac, and Friends World College.

All the many experimental colleges that I knew of taught some kind of liberal arts curriculum; but when Howard Johnson proposed that M.I.T. start one he made it clear that mathematics and science were to be emphasized to the extent normal at M.I.T.

Could you adopt such extraordinary freedom of manner and spirit to a rigorous curriculum? I thought not, at first; so I explored the idea of adopting a rigorous curriculum to the ideas of experimental colleges—this seemed even less possible to me.

Time has shown that I was wrong on both judgments: the M.I.T. Experimental Study Group is in fact, today, an experimental college entirely in the spirit in which Bensalem and the others were conceived; the curriculum is as rigorous as any at M.I.T. in the sense that hard books are mastered; but the curriculum is also as free and open as any of the liberal arts experimental colleges in the sense that students study when, where and to some degree what they like.

How the Elder Learners and Edna Came To Be

In all my reading about experimental colleges I found precious little hard information and even less guidance. However, one paper, by Joseph Axelrod, was invaluable; it gave me the idea of the "elder

learner" and also led to my hiring of Edna Torgerson and to my defining her job so that she could become the emotional and social anchor-woman of the E.S.G. [23]

I now quote from Axelrod:

> "The structure outlined here, called Model M, is offered as a model for an experimental college that would be established on the large urban campus." (San Francisco State College; p. 328)
>
> "Small classes or more face-to-face contact cannot, in themselves, turn students on—i.e., induce genuine involvement, a feeling of relevance. The only thing that can is a special teacher-learner relationship. It is that special relationship, as a feature which is characteristic of the climate of learning, rather than a happy and relatively rare accident that Model M seeks to establish." (p. 329)
>
> "Within the primary group, as the professor takes on certain functions which traditionally are conceived as appropriate to 'learners' only, so Model M envisions the student assuming certain functions that are usually considered appropriate only for professors. If teaching and learning are to become a single process—an engagement in joint inquiry—then it follows that the pattern of authority and status in Model M must also differ from that typically found in the traditional university model. The crux of the process, as Harold Taylor puts it, is for students to learn 'how to teach each other and how to learn from each other, from books, from experience, from their teachers, or from anything.'" (p. 330)
>
> "The faculty aide is a new post created for Model M. His function is administrative rather than instructional. He is the 'leg man' for the staff team, and responsible for all administrative and record-keeping matters for the primary group to which he belongs in a given term. As a 'trouble shooter,' he facilitates communication between students and faculty in the primary group, and serves as the group's liaison with student personnel services. He is the major clearinghouse for information regarding group movements, the message center for members of the group, morale builder, Mother. Probably mature in years and experience, the aide is someone holding a college degree or the equivalent, able to alleviate the immediate problems of a nervous student or anxious faculty member. The aide is not someone aspiring to become a faculty member, for this is a career post in its own right. His salary lies somewhere between that of a senior secretary or administrative assistant and instructor.
>
> "Women whose children are in college or beyond might well be attracted to this post. No specific training is needed. Office machine skills are not, strictly speaking, necessary. Many mature and intelligent women who currently hold secretarial posts in the academic world perform, with great insight, all of the duties listed here for the faculty aide, so the post is, therefore, not actually a new one. Model M simply recognizes and attempts to formalize a complex job already performed on almost every campus by many faithful secretaries." (p. 332)

Anyone who reads Axelrod's paper will find many other concrete suggestions which I chose to ignore because I thought there was too much disparity between the intelligence of M.I.T. students and those taught by Axelrod and also too much disparity between the level of commitment demanded by the M.I.T. curriculum and that at San Francisco State. Soon after I read this paper, wild rioting broke out on the campus of San Francisco State College; this lasted throughout the formative years of the E.S.G. and until now it has not seemed helpful to emphasize that any feature of the E.S.G. was guided by experience at San Francisco State College.

These good ideas however would have been of no use to us had we not been able to hire a person who was both understanding and resilient. Miss Torgerson's personal qualities were exactly what was needed; without her the E.S.G. would never have survived its first year.

The European Universities

Early in 1968 I talked with a number of M.I.T. faculty members who had attended European Universities; those conversations, particularly with Professor S. Olbert and with Professor L. Trilling eventually put me on a path which seemed to lead somewhere.

Almost any student can matriculate in the European universities. The professors lecture pretty much on whatever they please, and the students attend or don't attend as they please. Text books are available but the professor usually will not recommend any of them since, as one of them was quoted as saying, "book? I know this subject, I don't need a book." Tutors are also available, usually for a fee. After the student thinks he's mastered his subject he can take an examination for a degree. The drop-out rate is extremely high, but European Universities also tend to encourage "perpetual" students—students who stay in residence for decades. The level of learning is, however, very high; and the highly motivated, unusually able student is likely to be best educated at one of these places.

Since M.I.T. only admits unusually able students one might expect that the freedom of the European University system would not result in a high drop-out rate if it were to be allowed here, especially if it were restricted to freshmen; or so I conjectured. Therefore I began to plan an experimental college based not only on brand new notions from California, but also on very ancient ideas from Padua, from Vienna, and from Paris.

The Cambridge University Tradition

I was interested in affording more students more contact with their teachers and the Oxford-Cambridge tradition seemed an appropriate model for that.

In March of 1968 I spent nine days in England. Professor A.B. Pippard and his colleagues at Cavendish Laboratory and Professor Horlock in the Engineering Department were most generous to me. I also visited the Universities of Sussex, Surrey and London.

I was quite disenchanted with Cambridge, and with the classic Oxbridge system as it was applied to technical education. I will not digress to explain why I was disenchanted; in Appendix D are some quotations from my trip report, which explain my disillusionment.

The O.I.A.

Immediately upon my return from England I began to put coherent thoughts together. I had the benefit of several conversations with Howard Johnson and Jerry Wiesner; and by the middle of April I had composed a document called "An Option for Intellectual Autonomy" which was satisfactory to both Howard and Jerry. (That document is Appendix E.)

In May of 1968 I began recruiting a committee of students and Faculty members; the committee was originally named "the Experimental College Study Group."

The First Recruitment

From each department head I had already received a list of his colleagues who were particularly interested in undergraduate education; this list of names was originally intended to be the mailing list for the Valley-Stuart [14] Reference Manual. Now I used it again, this time as a source of names of potential committee members. I did not know how many would respond, so I decided initially to send out thirty

copies of "An Option for Intellectual Autonomy" with a covering letter asking for comment, but saying nothing about any committee. I sent these as follows: fourteen to the School of Science; six to School of Engineering; four to the School of Humanities and Social Science; two to the School of Management; one to the School of Architecture; and three, in addition to Howard and Jerry, to the Administration. I received favorable replies as follows: from Science 55%, from Engineering 50%, from Humanities and Social Science 100%; from Management zero; from Architecture zero; from Administration 100%.

I chose thirty sophomores as follows: they should have highest freshman-sophomore grades combined with highest SAT verbal scores. I had good reason to believe that high SAT verbal scores correlate with "divergence;" thus I was after smart divergent sophomores. I was chiefly interested in sophomores because I wanted some of the student members of the committee to serve as tutors in the new enterprise, and I expected that it would take a year of planning and arguing before the experimental college would exist.

Twenty-six sophomores said they would be interested; I chose several that I liked the looks of, plus Robert Berman who had been working in my office and on whose competence and good sense I could rely.

During the summer of 1968 Edna Torgerson decided to leave the Stanford Linear Accelerator Center and return to Cambridge. Edna had worked with me in the Junior Physics Laboratory and I knew I could rely upon her to fit the role described by Axelrod. [23] There were several other professors who also had high opinions of Edna, and I solicited letters of recommendation for her from them; armed with these letters I had little trouble arranging her salary, and she became the first member of the Committee.

The Name Is Invented, And Meetings Are Held

Sometime also during that summer, I received a message that, since "Experimental Colleges" were creating noise on some campuses and arousing the disfavor of prominent citizens, it might not be a good idea to call it the "Experimental College Study Group." So I erased the word "college," thinking that the ambiguity in the name would be fun. Actually this ambiguity created lots of argument in the E.S.G. and for three years some E.S.G. people complained that the study group wasn't experimental enough while others said the experimental studying wasn't going on in a sufficiently group-like (i.e. communal) atmosphere.

The first meeting of the Experimental Study Group was held on September 18, 1968 at 10:00 a.m. in Room 10-280.

Faculty members present were: Eric Cosman VIII, A.P. French VIII, Albert Gurney XXI, President Johnson, Arthur Kaladin XXI, Daniel Kemp V, John King VIII, Frederick McGarry II, Walter Rosenblith VI, Edgar Schein XV, Arthur Steinberg XXI, Gilbert Strang XVIII, George Thomas XVIII, George Valley VIII; absent were: Thibaut Brian X, Henry Millon IV, and Provost Jerome Wiesner.

Students present were: Robert Berman XVIII, Charles Friedman VIII, and William Holland IV; absent were: Richard Edelman XXI and James Jamieson XXI.

President Howard Johnson opened the meeting and expressed his full support for the effort. He said it was necessary to keep C.E.P. and the Faculty informed of our deliberations; he also said he needed a report by January 1, 1969.

From then on we met every week at 3 p.m. Jerry Wiesner and Paul Gray came to many of these meetings and we made minutes available to everybody. I talked with Howard Johnson periodically and I always had his firm support. The membership was fairly constant during the fall term of 1968. During that time Professor Robert Halfman asked to be included, and there was some change in the student membership.

I made no effort to push the paper called "An Option for Intellectual Autonomy" although I did see that all the ideas in it were well argued.[1] Some of them survived and some did not. What did survive, however, was the idea of intellectual autonomy—everybody bought that wholeheartedly; what was harder to do was to figure out the method.

The Report of January 1, 1969

We prepared a thick report and delivered it to Howard and Jerry and sent copies to the C.E.P. (The first seven pages of that report are Appendix G of this report.)

If one compares the "Objectives of the Proposed 'Option for Intellectual Autonomy'" as stated by me in April 1968 (Appendix E, p. 5) with "Guiding Principles for an Experimental Program" in the January 1 Report of the Experimental Study Group (Appendix G, p. 3), one sees that similar ideas are expressed from two very different points of view.

In April 1968 I expressed such ideas as: each student should learn at his own pace; there should be informal exams; there should be undergraduate tutors; a freshman should use several books for each subject; freshmen should invent original homework problems; there should be freshman colloquia; there should be self-education of freshmen; "grading" should be by staff approbation; there should be a staff attitude of "we don't care how he learns as long as he does learn."

In January of 1969 the E.S.G. report (which I drafted but which was extensively corrected by E.S.G. members) expressed these ideas: there should be an individualized program for each student; students needed guidance toward the use of freedom; students should be shown how to create their own programs; students should come to understand themselves; students should learn to cooperate with others; the new program should influence all M.I.T. education; there should be general colloquia; there should be available to each student self-study, concentrated study, seminars, lectures, and regular M.I.T. subjects.

These two papers are not in opposition; they are in fact describing the same general point of view. However, whereas the 1968 paper represents only my own rather process-oriented views, the 1969 paper gives a much warmer student-oriented picture of what was proposed.

The 1969 paper is also written in less specific terms, and perhaps one can sympathize with the convergent faculty member who told Malcolm Parlett, "George Valley managed to sell a contentless program." [24] After rereading both these E.S.G. papers, I now see that they have a family resemblance to all those other experimental college descriptions which were of no help to me [e.g. the book about Hampshire College [25]] while I was trying to plan an experimental college.

I believe the reason why these papers seem mysterious, vague and contentless is that they are trying to describe the creation of a new ambiance, a new atmosphere of learning. They are not proposing new subject-material because the authors are all wise enough to know that new material isn't required. The difficulty really lies in the choice of art-form. Ambiance and atmosphere cannot be communicated well by descriptive prose; we should have written a novel—then the majority of the M.I.T. faculty would have been able to understand what was proposed (and it probably would have scared the hell out of most of them).

Following our January 1, 1969 report there was a period of hooting and hollering, chiefly about money, but also whether or not I should direct the new program. I would like to express my appreciation to the many members of the M.I.T. Administration, Corporation, and Faculty who supported the new ideas at that time; particularly to Howard Johnson, James B. Fisk, and Edwin H. Land.

[1] Some questions which the Committee members asked me about the "O.I.A." are in Appendix F.

Why I Insisted on Running the E.S.G.

(1) To a good approximation the main new ideas originated by any committee are those of one or two of its members. The whole committee rarely produces anything valuable ("a camel is an animal designed by a committee"). Committee discussion is useful and necessary chiefly for judging the value of ideas, and for refining ideas.

(2) During twenty years of chairing committees I had seen ample proof that new ideas cannot be proposed by one group of people and then carried forward by a different group; this just doesn't happen with new ideas. If something new comes out of a committee, then some of the people on that committee are needed to run the implementing operation.

(3) Following Dr. Parlett's comment that M.I.T. was elite and convergent I thought about M.I.T.'s eliteness for several weeks. What confused me was the large number of M.I.T. people who continually abjured eliteness. (Indeed at its first meeting in September, 1968 the Experimental Study Group was instructed not to devise an elitist society.) I finally decided that M.I.T. was indeed an elite organization; that all professional groups are elite, and that the original École Polytechnique was itself elite. I came to the conclusion that the support of egalitarianism by many M.I.T. faculty members was only a benign manifestation of their puritanical upbringings and concomitant feelings of guilt; and that the speechifying of a few "radical" professors was empty posturing—they were as elitist as everyone else.

(4) Some of my criticisms of M.I.T., which led to my interest in starting the Experimental Study Group, were very old. For instance on April 8, 1947 I wrote to Professor W.K. Lewis, Chairman of the Committee on Educational Survey:

> "...it is most important that, if Institute policy be aimed at adequately training the many, it shall not inhibit the few. Let us take care not to make ducks out of our swans."
>
> "In order to teach effectively the instructor must infect the students with some of his own enthusiasm."
>
> "Instead of being educated in science and engineering they are being well trained in solving problems. Instead of leaders, hacks are produced."

(5) As I speculated about the motivations of the people who were opposing me, and studied their statements, I could discern no indication that they could understand, or lead, an enterprise intended to emotionally support uniquely competent students. Therefore I persisted.

I determined that my influence on the E.S.G. would be to make it fit for budding Einsteins; that what I was interested in was fostering students who would be courageous enough to think in new ways without fear of getting the wrong answer. In short, I was going to educate potential Nobel Laureates. I expected that the price of doing this would be that I fostered some crack-pots.

Of course it was not at the time politic to discuss such a goal openly; nor would I do so today if I intended to continue operating the Experimental Study Group. I should report, however, that in 1968 and 1969 there was evidence that some people saw where I wanted to go, and tacitly supported me. There may also have been some members of the original E.S.G. who were prepared to go my way—as long as we didn't make fools of ourselves by talking about it. I remember one administrator who looked me in the eye while he said, "M.I.T. is certainly good at producing vice-presidents of industry." "What about presidents?" I asked. "Hah," he replied.

Recruiting Divergent Freshmen

As soon as it was practical to do so I set about planning to attract divergent freshmen. The most immediate problem was space. Parlett [24] contrasts the E.S.G. space with that of another experimental program in this way:

> "ESG has its rooms (e.g., library, music listening room, seminar rooms, office, lab, etc.) clustered around a central lounge area which forms a definitive focus and communal center. Anybody entering ESG must go through it. It would be difficult to avoid all communication. It is easy to see whether people are in or not. USSP is quite unlike this. Rooms it uses are spread along four corridors on three floors. 'Have you seen Harry?' 'No, have you seen Don?' is an instantly recognizable USSP corridor encounter. While Edna Torgerson in ESG could tell you at once whether a particular student or faculty member was around, her counterpart in USSP would find it impossible. USSP is diffuse, its boundaries uncertain. It's just sections of corridor and numerous little rooms. ESG is an intimate little enclave, distinct, intra-regarding, and secure. Its members' descriptions reflect this: ESG is a 'home,' 'a private club,' 'a refuge,' 'a type of commune,' 'a womb,' 'a fraternity without the artificial garbage.' The most common metaphor is 'a home' (and, as one visitor remarked, 'a middle class home at that'). ESG has a kitchen, used privately and for preparing group lunches; most of the ESG area is open 24 hours, and there is an extensive night life. In addition, there are organized social activities—e.g., excursions to the beach. In fact, ESG set out to be home-like ('comfortable, colorful, almost child-like,' ESG faculty member), providing facilities more often associated with living groups than with academic programs."

The ESG rooms were not arranged by accident. When the M.I.T. Lincoln Laboratory was first set up in 1951, my division occupied the top floor of a square building which used to be where Building 26 now stands. We had a space about 150 ft. square, of which the periphery was lined with offices and a meeting-room. The entire center area, about 10,000 square feet, was open, and in it each research team had its own area with undeliniated boundaries which were respected by everyone. The result of this arrangement was that I knew everyone by name and knew what he was doing. More importantly, everyone knew what everyone else was doing and we didn't need to call many meetings. But after we moved to the new Lexington Laboratory buildings we inhabited private offices and private laboratories branching off long hallways. I was immediately shut off from my colleagues; people became strangers to one another and we had to call frequent meetings.

By 1968 I also knew that these ideas about space had the support of social psychologists. Therefore I sought a square space for the E.S.G.; the only one which was then unoccupied was the enormous lobby of the Bush Building. I would have liked to build seminar rooms, the kitchen and all that around the periphery of the Bush Building Lobby; I would have retained the central space as the E.S.G. Commons Room.

Thus, when it had been decided that the E.S.G. would inhabit the penthouse atop Building 24, we deliberately created a big central room with smaller offices and rooms in front and behind.

During the summer of 1968 I asked Edna Torgerson to take the scoring sheet for the Omnibus Personality Inventory and sort out in lists all those questions which pertained to each particular dimension of personality. Regardless of whether we thought this personality test had any value as such, we did know this about it: among its five-hundred odd questions there were some which were consistently answered "yes" and others which were consistently answered "no" by freshmen who ultimately majored in science, humanities and architecture; and opposite answers to many of these same questions were frequently given

by potential engineers and students of management. Thus, as a result of Edna's sorting, I acquired a handy list of ideas. When I suggested to other members of the E.S.G. such ideas as: should we have a music room; a kitchen; a place to work with your hands which was not necessarily a laboratory; brightly colored walls; carpets and furniture; informal arrangement of furniture; I was inspired by this list. Those were questions which certain students always answered "yes" to when asked in the O.P.I. Of course not all ideas came from the O.P.I. list—people thought of other items by themselves. Some of my proposals were voted down; but I got pretty far. When it came time to prepare a descriptive paper to send to the new freshman class, I again read this list of O.P.I. questions, and answered many of them affirmatively in the first draft. Of course, much of this was edited out by other members of the E.S.G. but still, a fair amount was accepted.[2]

The Experimental Study Group

The First Year

The following is a list of names of the first E.S.G. teaching staff including the upperclassmen who were tutors.

Robert Berman	Senior, Mathematics
Melinda Bird	Senior, Humanities
John Compton	Senior, Physics
Rich Edelman	Senior, Humanities
Peter Elbow	Assistant Professor, Humanities
Mark Engler	Instructor, Chemistry
John Franks	Instructor, Mathematics
Anthony French	Professor, Physics
Charles Friedman	Senior, Physics
Richard Goodman	Senior, Chemistry
Robert Halfman	Professor, Aeronautics
Robert Hobbs	Graduate Student, Physics
Barry Jentz	Educational Consultant
Mark Levensky	Associate Professor, Humanities
Margaret MacVicar	Instructor, Physics
Madeleine McClure	Senior, Electrical Engineering
Alan Millner	Graduate Student, Electrical Eng.
Harold Nussbaum	Junior, Political Science
Steven Pincus	Senior, Chemistry
Elaine Savage	Junior, Material Science
Gilbert Strang	Associate Professor, Mathematics
George Valley	Professor, Physics

I will let three humanists describe the first term.

[2]This first 1969 prospectus is reproduced here as Appendix H. It may be compared with Appendix I, the prospectus sent out during the summer of 1973; these two papers show how the E.S.G. developed during four years.

How Professor Mark Levensky Saw It [26]

"The freshmen who joined the ESG in the fall of 1969 were extraordinary. They were as loud, as wild looking, as outwardly self-confident, as anti-establishment, as raring to go as any group of people that I have ever run into. Most of the ESG faculty and staff couldn't have been happier. Some faculty members, however, were already trying to figure out where we went wrong. ("Self-selection. That's where we went wrong. We shouldn't have let the freshmen choose themselves.") Actually the joining up and selection procedures that we planned–lots of written information, formal and informal talks with faculty and staff, a chance to meet each other, a week or so to investigate the regular curriculum, no coaxing, everything very low keyed, self-selection–worked as well as anyone could have hoped. Out of the hundred freshmen[3] who visited the ESG during the first two weeks of the term, only thirty-eight wanted to join and we took them all. Of those that joined, six later said that they made a mistake. I think that they were right. They should have either joined the regular curriculum or gone to another place. Of the thirty-two students who later said that they made the right choice when they joined the ESG, probably twenty-one would have been unhappy in the regular curriculum. More importantly, if the faculty and staff had chosen the students for the ESG on the basis of applications, letters, interviews, and personal intuitions, we would probably have made the right choice less than half the time.

"Our getting started program was pretty much of a flop. Only a couple of people believed that it might work, so it didn't. What we did was to ask each freshman to make a list of some of the areas, problems, or questions that he had seriously wondered about from time to time, and that he might be interested in finding out about now. These lists did not have to have an academic flavor. Any topic would do. Once these lists were made we had copies of them xeroxed and passed out to everyone. We then met in small groups to consider whether the lists suggested any areas of overlapping interests among the students, and if they did, whether these people might like to get together to help each other get started with some work. Some of us hoped that by doing this we could provide a comfortable way for freshmen to get started with something that interested them, to do work that they probably wouldn't have had a chance to do in the regular curriculum, and to form small groups in which they could help and support each other. But mostly, these hopes weren't realized. The freshmen didn't take their lists seriously. One list came in on a crumpled napkin. And most of the lists were made up, in more than one sense, at the last minute. Consequently, the groups that met to consider these lists had a sense of let's pretend about them. And at the same time that these groups were meeting, faculty members were putting up signs on the bulletin board saying that if anyone was interested in starting freshman mathematics, they should come to a meeting in the large seminar room on Wednesday at one o'clock.

"In spite of our getting started program, most freshmen got started on something almost immediately. Most started calculus, or joined a writing or poly-water or mechanics seminar organized by a faculty member, or started some project of their own–reading Descartes, doing space research, building a helicopter–with the guidance of one or two faculty members, or started doing work for a course in the regular curriculum. A few students didn't seem to get started with anything. They just sat around.

"By the end of the first month, things began to change. Students stopped studying calculus, stopped coming to seminars, and stopped doing their individual projects. Instead, more and

[3]The number who visited was actually 56, not 100. - G.E.V.

more students started to sit around too. They drank coffee, ate, read newspapers and magazines, talked, messed around. A few small groups of people did get together to do something. What they did was to practice yoga, read contemporary American poetry aloud, learn how to use pay telephones without paying, or talk about inter-personal relationships and themselves. Other students simply disappeared.

"At this point the faculty and staff started to mumble to one another. Something seemed wrong. Most of the students had suddenly stopped doing traditional academic work and no one knew why. This period of general floundering–aimless activity, vacant stares, starts and stops, unrecognized fantasies, unpredictable forgetfulness, some non-academic work but a strong reluctance to do any academic work on their own or to work with other students on traditional academic subjects, self-deception about what they were or weren't doing, too much sleep–lasted for about two months. A few students never seemed to flounder at all. They knew exactly what they wanted to do and more or less did it. Others never stopped floundering, and to some extent are floundering still.

"We later came to understand these events in the following way. Many of the students who joined the ESG were not as raring to go as they first appeared to us, and to themselves, to be. At least they were not as anxious to begin academic work as we all thought. What some of them were anxious to do was figure out who, exactly, they were, how, miracle of miracles, they happened to be at MIT, and what, on earth, they wanted or at least were going to do now. Had all of these students been in the regular curriculum, they would have been permitted to think about such questions on their way to classes and in the last moments before sleep. In the ESG, they had the time, space, and permission to think about these questions constantly. Some did. [Emphasis added by G.E.V.]

"Another group of students who stopped doing academic work had joined the ESG fully confident that there was work they wanted to do on their own and that they were prepared, emotionally and intellectually, to do it. But once they began this work–at MIT, not at Old West High–they discovered that they weren't as fully prepared to do the work as they thought they were, and, then, that they weren't all that interested in doing the work anyway. This came as quite a shock for some of these students. It took them a while to get over it.

"A third group of students stopped doing academic work because they were just plain tired of school. They had worked very hard in school for a very long time so that finally, someday, they could go to another school, a school like MIT. Now they were here and it hardly seemed worth all the trouble. In any case, they wanted out of school for awhile. So instead of formally dropping out of MIT, dealing with their parents, and finding some place else to live, they took an informal, short-term leave of absence compliments of the ESG.

"What we didn't understand then and what we still don't understand very well is how the faculty, staff and students in the ESG can be helpful to each other in this situation. What some members of the ESG have concluded is that:[4]

1. Students need to come to terms with their non-academic goals before they can take the initiative to study academic topics effectively.
2. Neither non-academic nor academic goals can be forced on students or even profitably suggested to them, but much can be done to make them aware of possible goals.

[4]These conclusions were more fully described in the second ESG report to the C.E.P. (Spring, 1971).

3. Worrying about 'the student who can't decide what he wants to do' or 'the possible unsettling effect of freedom' is sterile; we should be supportive rather than critical or fearful.

But it is still an open question for us what in particular we can do to help students come to terms with their non-academic goals, to suggest possible non-academic and academic goals, and to be as supportive as possible. One thing that seems clear is that it requires an enormous amount of people's time, energy, and empathy and insight. Far more than the ESG faculty was prepared, at first, to offer. When the faculty signed on to this program, we all knew that we would be talking seriously with students about their non-academic lives. This was one of the reasons that we joined the program. But we simply didn't realize what we were letting ourselves in for. We all had some experience advising students in the regular curriculum. But what that meant is that we had seen some students a couple of times of year, signed some papers for them, and had a short, friendly chat. In the ESG however, each of us had four or five advisees, and some of us saw and talked to most of them once or twice a week if they were still around, and had at least one long, fairly agonizing talk with each of them once every two weeks. I used to go home from these talks emotionally exhausted, completely certain that I had said all the wrong things, and amazed at the variety, complexity, and intensity of the personal problems that I was being asked to talk about. I also went home with the uncomfortable feeling that I would probably have to have another of these talks with someone before the week was out. Other ESG faculty members dealt with the problems of being an ESG advisor very differently. Some relished being a very personal, confidential counselor to their advisees, and did a good job of it. Others avoided their advisees, or at least their advisees' personal problems, as much as they could, and they did a good job of that too.

"An important thing that happened about the time that many of the students in the ESG stopped doing academic work was that various groups in the ESG began to meet together to talk about the program. The faculty met. The faculty, graduate assistants, and senior tutors met. The freshmen met. And once a week there was a general meeting open to everyone. At most of these meetings people complained. People complained about some administrative aspects of the program, about the use or misuse of some part of the ESG area, or about faculty in the program, or students, or each other. Suggestions were made. Proposals written. Committees formed. These meetings were extremely helpful. Not only did they give people a chance to say what was on their minds, to feel that they were part of something real, and to do something about changing that reality, but they also gave us all a chance to learn some interesting things about our program and each other.

"One of the things that I learned at these meetings was that when the faculty and staff who planned the ESG agreed that, in the ESG, students could learn what they wanted to learn, they didn't all mean the same thing. For example, some of them meant that in the ESG a student could learn what he pleased so long as what he learned was physics, chemistry, mathematics or some other academic subject normally studied at MIT. Others meant that a student could learn what he wanted to learn, period. This particular example of unexpected disagreement in meaning came out when some members of the faculty complained that the students weren't doing anything, and continued to complain about this even after it was pointed out to them that many of these students were practicing yoga, reading contemporary American poetry aloud, learning how to use pay telephones without paying, or talking about interpersonal relationships and themselves.

"Another thing that I learned was that while many of the faculty said before the program began

that they had no particular expectations about the kind of students who would join the program, or about what the students in the program would do, we all did have such expectations. Most of us had private expectations about who the students would be–freaks or straights, scientists or engineers, the very gifted or the just very bright. Many of us had private expectations as to how much of a group the ESG would and should become. Some wanted the ESG to be a personal, open community and were anxious to use encounter group techniques to help this happen. Others expected that soon after joining the ESG each freshman would go off on his own, start an independent project, and soon begin to develop the ability to make critical, independent judgments about his work, life, and world. We made most of our private, often conflicting, expectations public to the students soon after the program began. And when most of these expectations were not satisfied, we managed to make our private, often conflicting, disappointments public too.

"A third thing that I learned at these meetings was that when the students stopped doing school work, the staff stopped teaching, and for the staff this was hard to take. Faculty members in the ESG were considered and considered themselves to be bright, knowledgable, and good teachers. They all were anxious to teach well. So were the graduate students and tutors. But when more and more of the students stopped reading textbooks, doing problems, and asking questions, and started reading magazines, drinking coffee, and sitting around, more and more of the faculty did too. Some of the faculty, like some of the students, even disappeared. It was extremely depressing to feel so useful but to be so useless. The senior tutors probably had it the worst. For many of them this was their first official teaching experience in a university and they were really looking forward to it. But even when the program was going well, they weren't used much. Freshmen probably thought: why work with an undergraduate when there are all these professors around? And the tutors found it far more difficult to relate to the freshmen as fellow undergraduates than they had expected.

"I suggested at this point, and at other times, that the ESG staff form an interdisciplinary seminar of our own and then open the seminar up to any students who might want to join. After all, we weren't doing much and were bored, there were staff members from five or six-different disciplines, and the space and time was available. What a perfect opportunity to do what everyone around MIT always talked about doing but seldom did–interdisciplinary work. And if the seminar got started and was successful, then it could serve as a valuable model to ESG students and to faculty in the regular curriculum. But the seminar didn't happen. It didn't happen then, or, with one small exception, at any time since in the ESG. And I think that I know why. In spite of what each of us often said or even believed, none of us was willing to learn very much about any other discipline but his own. I wasn't willing to learn calculus or physics, and other folks weren't willing to learn philosophy or history. So most of us just sat there drinking coffee, eating cookies, answering questions, and waiting for the students to make up their minds what they wanted to do.

"One last thing that I learned from these meetings was the importance of George, Edna and the ESG area in keeping things together. George was amazing. Although in one sense the ESG was his program–he thought a lot of it up and got it going–and although he was as strong willed and as self-confident as anyone, he was open to any suggestion, willing to change his mind, and at the losing end of a number of important arguments about the policies of the program. Edna kept track of all the administrative details that most of us hated to deal with, knew all of the students, talked with students that many of us couldn't reach, and was a constant source of information for everyone. The ESG area was an ESG home. It was always open and someone in the ESG was always there.

"By the end of the first term, most students in the ESG were doing some serious academic work. By the end of the second term–the second term ended in an Institute-wide student-faculty strike over our country's invasion of Cambodia–all but four students were.'"

How Melinda Bird Saw It [27]

"Passivity or non-participation was felt as threatening so pressure was brought to engage more people in the movement. From the tension arose the controversy between the 'thinkies' and the 'feelies.' Those who withdrew from the group-grope were 'cold and rational,' 'unfeeling,' whereas those who wanted more understanding and communication between individuals were 'anti-intellectual,' 'unrealistic,' and 'too emotional.' Polarization rapidly cast people into extreme roles, and although this came to be viewed humorously, and was a stock joke for the remainder of the year, the conflict revealed the deep split in the ESG.

"In the middle of November, another issue arose which dominated general meetings for some time. Beginning as an open debate, the discussion about credits continued in a fairly egalitarian manner with many active participants and much feeling. All the talking failed to come to a conclusion, and so before very long, the faculty took over the question and made their own decision. It became suddenly clear that there was a power structure with very real things to say: 'all this talking and friendliness and group participation is very nice, but when it comes down to the nitty gritty, you are here to do some work and we are here to judge it, and the final decision as to how we make that judgment will always be up to us.' The 'big happy family' collapsed before that fact."

What Rich Edelman Wrote in His Diary [28]

Richard Edelman,allowed me to have his diary copied. Here is his entry for Wednesday, September 30, 1969: (I quote exactly, misspellings included.)

"Today I have begun to review the 'what are you interested in doing' questionnaires. Last week freshmen were asked to quickly jot down on a piece of paper any questions, no matter how vague or specific, which they would like to have answered, thru study. These were xeroxed up and a complete listing was distributed to every member of ESG. The purpose: to get people thinking, to see areas of overlap, to form possible groups, to see what the cognitive terrain of the freshman is.

Comments will be made when I finnish reading them all.

I have said little about the immediate atmosphere around ESG. Right now it is about 10 o'clock A.M., about 7 or 8 students are reading the morning paper or drinking coffee in the lounge, quiet, sparse discussion. Students wander in, one or two at a time.

In the computer room 5 or 6 students are noisily gathered around a senior tutor who is giving instructions for use of computer counsole.

No one in library or lab.

A few staff members wander in and out of secretaries office, cups of coffee.

2 individuals are checking the bulleten board for notices and seminar announcements.

This is the quiet part of the day.

I see that today:

10:30 Organic Chemistry

1:00 Contemporary { Phil / Lit }

3:00 Calculus review

Here are the discussion groups posted on bulliten board:

1. Independence from Parents–In what ways, how, when?
2. Dormitory Ethics
3. Relationship between Prejudice and Appearence: Jews, Blacks, Hippies, etc.
4. Why might chemists be more Conservative than Physicists?
5. Clouds
6. Morality for scientists
7. Concientious Objection and the Draft
8. Role of U. in Society
9. Acid Rock Music
10. What is a Phony
11. Is there a Spiritual Revolution Occurring in this country?
12. World Energy Sources
13. Science and Music
14. Post-Appollo
15. How Does a Good Teacher Teach
16. Should Scientists Study the Humanities
17. Relativity
18. Communication
19. Yoga

–The frequency of visits of Prof. to ESG is going down."

And for October 2, 1969:

"It is 2:00 o'clock and we are having a staff meeting. Several freshman are also present, the meeting is open.

How can we set up a mechanism to 'keep tabs' on freshman progress, what progress are they making towards their goals? Advisors? Associate Advisors. Peter Elbow has a written proposal, including a general calendar for each freshman which he formulates to indicate his general plan of study.

The general opinion is that the freshman will meet periodically with an advisor for each subject or field in which he is making investigations.

It was brought up that we should have a weekly general meeting to bring up any and all questions by any and all individuals. This will keep the group together and will foster the raising of questions before the whole ESG. More bulliten boards for notices and complaints are also being erected to foster such general, open communication.

So far the kitchen facilities are clean, a few freshman are working extensively to keep the physical ESG working well.

Personal comments from staff members on their impressions of ESG, so far.

A: 'things are loose, I'm somewhat uncomfortable, I will be more confident when specific areas of study develope'

B: 'some students are upset because they are allowed to do anything they want to do in general, but there are rules and restrictions on computer use' 'much investigation is going on with the computer.'

C: 'I am impressed with the speed with which study is being undertaken'

D: 'I am impressed with how some of them are undertaking studies, some are not. I would like to see a study program from every freshman by next week.'

E: 'But the plan should just be something in mind, not a rigid program. It can be changed at any time, but should give them an initial direction'

F: 'In humanities it is difficult to get things going, because it is such a broad field. If freshman want to do independent studies, then they will have to do without seminars and tutorials. We can't have 30 tutorials!'

One student is interested in midevil history. One is interested in teaching in a local H.S., one wants to write a comprehensive personal philosophy. How can we form groups, to best make use of our Humanities staff talents.

Formulate a general question to which specific interests can be brought to bear for a solution?

Many of these interests can only be fostered or evaluated by faculty outside ESG. Their interest will not be great. This is a problem. How can we monitor the progress of such an esoteric course of study.

Freshman: 'it is unfortunate that any judgements have to be made. Maybe its because we are working within the larger context of MIT'

G: 'We don't want to judge, rather we want to help a freshman to avoid wasting time'

Freshman: 'There is no such thing as a waste of time'

H: 'Not absolutely, but relatively. You can benefit by talking to someone who has been in the business for a long time. You might be simply missing the point'

It was noted that some freshman are willing to tutor other freshman. This source of education should be utilized. If we are to expand to a University-wide system, we can not maintain the high staff/student ration, it is not feasible. By making use of student talents, the need for such a high ratio can be eliminated or lessened.

There is a discussion going on next door the drift of which is: we are getting over organized, over structured. We are having calculus, physics review sections. In chemistry there is less structure. People are pursuing smorgishboard interests

Why a list of what you are doing, even if it is changeable? Is it to relieve our sense of be uncomfortable and unsure? Maybe it is good for a student to flounder.

A tutor said this (it blew my mind); they are just out of H.S., they know so little that they need a rigid orginization to keep them on the straight, a straight line. I don't think the organization of the MIT at large is a good one. We need a better organization.

Why this need for superstructure?

K: Organization fosters feedback.

L: The advisors who believe in the system of the outline and plan method should ask freshman about it.

M: Prof: how can I evaluate a freshman if the first time I see him is at the end of the year

N: Fresh: why evaluate?

O: Don't we have any responsibility to the freshman? What are we supposed to do?

P: What good, then is the list? Why? It just formalizes things

Q: O.K. We won't have freshman write lists. Maybe the advisors can keep notes on the freshmans pursuits.

R: (freshman): The lists are restrictive. I want to be free to do what I want, delve into what I want to delve into. I might have a list in my mind, but not on paper."

And for October 3, 1969:

"Some regular meeting sessions have begun in calculus, physics.

It is late in the afternoon, and as one would expect, there is not very much action (it is Friday!).

Today there was a confrontation between students and the MIT corporation to demand

1. End to War related research
2. End of Corporation Rule

Several ESG students took part in the action.(freshman 2 or 3, staff 2)

Last night there was a march to the Presidents house to demand $150,000 be given to the Black Panther Party for there free Breakfast programs, following a presentation by the Panthers at MIT.

Perhaps 10 members of ESG attended the meeting, about 5 went on the march, including 4 freshman.

There is no doubt in my mind the ESG, if successful, will raise socialist consciousness of the members of the group.

Aha! I now know what my second Radical Politics Presentation will be. I will talk about MIT as an agent of Imperialism, its place in the country, and how its operation mirrors the operation of society. Then I will take ESG as mirroring many of the aspects of decentralized socialism, utopia.

But, I will have to show why the practices of ESG could probably not be expanded to the whole institute or certainly not to society at large without revolution, since we oppose the interests

of the ruling class, there can be no channeling, etc, without a rigid institution, we would not have competitive but cooperative Cs, etc.

Point: we can exist only apart, as an elite.

How can philosophy of ESG be expanded to all of society? The small community, the commune, direct control and democracy, maximum anarchy, control of every aspect of environment. Mutual trust. Knowledge related to social relevence and use. Self-criticism. Absence of authority. Abundance of communication.

I can't wait until I work this all out in my head, It will be much more effective than my last talk."

And for October 8, 1969:

"Talked with George Valley.

Some of the freshman are doing little reading visable work. Therefore he thought it would be a good idea of each advisor (prof) had an associate advisor (senior) to talk with and work with a given set of freshman, to help all of us understand what they are doing. It will foster communication. Its purpose is not to coerce students into doing anything but just to get them to let us know more about what they are doing, so we can help them in any way possible to realize the goals."

And for October 9, 1969:

"—talked with George Valley again.

—the work in the sciences is progressing well for chemistry and mathematics, but not in Physics

—in Chemistry one prof. is working on a real, interesting problem of chemistry, analysing some interesting chemical prop. of some of the moon rocks. there is little known about the problem so that students have the feeling that they are really 'in on something' and that what they learn, they learn because it is relevant to the solution of a real problem. The ussual learning method is reversed. Instead of increasing knowledge and technique gradually until you are ready to solve real problems, you pick a real problem, then go backwards and pick up necessary techniques.

—in math there is independent study, and groups of various ability and sophistication meet informally to discuss any questions which any of them may have.

here, I am basically referring to the work in calculus, which most of the students want to learn. there is other independent work in other more esoteric fields of mathematics.

—but in Physics, there are great problems in getting people into the real 'stuff' of physics, they are interested in the manipulation of high order mathematic functions and equations of Physics, but they do not wish to apply them to any real situation, i.e. problem of physics, or exercise of physics.

they wanted to learn about Einstein but not about Newton

generally George Valley thinks that as far as physics go their 'heads are off in a cloud' and that 'they don't want to get their hands dirty'"

And for October 23, 1969:

"Meeting of Staff —a psychologist has joined the group, brought in thru MIT administration; some people are uptight that he is an evaluator, or an 'arm' of the administration.

—people wonder why we weren't asked before the decision to appoint him was made, why the freshman weren't asked

—we should have had a voice in how we were to be evaluated.

—some people say: we do need to be watching how things go. But how?

—the group is displaying a sense of betrayal and invasion, intrusion

—he was asked to leave, invited to return after we can discuss the situation

—There was an insistance that we control the nature, operation of our group.

—Then he asked if he could tell us what he was about, we said no, because freshman weren't present; come back at general meeting

—We are now going to discuss the work and behavior of every freshman; we all have an evaluation sheet; a copy of this will be included in this journal

—many people are simply doing nothing

—It seems that only about 30% of the students are actively engaged in a continuous process of learning, be it yoga, physics, or poetry.

—70% of the students (including 30% above) have 'begun something' 'have read a book' or 'been to meetings' but they are not really into anything

—people see this as a problem

—one person says this is not the problem, that the problem is with us, that this is indicated by our chart evaluation method, that while many are doing nothing, this is our fault and it is not bad if they are not doing any measurable thing, that they are learning to be on their own, responsible to themselves, not to have to answer to anyone, etc., etc.

—but are we letting the freshman delude them- selves? They think they are doing something, but are not, perhaps?

—what does matter? : what has changed in their lives by virtue of ESG?

or

what do we think they are doing, relying on traditional 'course of study' concepts

—are they now 'learning to learn?'

—one person said: 'the question is, can we keep this ship floating until the Baby is born,' that what is going on now is 'adjustment'

—a paper was written and read on what it feels like to be a freshman in independent studies, Rich Goodman wrote it; I will get a copy and include it in this journal.

—many are demanding that they do nothing that they are not sure that they personally have decided to do, that perhaps as a result they do nothing, because 'to act, is to rob one of possibilities.'"

This is the end of Rich's Diary.

And finally to sum up the observations of Mark, Melinda and Rich, this by Philip Wylie:[29]

"The point, here, is the need of young men and women for something it is harder and harder to find in this country: a little patience, attention and understanding—love, call it—from older people. Some days I almost believe the majority of Americans over age forty are scared of their own kids and of kids they know and literally terrified of kids who are strange to them. I almost believe that. Not quite. Because, if I did, America, by my definition, would have lost the ball completely and forever— in which case it would be stupid for me to write another word I meant and stupider, still, to be out at a faculty drinking-and-gladiatorial binge in a house full of the rich debris of banking, armor and halberds and tapestries...."

The First Year As I Remember It

The Students

The students at first startled me. They seemed extraordinarily sophisticated—about sex, about drugs, about encounter groups, about General Relativity. Most of them wore blue-jeans, some had floppy leather hats, some wore buttons which said simply "HASH." I felt I had successfully attracted tigers without first finding out what tigers are really like. But the other faculty members seemed unastonished, so I too behaved as though this was the most ordinary bunch of kids I'd ever seen.

After the freshmen had registered, I got their admissions folders and calculated average grades, etc. I was very satisfied to find that not only were their science and math grades in the upper quarter of the freshman class, but their verbal SAT scores were also very high. Somewhat to my consternation I also found that their average score on the MIT Admissions Office "Personal Rating" scale was above average—an indication of probable mediocrity. But, after I knew the students better, I decided that their personal ratings were simply wrong; these were simply kids sharp enough to have fooled the Admissions Office. I read their letters of recommendation and these freshmen were highly regarded as all our applicants are. Except that an unusual number seemed to have involved themselves in helping old people or sick people, I saw no common characteristics, and I found this highly satisfactory: divergent people do not resemble one another.

Within six weeks the students had separated into two distinct groups: about twenty students who used the E.S.G. as a base of operations from which they went out exploring M.I.T., using the libraries, and generally acting autonomously. The rest of the freshmen were around the E.S.G. rooms all the time; and it is this latter group of which Melinda Bird primarily writes. These are the fresh- men who eventually split into "feelies" and "thinkies." There were six or seven freshmen "feelies" plus the humanities seniors; there were also six or seven "thinkies" plus one or two of the science seniors. There were very competent students among both the feelies and the thinkies; but possibly the largest number of competent students were in the other half of the class whom we rarely saw.

The Faculty

Mark Levensky has described most of the faculty attitudes—all except one, which he couldn't be expected to have observed: the science and mathematics teachers were initially afraid to admit their ignorance to one another, or to admit that they were unable to establish a confidential relationship with all their advisees. One or two of us recognized this and set to work to get the faculty to relax. We had talked about being "elder learners" but each of us was reluctant to admit that anyone younger or with a less prestigious title could help him understand his own specialty. This fright slowly dissipated—largely I think because you couldn't get the students into a room all to yourself. We had a rule that everyone could listen to anything which was going on—and so professors discovered that nothing lastingly disagreeable happened if they couldn't do a problem, and another professor as well as students helped them. It was hard to foster this loosening-up process, since at first I was as timid as the others.

Feelies and Thinkies

A different task, which I eventually learned to do well, was to supervise the teaching. This task was different in kind from any other in the Institute because, although I had the kind of direct contact with teachers which is characteristic of department heads, I had to supervise teaching not only in my own discipline but in three others. I did not feel equally at home in all of these; chemistry interested me the least, which is possibly why I did not become aware until February that the chemistry Ph.D. was spending all his time leading Yoga exercises and a seminar in Eastern Religion.

The E.S.G. faculty had argued over the suitability of Yoga and after a considerable argument those of us who had initially opposed it had agreed it was, at worst, harmless. So Yoga was O.K. but my problem was that no chemistry was being taught and several reasonably competent freshmen had complained. My suggestions that he teach chemistry were ignored by the chemistry instructor. I therefore discussed this problem over lunch with those members of the E.S.G. staff who were members of the M.I.T. faculty; everyone seemed to agree that we had promised to teach chemistry, and we had to do it.

About a week after this luncheon the junior staff, led by the two assistant professors in humanities, began to act hostilely toward me; I had acted in a "profoundly Fascist way" by not inviting the chemistry instructor to lunch. Thus started about two months of an unpleasant experience, since seven or eight freshmen got worked up (the 'feelies') and the whole pack of them, seniors, feelies and junior staff, jawed at me everytime we got together. It is this which Mark Levensky refers to when he says "at most of these meetings people complained."

It is also what Melinda Bird is referring to when she refers to the controversy between the feelies and the thinkies.

I was unable to give these complaining students what they wanted—since what most of them wanted was to be transformed into different people. I was faced with two choices: fire the two humanities professors and tell the freshmen to shut up—or listen.

While the teapot was having its tempest, another group of about seven freshmen and one or two tutors (mostly thinkies) would privately visit Edna or me and, after vowing loyalty, fill us in on who had said what to whom the night before. I was careful not to encourage these students since my aim was to get both the thinkies and feelies to calm down and stop shouting at one another; encouraging the thinkies would have led to a permanent split.

My problem therefore was to make reason prevail without using force. I needed also to convince myself that I was truly in favor of what I'd called "intellectual autonomy." It seemed to me therefore that I must listen.

I had spent about twenty years working with the Air Force. Sometimes I'd been up against hostile audiences and committees, and I'd survived the worst that ambitious but wrong-headed men could throw at me. So I did not feel threatened by the jawing of a handful of freshmen and Ph.D.'s.

The complaining E.S.G. students were almost completely irrational—usually their complaining began by their accusing me: "You don't understand what I'm saying;" or "you don't understand me;" or "you won't let me tell you about me;" or "I want to talk about me". I would listen; and by and by it would be time to go home.

About a year later Professor Elbow showed me an article in Change magazine, some passages of which were almost perfect descriptions of what happened during the spring of 1970 in the E.S.G. [30] Here is the most applicable paragraph:

> "It is probably difficult for those who have not seen such programs firsthand to realize how fierce they can become. I have watched with a kind of sickening fascination how needs of

people emerge to destroy themselves and one another. Periods of heady joy and warmth and optimism are followed by black storms and bleak periods of spiritual numbness. Young people are not prepared by their home lives or schools to make decisions about themselves and often are nearly incapable of discovering within themselves the grounds for order, discipline, direction and purpose. They have dreamt of what they would do if it weren't for the limits and demands imposed upon them; but when they are free they are likely to unzip and find nothing inside. If you believe you would be creative, industrious and productive except for external restraints you can retain some hold on dignity, though you feel continually frustrated. But if you discover that you do not in fact spontaneously create—or even read—that you are not really very interested in cultural or political events, in ideas, in intellectual issues, that you have little drive to achieve, that there is nothing in particular that you want to do with your life, and that you cannot blame these things you perceive as deficiencies upon some system beyond your control you are likely to suffer waves of guilt, self-hatred and paralysis of will. People dissapointed in themselves are often inclined to cut one another up in compensation. People unwilling to make commitments are distrustful of those who want to act. Being "open" is celebrated by most of those who enter experimental programs, but if it means exposing a vacuum, they feel unworthy and ashamed and close themselves up tighter than ever in fear of being rejected."

The first year was an almost unbearable experience for Edna. About half the freshmen could best be described as half-civilized. Edna talked constantly to these children, slowly convincing them that they shouldn't fight; that they should respect one another's opinions; that they shouldn't shout obscene names at one another; that if they wanted to write on the walls it was desirable to paste a sheet of paper up first; that the best way to influence people was by reason, not by writing messages on the walls calling them names—and so on, and on, and on. It is due to Edna that a group-spirit of civilized give and take eventually grew and persisted in the E.S.G. This was hard work, about which she never complained.

However, when the junior staff began to needle me, they also began to treat Edna badly. This she did complain about, and I did have to speak plainly to one or two of the instructors: "If Edna left the E.S.G., I would disband it the next day."

The third influence on Edna at this time was due to her sympathy for me; she saw me getting bloodied up, and it hurt her, too.

But eventually Professors Strang and French began to speak publicly of their disapproval of what was going on; the irascible students got bored; the saner students began to be heard; and finally they all began to listen to what I'd been saying all along: "we shouldn't be 'feelies' and we shouldn't be 'thinkies,' civilized people should be both thoughtful and sensitive."

This period is also interestingly described by Parlett [24] pp. 15-18.

The upshot was that we decided that next year's new faculty members would be chosen by the students. My "fascist dictatorship" having thus been overthrown everyone quieted down.

But then it turned out that nobody wanted to be around to interview potential members of the faculty. Since I'd promised to let them choose, this meant a great deal of extra work for Edna and me, in that we had first to assemble a group of students and then I had to convince the potential faculty member to put up with being interviewed by them (and me). But I managed to get this process done six or seven times before the invasion of Cambodia ended the term.

The students have always been very proud of-the fact that "students choose the E.S.G. instructing staff." But in fact they have never done more than choose between two people either of whom would have been suitable to me and both of whom were nominated by their department head.

The students' judgements, when I have been able to collect enough students to form a judgement, have been entirely satisfactory. We have had only two disappointing instructors (in both cases people who spent all their time doing Yoga) but each of these was the sole appointee of his department, and no one in E.S.G. exercised any choice. Only twice have E.S.G. students nominated as tutors persons whom I concluded were unsound, and these two I refused to appoint.

It is only fair to report that during the following year Professors Elbow, Levensky and MacVicar, each in his own way, apologized to me. Few young persons were entirely in control of themselves during 1969 and 1970. Both men and women were frightened by the draft; many of them were genuinely appalled by Viet Nam and Kent State; and as far as young humanities professors were concerned, their elders preached that fomenting riot and rebellion was their proper function—that you weren't a real humanist if you weren't also subversive.

As Levensky [26] says, at the end of the first year the instructing staff was unhappy with the performance of the freshmen. They hadn't lived up to our expectations; we talked a lot about whose fault this was and how could we make freshmen behave the way we had expected them to behave given the advantages of the E.S.G.

Actually there was quite a good deal of academic activity in the E.S.G. that year. Here is a list of the more enduring seminars:

Seminars	Instructor
Writing Seminar	Elbow
Special Relativity	Valley
Yoga	Engler
Bhagavad Gita	Engler
Poetry	Levensky
Quantum Mechanics	Villars
Philosophy	Levensky
Movement	Jentz
18.02	Strang and J. Franks
Linear Algebra	Strang and J. Franks
Relativity Discussions	French
Electricity and Magentism	French

During the spring term Dr. MacVicar ably conducted a seminar in physical chemistry for those freshmen who had previously complained to me. Professor Halfman gave a seminar in which two freshmen studied advanced mechanics from Goldstein's book.

The writing seminar started by Professor Elbow was important in that it was the first academic enterprise in which some freshmen did start to lead themselves, taking the initiative toward learning that we'd expected all the freshmen to take toward everything. But what these freshmen wrote was almost entirely about themselves; nevertheless some of it was very well done, perceptive and beautiful.

The students also complained about their academic life: they all detested the General Institute Required Subjects; and many if not most of them wanted the E.S.G. to persist for all four years of their college careers.

The Second Year

The second class of freshmen to enroll seemed considerably less tense than the first. Perhaps because of that, perhaps because the faculty no longer regarded the E.S.G. as entirely new as it once had, the

atmosphere was considerably quieter. "Too quiet," some said.

In our report to the C.E.P. dated February 1, 1971 [31] we came to terms with freshman abilities and predelictions. I shall here accept Mark Levensky's summary of our decisions about "academic goals" and "non-academic goals" (pages 30-31 of this report).It is also tempting to quote from the students' assessments of the E.S.G. (which were attached as a long appendix to our C.E.P. report) but there are just too many of them (there are 62 which range from wildly enthusiastic to favorable, and three which are unfavorable).

The Third Year

As the third year started we nervously anticipated the investigation by Dr. Malcolm Parlett ordered by the C.E.P. Since Dr. Parlett had once been a visiting research associate in the Education Research Center, many members of the E.S.G. incorrectly supposed he would be biased against the E.S.G. Whether because of this worry or for other reasons, the E.S.G. visitors' book for that year's Freshman Orientation Week is full of brittle witticisms by E.S.G. students; there were other signs of low morale as well.

Morale was lowered even more by the fact that only about a dozen freshmen wanted to join the E.S.G. (even by the end of the first term there were only 20 E.S.G. freshmen). The fact that the new Concourse program had an equally small number of freshmen made us think it was not some undesirable characteristic of the E.S.G. which was repelling freshmen. This low enrollment, together with the obvious demoralization of some of the older students, made me wonder whether the E.S.G. would last another year, or whether it would join the U.S.S.P. in fading away.

The philosophy of the E.S.G. changed in only one way during the third year: we made our peace with the General Institute Required Subjects. We decided that they were a legitimate part of an M.I.T. education. This is what our third report said: [32]

> "...we definitely do not want to discourage study of the G.I.R.'s. On the contrary, we feel that students who are studying them, or other subjects, and encounter the problems just discussed, can benefit greatly from the academic support that a community can provide."

Several of the papers I had read mentioned the difficulty of transferring the control of Experimental Colleges: they seemed frequently to die when the original head left them. It seemed to me that this would probably happen to the E.S.G. and I now determined to try to make a genuine transfer of authority to the students. I felt that the E.S.G. had attained a settled and viable philosophy of education, and that its atmosphere of quiet attentiveness to the world had now been established. The success of E.S.G. students, as students, was also evident to everybody.

In the summer of 1972 Edna and I began to tell the E.S.G. students we were going eventually to leave; and after they and the junior staff were convinced this statement wasn't some new kind of a manipulative ploy, the students formed a governing committee called C.I.C.D.O. This committee has functioned reasonably well although it has required nearly continual encouragement from Edna. In my opinion, it will continue to need continual encouragement.

The students also took a big hand in recruiting freshmen for our fourth year. That year we (and Concourse too) had our largest enrollments; for the first and only time in its existence the E.S.G. was oversubscribed during the winter of 1972-73, and after accepting our fifty-first freshman, we turned several others away.

Our fourth report to the C.E.P. [33] was entirely composed by students, and the final drafts were written by two E.S.G. seniors, Herbert Lin VIII and Dana Roberts XII. The fresh invigorating style of this report

was approved by all its readers, and Herb and Dana received much praise.[5]

Our fifth and latest report to the C.E.P. was prepared by Walt Witryol, a freshman, with the help of Rich Hilliard, who was then a sophomores. [34] Here is a paragraph which caught my eye:

> "The E.S.G. has reached a turning point in its development. Its long term viability as an alternative program at M.I.T. depends not so much on one or two personalities as on the continued interest and involvement of students (past and present) in planning and directing E.S.G.'s future. Evaluation processes, governance and community relations are all responsibilities which must fall jointly to students and staff. For its part CICDO has become a more organized group, with elected co-chairmen, providing the necessary continuity in the E.S.G. community during periods of inevitable shifts in the staff."

Glop, Credits, Floundering, and Other Subjects Which Have Preoccupied E.S.G. People

These are adequately covered in the second and third E.S.G. reports to the C.E.P. [31][32] and in the Parlett Report, [24] and I'm tired of them.

Discipline

In five years there have been only a few instances of disorderly conduct that I've heard of. I ascribe the relative peace in the E.S.G. rooms at night to the calming influence of the janitorial staff. While there has no doubt been some experimentation with drugs during the evening hours, there does not seem to have been nearly as much as in some of the dormitories.

Most bothersome have been those students who could not be convinced that phone-hacking and lock-hacking were forms of stealing and burglary; and that the rest of us in the E.S.G. didn't want to associate with burglars and thieves. Several times I've had to speak sternly to students about phones and locks—but in most cases Edna was able to convince students without my help. Although I have considered dismissing four students from the E.S.G. I never actually dismissed anyone.

The E.S.G. Academic Program

Professor Hartley Rogers stressed that I should write about those things which worked and those which didn't work in the E.S.G.'s academic program.

Before commenting on the separate disciplines I should report that the quality of teaching required by the E.S.G. is high; this is diametrically opposite to what I originally expected. In 1968 I expected that a program which emphasized self-instruction would not require good teachers. M.I.T. freshman science and mathematics teaching was poorly regarded at that time, so I thought I had made an ingenious combination of the required and the available teaching skills. I was wrong.

I would like to single out Arlene Fingeret and Robert Halfman as two staff members who have had particularly good relations with students. Each of them radiated an aura of caring and sharing which made

[5]Except from those faculty members who insisted on believing I'd written it! There was similar skepticism about the authorship of the testimonial letters in our second report. Parlett [24] quotes a department head: "Valley's report was more informative because of student letters...whether objective or not we don't know..." The report you are reading is subjective.

the E.S.G. a more comfortable place for many students. I shall long carry a picture in my mind of Bob Halfman, submarine sandwich in hand, writing his words of wisdom—often with a student looking over each shoulder.

Arlene's confrontation of the visiting Japanese professor was the funniest event I saw happen in the E.S.G.; probably no one remembers it but me. Thank you, Arlene.

Chemistry has been taught in seminars, and by self-study accompanied by frequent consultations with a teacher. The most popular subject has been 5.41 and therefore we have usually had a teaching assistant in chemistry whose specialty was organic chemistry. In my view Paul Bock, who was with us in 1971 and 1972, was an extraordinarily fine teacher. Various physicists (Professor Margaret MacVicar, Professor N.H. Frank) as well as the chemistry T.A. and several undergraduate tutors have jointly taught physical chemistry 5.60.

Physics has not been successfully taught in either seminars or classes in the E.S.G. Students have successfully studied mechanics and electricity and magnetism by themselves, usually only asking for help when they couldn't do a problem. The most common way of studying physics, 8.01 through 8.05 and including 8.20, has been via the Keller Plan. The Keller plan of self-paced study has worked very well for physics in the E.S.G., probably because Dr. Stanley Hirschi is an excellent teacher and theorist. While it was an honor to have a former head of the Physics Department join the E.S.G., it is Professor Ned Frank's friendly presence and his down to earth approach to complicated problems which have comforted the E.S.G. "learners," elder as well as younger.

Mathematics: Freshman mathematics has been most often taught in classes which were partly like seminars, partly like recitation sections. Individual tutoring accompanying self-study has been used for advanced mathematics subjects like 18.100, 18.700, 18.076, 18.701. Henry Walker has been an outstanding teacher.

Humanities: We've had literature, philosophy and history professors and they've taught a great variety of subjects. Here is the list from the 1974 C.E.P. report: Individual projects (e.g. keeping a daily diary); Biomedical Ethics; Minds and Machines; Psychology of Religion; Technology, Society and the Future; Writing Workshop. Individual teachers have not only given seminars on subjects which they teach in the regular curriculum but have gone outside their specialties as well. For example, here is a list of topics studied in the E.S.G. under Donald Bell during the last three years: Education, The Family in Industrial Society (21.489), Dreaming and Dream Theories, the Future of Technological Society, and Technology and Society. Professor Bell also held tutorials for one or two students at a time on such topics as: Contemporary Poetry, Appreciation of Pictures, George III and the American Revolution, Paul Goodman's writings, Energy Supplies and Public Policy, Theories of American Policial Power, and Readings in French History. Three years ago he also led the E.S.G. organic gardening project.

Charlotte Fishman, in my opinion, has been the humanities teacher who best succeeded in changing freshmen's opinions while remaining well-liked. This is what I wrote to Professor Richard L. Cartwright, Head of the M.I.T. Department of Philosophy, in November, 1972.

> "If it is a proper function of a philosophy teacher to encourage students to examine their lives, then Charlotte is succeeding;...I think what Charlotte is doing in the Experimental Study Group would be valuable in any college, and would be particularly relevant for many M.I.T. undergraduates. I would like to express the hope, which I have already expressed to Professor Douglas, that either the Philosophy Department or the Humanities Department will regularly offer subjects similar to Miss Fishman's 'Minds and Machines.'"

Other kinds of classes, usually not for credit: [34]

Edna's Cooking Seminar
Introduction to Computers
Logic Seminar
Discussion of Humanities at M.I.T.
Mushroom Seminar
What's it like to be a mathematician, a chemist, etc. etc.

What do they do?

The majority of E.S.G. students elect to major in science or mathematics; another quarter of them prefer computer science, and there is always a strong E.S.G. contingent in the Artificial Intelligence Laboratory. Relatively few elect to study engineering or management. Those who intend to enter medical school seem oriented toward psychiatry to an unusual degree.

Four E.S.G.'ers have received National Science Foundation fellowships:

David Gero	1972	Electrical Engineering
James Given	1973	Physics
Mark Davison	1974	Mathematics
E. Michael Thomas	1974	Urban Studies

During the academic year 1972-73, two of the three M.I.T. nominees for Danforth Teaching Fellowships were E.S.G. seniors; in 1973-74 two out of four M.I.T. Education Division Fellowships were awarded to former E.S.G. students.[6]

E.S.G. students have also engaged in unusual extracurricular activities. The two that pleased me most were Bev Seavey's introduction of belly-dancing to M.I.T., and Andy Rubel's inauguration of the M.I.T. Unicycle Club. A complete roster of the E.S.G. since it started in 1968 is given in Appendix K.

What the E.S.G. has meant to me

Everyone says I've mellowed. Even Parlett says "George had to change." [24]

Here is an example of how I used to be:

Ten years ago, in 1964, the phone rang. "Hamilcar Barca, Barca Associates, Doctor."

"Ah! Elephants?" I enquired brightly.

"Doctor Valley, we have just the job for you."

"But Mr. Barca, I have a job, and besides I've just been made a member of the M.I.T. Committee on Educational Policy—what more could a man want?"

"Doctor, how would a gross of 75 million, net 5 million, 23% return on capital interest you?"

"Come again," I said, politely.

"Doctor, I didn't become Chairman and Chief Executive of Barca Associates without being able to offer good jobs to good men—that's my business—find talent."

"Doctor, my client is looking for a president of his company; stock options, of course."

"But—" I didn't get any further before he rushed on.

[6] Herbert Lin, private communication.

"Doc, just shoot us a page on your background—you know, all the regular stuff: children, religion, education, medals, honorary degrees—the works."

"But, Mr. Barca, you can find all that in Who's Who In America."

"Doctor, Barca Associates doesn't get its information from books—we want the straight stuff."

"But Mr. Barca, I wrote the paragraph about me in Who's Who."

"Yeah, but Doc, that's just advertising–just shoot us down the real truth and you're in."

Well! That was the first time anyone had called me up and suggested I had knowingly published untruths.

I wasn't so mellow then; I got angry.

"You fool!" I shouted, "get your silly ass off my phone!" and I slammed the receiver.

You see the effect of the E.S.G. on me. Today if a man called me up and suggested I tell the truth for a change, I wouldn't call him a fool—not to his face anyway. The E.S.G. has taught me how to cool the mark out. [35]

June 13, 1974

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[2] Emerson, Edward E. "The Social Circle in Concord," VII, privately printed.

[3] Perry, Jr., William G. Intellectual and Ethical Development In the College Years. New York, NY: Holt, Rinehart and Winston, 1970.

[4] Artz, Frederick B. The Development of Technical Education in France, 1500-1850. Cambridge, MA: M.I.T. Press, 1966.

[5] Thompson, W.I. At the Edge of History. New York, NY: Harper Colophon Books, 1972.

[6] Rasmussen, S.E. Experiencing Architecture. Cambridge, MA: M.I.T. Press, 1962.

[7] Schilpp, P.A. Albert Einstein: Philosopher-Scientist. Evanston, IL: The Library of Living Philosophers, 1949.

[8] McCollough, David. The Great Bridge. New York, NY: Simon & Schuster, 1972. I quote from page 154 which is itself a series of quotations from three other books.

[9] Vitruvious. The Ten Books on Architecture. Translated by N.H. Morgan. New York, NY: Dover Publications, 1960. p. 213. Vitruvious is thought to have written during the reign of Augustus Caesar.

[10] Getzels J.W., and P.W. Jackson. Creativity and Intelligence. New York, NY: Wiley, 1962.

[11] Hudson, Liam. Contrary Imagination. Baltimore, MD: Penguin Books, 1967.

[12] Sometime during 1967 or 1968, I had my first conversation with Professor Malcolm Parlett. Something I said educed the following description of M.I.T.: "It's elite and convergent." My memory of this conversation is that I found it supportive of my views. It was the first time I'd thought of M.I.T. as being "elite"—which it certainly is.

[13] "Roman virtue compounded of will-power, strictness (gravitas, seriousness free of any frivolity), and devotion to the fatherland [i.e.] the realization of a hierarchy that strictly subordinates the individual to the various social groups, and these groups to one another." (p. 98)

"Virtus, pietas, fides, self-discipline, respect, faithfulness to engagements—such was the Roman ideal." (p.104)

From Grimal, Pierre. The Civilization of Rome. Translated by W.S. Maguinness. New York, NY: Simon and Schuster, 1963.

Modern Italians, whether they are Catholics or Communists, are still convergent—they just have different ideals. Only during the Renaissance were noticeable numbers of Italians divergent.

[14] Valley, G.E., and W.A. Stuart. Reference Manual, The Freshman Year at M.I.T., Classes of 1968, 1969, 1970.

[15] The Confidential Guide to Lower and Middle Level Courses. published by the Harvard Crimson.

[16] Rodin, Miriam, and Burton Rodin. "Student Evaluation of Teachers." Science 177 (29 September 1972): 1164.

[17] Gessner, Peter K. "Evaluation of Instruction." Science 180 (11 May 1973): 566.

[18] Frey, Peter W. "Student Rating of Teaching: Validity of Several Rating Factors." Science 182 (5 October 1973): 83.

[19] This is a well-known result; although the distributions of IQs (or other similar scores) of the professions overlap one another, business majors, military officers and physical science instructors are always at the bottom. Cf. Wolfle, Dale, and Toby Oxtoby. "Distributions of Ability of Students Specializing in Different Fields." Science 116 (26 September 1952): 331-341.

[20] This finding agrees with that of Benson Snyder, et al, in "Report on Massachusetts Institute of Technology Student Adaptation Study," 1967.

[21] Based on the Omnibus Personality Inventory data for classes of 1968 and 1969.

[22] Time, 15 March 1968, p. 78.

[23] Axelrod,Joseph. "An Experimental College Model." Educational Record (Fall 1967): 327-337.

[24] Parlett, Malcolm. "Study of Two Experimental Educational Programs at M.I.T." Unpublished, 15 December 1971.

Pages 5 and 6 give a very good summary of the E.S.G. as perceived from all its 1969 papers, including the 1 January 1969 proposal.

[25] Patterson, Franklin, and C.R. Longsworth. The Making of a College. Cambridge, MA: M.I.T. Press, 1966.

[26] Levensky, Mark. "The Experimental Study Group: A New Undergraduate Program at MIT."

This paper was written in the summer of 1972, after the third year of the E.S.G. Consequently, it describes conclusions we reached in later years.

[27] Bird, Melinda. "A Report on the ESG as an Experiment in Group Deportment." submitted in partial fulfillment of the laboratory requirement, May 27, 1970.

[28] Edelman, Richard. "Journal of the E.S.G."

[29] Wylie, Philip. They Both Were Naked. New York, NY: Doubleday, 1965. p. 268.

[30] Judson, Jerome. "Portrait of Three Experiments," Change, July/August 1970.

The passage quoted here is about Bensalem College (pp. 47-48). I have excerpted other passages from this article; they appear as Appendix H. I wished I could have read this paper two years earlier.

[31] "A Qualitative Assessment of the M.I.T. Experimental Study Group." February 1, 1971 by the staff and students.

This thick report contains 65 one-page appreciations of the E.S.G. by freshmen and sophomores.

[32] "The M.I.T. Experimental Group in its Third Year, A Report to the Committee on Educational Policy." Winter 1971-72.

[33] "A Report on the Experimental Study Group." December, 1972.

[34] "The Experimental Study Group Report to the C.E.P." March, 1974.

[35] Goffman, Erving. "On Cooling the Mark Out." Psychiatry 15 (1952): 451.

[36] Stricker, Lawrence J. "The True Deceiver." Princeton, NJ: Educational Testing Service, May 1966.

[37] Sullivan, Harry Stack. "The Psychiatric Interview." Psychiatry 15 (1952): 127.

Appendix A: Where do Technically Inclined Students Come From?

The most convincing report I've seen is S.W. Bloom's 1963 Harvard Thesis [1]. I quote:

"The decision for science is apparently made earlier in the career of the individual than the choice for a non-science career. The boy who ultimately entered a scientific career made his career choice before high school graduation, usually during the junior high school period. The non-science boy was more likely to make his decision after high school graduation. This difference in the time of decision is significant at the .001 level of confidence. Moreover, a decision not to attend college is decisive against entry into many careers and is irrevocable for a professional or even semi-professional career in science.

An important decision point in the career development of the individual is the decision for college. Two factors were found to be pre-eminent in the decision for college-going: the attitude of the parents and the career aspiration of the individual.

During the college years, the science boy is generally committed to science upon entry and remains firm in his choice of science as his vocational objective. The non-science boy, even at the college level, remains in the career-decision stage of development. One fact, particularly significant to this study and to science education, is the attrition from science. Once a decision is made to change out of a scientific field, the choice is usually final. Not a single individual in the sample changed from a non-science field into science during his college career." (pp. xxii - xxv)

"One test administered in the fifth grade showed a significant difference between the college-bound boy and the boy who did not continue into college. Differences in ability during elementary school between the science and non-science subgroups were discernible at the .05 level of confidence. It is inferred from these test results that boys with academic promise may be identified as early as the elementary school. Among these identified high ability children at the elementary level are found the boys who ultimately enter a scientific occupation." (pp. 329-330)

"The choice point for science is apparently at the beginning of the ninth grade. It is the point where the choice between general mathematics and college algebra must be made. For many boys it is the choice point for college-going." (p. 330)

"It appears that organized science clubs and similar school experiences are not vital forces in career choice. If more boys are to be guided into science, methods by which out-of-school interests can be expanded and directed need exploration." (p. 333)

"A significant difference is noted between the science and non-science groups in the area of interests. Members of the sample were active club participants, participated in sports, musical organizations, and student government in about equal proportions. A different pattern appears in the area of out-of- school hobby interests. Members of the science group were more likely to have interests that were computational, manipulative, and scientific in nature; a home workshop or laboratory was not uncommon among members of the science group. Members of the non-science group were likely to have cultural interests such as music, dramatics, writing, among others.

This difference in interests was not reflected in the organized extra-curricular program of the school but was evidenced by what the boy did outside of school hours. This cluster of outside interests is a critical factor which distinguishes members of the subgroups and may be useful for prognosis of orientation toward a career in science." (pp. 331-332)

> "The formal guidance program, as recalled by the respondents, apparently was not an effective force in the decision-making process for members of the sample. As revealed by the questionnaire data, the informal contacts between teachers and pupil more frequently provided the source of guidance conducive to a choice for college and a decision for an occupational field than the organized guidance program within the school." (p. 336)
>
> "If there is to be an increase in the number of entrants into science, recruitment must be made early enough in the educational life of the boy so that appropriate choice of subject matter may be made. The junior high school is the apparent choice point, beyond which time the loss to science is generally continuous and complete." (p. 338)

Bloom groups physical science and engineering together, and therefore he occasionally reaches the wrong conclusion. I believe he is particularly in error when he concludes "that boys who entered biological research come from homes where the fathers functioned at higher occupational levels than the fathers of 'physical scientists'"—for "physical scientists" read "engineers." Similarly when he says "the change for members of the science group represents a change from lower-middle class to middle class and professional status," I believe one should read "engineers" for "scientists." These points have been discussed by Martin Trow[1],a social scientist who is able to tell the difference between scientists and engineers.

[1]Martin Trow, "Some Implications of the Social Origins of Engineers," in Scientific Manpower 1958, papers of the Seventh Conf. on Scientific Manpower, Symposium on Demographic and Sociological Aspects of Scientific Manpower, NSF 59-37, pp. 67-74.

Appendix B: More About the École Polytechnique [4]

"The organization of the courses and the method of instruction with lectures and répétiteurs, who acted as assistants and tutors, chiefly followed the ideas of Monge, and they were modeled on usages that prevailed in the engineering school at Mézières and in the school of bridges and highways in Paris. The severe admission examinations and the laboratory and practical exercises came from the Mézières school, the répétiteurs from the Paris school. Instruction was given in a series of classrooms, laboratories, and shops from eight until two each day. This was followed by the noon meal and recreation and private study; instruction was then resumed from five to eight in the evening. The students were divided into groups of twenty for their laboratory exercises and practical work. The curriculum was planned to cover three years; the first-year courses were in geometry, trigonometry, physics, and the fundamentals of chemistry with their practical applications—which involved a good deal of drawing and some laboratory and shopwork—in structural and mechanical engineering. The second- and third-year courses continued the same subjects with the application of the theoretical work turned to the building of munitions.

After each lecture, the répétiteur went over the lecture, questioning the student and cleaning up all difficulties, and giving some suggestions for the private study, the drawing, laboratory, and shopwork each student had to do...."

"The teachers included some of the best scientists in France, men who under the Ancien Régime were not in the universities. Indeed, the new faculty of the École polytechnique was now the most distinguished scientific faculty in the world. La Grange and Laplace taught mathematics; Prony, mechanics; Monge and Hachette, descriptive geometry and stereotomy; Delorme and Baltard, engineering design and architecture; Fourcroy, Vauguelin, Berthollet, Chaptal, and Gayton de Mourveau, chemistry." (pp. 153-155)

"...a highly selective system of admission by competitive examination, strict limitation of numbers, insistence upon a single course of closely integrated studies, mostly in mathematics, without any attempt to adapt the work to individual differences among the students, a regime of careful, thorough, and hard work, the use of the lecture system in teaching, supplemented by the work of rététeurs, and the courses combined with drawing, laboratory work, and practical exercises, emphasis on oral rather than written examinations, and the main lectures given by the most eminent scientists available. At the very center of its striking success was the prestige and ability of its great teachers and the virtual monopoly of entrance which it commanded to many of the best careers in the state service. Thus, from its very foundation it was the most sought after and the most difficult of access of all the schools in France and probably in the world."

Appendix C: Recent Papers on Student Evaluation of Instructors

The first of these papers asserts "students rate most highly instructors from whom they learn least."[1] More particularly: "the partial correlation between the objective and subjective measures of teaching ability, with initial ability held constant, was equal to $-.746$." The subject matter was elementary calculus, and the teachers were graduate student teaching assistants.

Gessner[2] criticises the Rodins' paper and gives contrary results. The subject was "basic science," given to medical school sophomores: the teachers were "faculty members." The correlation between student ratings of instructors and average class grades on "the National Medical Board Examination" was $+.77$. Most curiously, however, the correlation between the student ratings and the college's own internal examinations of the same classes was essentially zero!

Frey[3] also criticised the Rodin paper and carefully repeated it for classes of "introductory" calculus and "multi-dimensional" calculus. The mean final exam grade for each student was adjusted to compensate for his ability (i.e. his SAT scores). Class means of these adjusted grades were then correlated against a carefully chosen set of questions about the instructors. All correlations were positive; in one case as high as $r = +.90$.

[1] Miriam Rodin and.Burton Rodin, "Student Evaluation of Teachers," Science,Vol. 177, 29 September 1972, p. 1164.

[2] Peter K. Gessner, "Evaluation of Instruction," Science, Vol. 180, 11 May 1973, p. 566.

[3] Peter W. Frey, "Student Rating of Teaching: Validity of Several Rating Factors," Science, Vol. 182, 5 October 1973, p. 83.

Appendix D: The Cambridge University Methodology of Higher Scientific Education

The student of science (or engineering) has the following kinds of formal contact with the faculty:

(a) Lectures — These are given from the lecturer's notes, which are not, historically, available to the students [this is changing—at Surrey a complete text (as followed by the lecturer) is distributed, for instance]; nor do the students know the content of the course beforehand. The students are expected to take complete notes. The purpose of the lectures is therefore to communicate the substance of the course. Subordinate purposes are: to provide emphasis (books on the subject may be recommended for reference); to provide points of view; to excite enthusiasm; and to achieve other unclear objectives such as are often stated in this country.

The students take notes, in the view of the faculty, because "by writing it down they are forced to think about it." This opinion appeared to be most strongly held in Cambridge; to be less strongly held in Sussex, to be explicitly denied in Surrey; and has been, in a peripheral setting, found to be untrue by British educational psychologists: "Ash and Carlton, who studied the value of note taking during film learning, found that it appeared to set up interference with viewing, which was not wholly compensated for even when time was given to review notes subsequently."[1] More to the point is the response of a Cambridge student in engineering:[2] "You should not take any notes at all during a lecture—the lecturer is supposed to be lecturing, not dictating his notes."

(b) Examples Classes — About two dozen students and several instructors spend an hour together; the students attempt to solve assigned problems, and when one of them is stuck he calls on an instructor who gets him over the hurdle.

(c) Laboratories — These operate much as do our own, and are at about the same level.

(d) Tutorials — Once a week the "supervisor" sits between a pair of students and reads their lecture notes, correcting any errors. If he finds gaps in a student's understanding, he assigns additional reading, or makes up a special problem to be submitted at the following "supervision." He also reviews the student's solutions to problems which may have been distributed by the lecturer. He is the sole source of "feedback" to the student. Two students at a time is the preferred number at Cambridge; at Oxford, I was told, they stick to the old single student system. A "supervisor" may have as many as six "supervisions" per week, and he prepares for these ahead of time. Since his students can be in different classes, he needs to have several subjects at his fingertips. It is usual for a "supervisor" who operates as a member of a college, to also have departmental teaching duty, e.g. lecturing, serving in examples classes, etc. A "supervisor" is almost entirely concerned with academic performance; I was told that relatively little time is spent at general advising of the student. The supervisor is in charge of the student, and each of them has a split allegiance to their college and to their professional department.

It is widely viewed as a desirable feature of this kind of instruction that the tutor is not also the student examiner, but both are on the same side; this advantage is however seen by some others as unimportant.

Supervisors can advise students contrary to departmental policy, e.g., "labs are a waste of your time."

In spite of this close periodic contact with the faculty, students complain of insufficient faculty contact, impersonality, etc.; however, as with us, few students voluntarily approach the lecturers after class. Many "supervisors" are, in fact, graduate students.

[1] Ruth M. Beard, "Research Into Teaching Methods in Higher Education"—the Society for Research into Higher Education Ltd., 2 Woburn Square, London, September 1967; she quotes from: P. Ash and Carlton, B.J. (1953) "The Value of Note Taking During Film Learning," British Journal of Educational Psychology, 23, pp. 121-125.

[2] From a private survey report, kindly made available to me.

It appears that this is an internally consistent system for driving the students to study their lessons. (It is also consistent with the very strict parietal rules of the Cambridge Colleges.) If syllabuses and texts were used, then students wouldn't take notes; if they didn't take notes, there wouldn't be any notes for the "supervisors" to read and to criticize, etc., etc.

Appendix E: An Option for Intellectual Autonomy

What it means

It is an Option because students would volunteer for it. Intellectual Autonomy means that students will be encouraged to think for themselves, start to guide their own lives, and become self-motivated to study. It is based on the idea that "all work and no play makes Jack a dull boy" only if the work is externally imposed so that it becomes drudgery. Most of the world's great men and women are usefully active all the time, but few of them say they are "working."

To whom it applies

It is to apply to M.I.T. undergraduates, who are a uniquely qualified group. I will cite a few statistics in order to confirm the common opinion:

(1) Academically, the upper half of an entering class at M.I.T. is drawn from a group comprising less than the highest one percent of those U.S. high school graduates who go to college; between five and ten percent of this elite group enter M.I.T. (depending on which College Entrance Examination Board test score one looks at). Stated in more commonly meaningful but less exact language, the median I.Q. of entering M.I.T. freshmen is about 150, and there is probably no freshman below about 130.[1]

(2) Personality, the mean "Omnibus Personality Inventory" scores for entering M.I.T. freshmen differ from the National Averages mainly in that the M.I.T. students are significantly more given to scientifically oriented habits of thought. Neither the fraction of "hippies" nor the fraction of rigid conservatives is higher at M.I.T. than at other colleges.[1]

(3) Motivation for Going to College, entering M.I.T. freshmen are more typical, in the reasons which they give for going to college, of those who enter liberal arts colleges rather than of those who enter engineering schools. A significantly larger fraction come to M.I.T. in order to become learned, than is the case for students entering all U.S. colleges.[1]

There is no other university which has simultaneously such large numbers of gifted students comprising such a large fraction of its classes. Other universities have large numbers of gifted students comprising small fractions of their classes (e.g., Berkeley) or small numbers comprising large fractions (e.g., Caltech); but in most institutions there is only a tiny minority (a few percent at most) of such students.

The problems

M.I.T. clearly has a national responsibility therefore to lead the way towards a more flexible education of gifted students. (In the opinion of a sample of the M.I.T. Faculty, M.I.T.'s educational methods are deficient in that they inhibit curiousity, work the students too hard, and are otherwise repressive.[2])

The less important problems

(1) Because the quality of exposition by the M.I.T. faculty is relatively high compared to that of teachers in other colleges, improving teaching does not seem to be a problem which requires a great deal of additional effort (although M.I.T. should, as a separate endeavor, maintain some kind of unit for training young teachers in verbal communication).

[1] Cf., Sections A and B of "Reference Manual, The Freshman Year at M.I.T., Classes of 1968, 1969, 1970."

[1] Cf., Sections A and B of "Reference Manual, The Freshman Year at M.I.T., Classes of 1968, 1969, 1970."

[2] "What 45 Members of the M.I.T. Faculty Seem to Like or Dislike About M.I.T. Undergraduate Education." by G. E. Valley, March 1, 1968.

(2) Because good books exist and our staff willingly continue to compose newer and better ones, this also is not a problem area which requires increased encouragement (although some new texts might nevertheless come out of the new program of education described below). Similar remarks apply to movies, programmed learning, etc.

(3) Nor is there an urgent need to devise new kinds of classes in which a single teacher interacts with students: all combinations of discussion groups, lectures, tutorial sessions and so on have been tried already, and with consistently fuzzy and inconclusive results. All that can be said is that students uniformly want, and say they enjoy, very small classes. I shall propose therefore to utilize this enjoyment in the furtherance of the intellectual autonomy of the student.

There is good reason to doubt the efficacy of recitation sections and I propose a plan which might eventually involve giving up recitation sections and using the space, faculty time, and other resources thus made available to support the new methods. In this way the cost of the new methods might be kept within M.I.T.'s present budget for undergraduate education.

The following are the more important problems:

(1) The syllabuses are too rigid, and suit neither the most able nor the least able students. At the present time syllabuses are devised according to someone's conception of what a typical student ought to be taught. This is probably true in all schools, but only at M.I.T. is there an urgent need to more flexibly educate such large numbers of gifted young men and women. This proposal is based on the idea that the "typical student" comprises only a minority of the M.I.T. student body.

(2) There is too much emphasis on teaching the student rather than on the student's learning for himself. This means that it is the teacher who tends to be active whereas the student tends to sit passively. It is particularly important for highly able students to learn to be active participants in their own education.

(3) Students tend to become "syllabus bound." This is one of the most important problems because the U.S. school system habituates students to study what they are told to study when they are told to study it. As a result, they come to college expecting to be led by the nose, and this is what M.I.T. and most of the other colleges tend to do with them. In most colleges students meet for the first time teachers who are smarter then they are themselves; the caliber of M.I.T. students is so high that we need to modify this statement: M.I.T. freshmen meet for the first time teachers who are as smart as themselves. It is because practically all our incoming students have for all their lives been pushed around by comparative dullards, that we can hope to guide them into the responsible use of intellectual freedom.

(4) Students tend to become incurious, because even if not actually overworked at M.I.T., they nevertheless have so much material to absorb that they lose their appetite for more. Einstein's famous remark about satiating the tiger's appetite is relevant.

(5) Students tend to become intimidated and afraid to express opinions, or to ask dumb questions in class; and they are otherwise subdues.

(6) The well-publicized problem of the "obsolescence of engineers."

(7) The faculties of many colleges, including M.I.T.'s, worry that students are insufficiently "creative;" that they have poor taste, whether it be artistic taste or scientific "taste;" that too few students have ever examined their own motivations.

Objectives of the Proposed "Option for Intellectual Autonomy"

The objectives are of course to solve or remedy the problems. At the present time many educators seem to believe that only those educational objectives are valid which can be clearly stated and whose attainment can be objectively assessed. This may be true for those subjects of instruction primarily concerned with techniques; it cannot be true for those objectives which may be highly desireable but which are inherently a matter for individual judgment such as "taste," or for objectives the attainment of which can be objectively tested, but only years after graduation, such as "non-obsolescence."

The following list of objectives is ordered approximately in harmony with the above list of problems, and the immediately testable objectives are marked with an asterisk (*).

(1) To allow students to learn, each at his own pace: "A" students would cover more than the normal syllabus; "D" students would cover less but learn it more thoroughly (*).

(2) Students would be encouraged, even forced, to learn—they could attend lectures, take exams, etc., etc., or not, as they chose; but each would be examined regularly, although informally by a staff member; there would be seniors and graduate students to go over problem sets with each student individually. The idea is that the student would be given, for each subject of instruction, only a list of topics, and references to a few carefully chosen books of graduated difficulty (*).

(3) Students would be referred to several texts and each student would be required to study a given subject from several books (*).

(4) Students would be encouraged to formulate original homework problems and to ask questions in face to face contact with teachers (*).

(5) There would be "freshmen colloquia" attended not only by freshmen but also by the student teachers and the staff. These would mostly be on "open-ended" subjects. Freshmen might give one or two short talks at each session, and then there would be general discussion. In order to encourage freshmen to speak up, there may need to be rules to prevent their superiors from downing them. Such a set of rules might be something like the following: Freshmen would be allowed to question everyone; student teachers could only question faculty; and faculty could only answer when asked by a student or could question one another in order to be invited by the students to participate (*).

(6) By putting the emphasis on "learning" rather than on "teaching," the student would be put into the habit of educating himself from the start. It is hoped that this habit once acquired would stay so that he would continue to consult books and attend (and give) lectures freely the rest of his life. He would therefore be able to avoid "obsolescence."

(7) "Grading" would be by faculty approbation, e.g., by smiles, cordiality, and other such marks of approval—as much as possible like real life. The homework tutorials would be regarded as part of a "weaning away from needing to be taught" (*).

The student would learn by whatever means suited him best (including, but not limited to, lectures, recitations, written exams, etc.—which he might or might not attend—we wouldn't care how he learned as long as he did learn) (*).

All this, in my view, should be done in a structured rather than a permissive atmosphere—and students should be allowed to give up their tutorials based on their individual attitudes and progress, as informally assayed by the teaching staff. Such students would continue to have weekly interviews with a faculty member however.

The supporting of creative impulses, the inculcation of good taste—both cultural and scientific, the encouragement of self-examination are all desirable objectives.

Although I do not see how the attainment of these can be assessed, I nevertheless believe that the M.I.T. faculty is competent to exemplify these qualities strongly enough so that students will rub some of

them off.

The overall principles behind these objectives can be summarized as follows:

(1) M.I.T. should create an atmosphere of learning which is conducive of self-disciplined autonomous intellectual effort by the student.

(2) M.I.T. should experiment with all kinds of classes (including those with more than a single teacher present—which has rarely been tried) in order to see if some methods suit only some kinds of student, and, if so, to find out how to help students discover their own best methods.

(3) M.I.T. should show students how mature men and women behave and how they reward one another in the real world.

Proposed procedure

Phase 1: This would be a joint student-faculty study group to convene in the Fall of 1968 for the purpose of modifying and detailing the foregoing.

Phase 2: This would be a fumble-stumble period, possibly starting with a few freshmen in January 1969, for the purpose of seeing if any of the plans should be tried out more seriously on a larger scale.

Phase 3: This might start in the Fall of 1969 with perhaps 25 entering freshmen. If successful, it might be continued and enlarged.

All would be subject to periodic Administration and C.E.P. review.

Methods, and estimated costs

An instructor who gives two 25-student recitations per week will typically spend a total of 10-12 hours/week on this duty—preparation, grading, and counseling included. If recitations were abolished, then an equivalent amount of faculty time could be utilized as follows: On the above basis he could alternatively interview about 10 students one hour each week (possibly seeing two students simultaneously) seeing any particular student at least once every four weeks for the purpose of general technical conversation, exposition of principles, and forming an opinion of the student's progress and ability (problems would be corrected and explained by seniors or graduate students, who would meet each student each week). If the student took four subjects, he would have a single interview with a professor each week, seeing each individual professor three or four times per semester as well as informally; each week he would also have four one-hour tutorials with student teachers. Thus the professor would supply technical and other kinds of understanding and also approbation; this would require only a small amount of preparation on the part of the professor.

This means that Phase 3, which would have only about 25 students, would be twice as expensive in faculty time per student as physics and humanities now are; if the plan were more widely used, the faculty load in those subjects would be about the same as now. Subjects which now employ graduate students as recitation instructors would be more expensive this new way.

Incoming freshman students would be given a prospectus, and would volunteer for the experimental college, knowing beforehand its risks as well as its potentialities. They might sign up for a curriculum of their choice just as now, but could leave the standard system prior to the first hour exam or theme.

The principal added costs would be in Phases 2 and 3 which would involve several thousand square feet of space, payment (if necessary) of student instructors, purchase of several hundred books (including autobiographies and other less technical works of great men—from Alfred Sloan and Theodore Von Karman

through Darwin and Poincare; there may also be need for a shelf of great novels which are also fun for adolescents to read. There will have to be lots of copies of about two dozen standard texts.), computer time (for those who find computer instruction to their taste), movie facilities, etc. It is hard to see how this could add up to more than the current Institute expenditure per freshman—e.g., about $100,000 for 25 freshmen. (However during Phases 1 and 2 this would have to be additional money.)

In principle this kind of plan can be successful economically in the long term whenever there are sufficient students to fully occupy the time of a professor; this is the only reason that I can see now why, if this works for freshmen, it can't be extended for all students who desire it (there is a little questionnaire evidence that as many as half the undergraduates might want to try this).

It is not contemplated that all undergraduates would ever be educated this way—a large fraction of our undergraduates are content with the present system.

G. E. Valley
April 17, 1968

Appendix F

Here are a few of the many questions I received from members of the Committee on October 3, 1968,[1] together with my answers.

"What sort of students will the Experiment appeal to?"
"What sort of students will benefit the most from it?"
Ans: It is easier to define who won't be interested: namely, the play-it-safe type who is interested in making a career out of having a career.

"How many students?"
Ans: Between 25 and 50

"Should the use of computers, films, tapes, television, etc. be emphasized?" Ans: They should be used when convenient and desirable, but we should not emphasize their use as a special feature of the Experiment.

"How is the erratic but creative student to be handled?" "How encouraged?" Ans: By exercising patience and forbearance with him, I suppose.

"Will the Experiment have an identifiable center but use the classrooms and laboratories of the Institute as departments do now?" Ans: It should under no circumstances use regular classrooms or seminar rooms; much of the teaching ought to be informal.

"Except for Academic Programs will students in the Experiment live as other students live?" Ans: Yes; I am against total institutions.[2]

"What system of rewards can substitute for the 'satisfaction of a good grade?'" Ans: What is the "satisfaction of a good grade?" The student should be allowed to make a good reputation; he needs approbation both from his peers and from his teachers.

"Should there be formal examinations?" Ans: Certainly not the kind we give now in which all the students are herded into big rooms.

"Is the immersion of the student in an atmosphere of intellectuality, to manipulate him? If so, is this bad?" Ans: If manipulation means coercion then it's bad because coercion is bad... How free can you get and still associate with other people?... I am against deliberate indirection, but no one can promise to be tactless all the time.

"Will students' speeches be so dull as to turn off their student audiences?" Ans: If students' speeches are dull, we will show how to make interesting ones.

"How much time can an individual faculty member give to this enterprise?" Ans: On the average no more than he now devotes to undergraduate instruction; however in some fields there might be more contact hours and fewer hours at home spent on this.

"As residents of Boston or Cambridge, what are the responsibilities of the Experiment and of the students and professors to the larger communities of which they are part?" Ans: The same as they are now.

"What is the name of this enterprise?" Ans: I don't know—clearly it is an "experimental" something.

[1] G.E. Valley, "88 Questions about the Experiment," report to the members of the Experimental Study Group, October 4, 1968.

[2] Erving Gottman, "Characteristics of Total Institution," in Report of the Symposium on Preventive and Social Psychiatry, Walter Reed Army Institute of Research, Washington, D.C., 15-17 April 1957. I had just finished reading this paper when I answered the question.

"For how long will it continue?" Ans: I don't know—if it is a success, then it ought to continue indefinitely.

"What sorts of things might happen outside of the Experiment in which members of the College might participate?" Ans: All kinds of things.

Appendix G

Massachusetts Institute of Technology

Report of the Experimental Study Group

Since September 18, 1968, the Experimental Study Group has held 13 meetings each of 2 hours duration, attended by 9 to 14 faculty members and 4 to 8 undergraduates. Besides these meetings, members have held many private discussions and exchanged many copies of interesting reports with one another.

I. Purpose of the Study Group

The purpose of the Study Group has been to survey the possibility of creating on the M.I.T. campus, an educational environment for undergraduates totally different in spirit and atmosphere from that which now exists.

The Study Group concludes that: (1) it appears feasible to create such an environment, as it is described below; (2) an experimental pilot program should be inaugurated to test, and to modify where necessary, the proposals put forward herein.

II. Considerations of the Study Group

During our deliberations we studied a number of research reports and descriptions of college education at M.I.T. and at other universities, including several accounts of "experimental colleges."

We have been led to ask questions such as "Why change?" and "Change for whom?"

The M.I.T. system of education has served its students well for a century, and we expect that it will continue to serve many students well.

However when we asked ourselves whether all M.I.T. students are now well adjusted or adjustable to M.I.T.'s methods, we found ourselves dissatisfied with our answer.

There is much that we do at M.I.T. which is superior to what is done at other places, and which is good for all our students; some of it is superb. Our spirit of educational innovation which has led for example, to the project laboratories; the enthusiastic informality which motivates freshman seminars; the superb preparation and delivery of our lectures — these we think worthy of high praise. Likewise we see much good in the several kinds of tutoring efforts which employ students as tutors; these include the informal tutoring carried on in the dormitories and fraternities, as well as the more formal schemes connected with certain subjects of instruction.

But in view of the high motivation of our entering students, the advanced preparation of some of them, and the fact that contemporary students are often more mature today than were their parents at the same age, we are led to question the universal applicability of some current practices.

We have asked ourselves why an interesting class discussion should be arbitrarily terminated by a bell; whether it is realistic to test all students' grasp of a subject by examinations when we know some of them can easily pass examinations but may later fail when put to the test of the real world; whether we should try to teach all students in a class at the same rate when psychologists have demonstrated that each person learns at his own rate.

We found ourselves less concerned because many of our students work very hard, than with the fact that so many of them seem not to know why they are studying the particular topics assigned to them. Again we have asked ourselves "How will it be after graduation?"

We have asked ourselves why some students cannot be encouraged to study more on their own; whether so many formal classes are necessary; and whether science and mathematics recitation sections are a good use of the faculty's time, or of the students'.[1] This has led us to wonder whether other kinds of less formal faculty-student contact would result in superior student counseling as well as superior teaching. We asked whether the student's teachers should also be his counselors, rather than faculty members who see him only on special occasions; whether a student's choice of his Course should be influenced by discussion with those faculty members who have actually taught him.

When we analysed the reasons behind our high regard for freshman seminars and project laboratories, we concluded that their spirit seemed much like that of the graduate school; that those seminars and laboratories tended to treat the student as a mature person. Then we asked ourselves why all students must spend such a long time being instructed. We asked whether there might be some students whose maturity was in advance of their knowledge and calendar age; and might these be better educated if treated right away as mature, rather than waiting until they were writing their Ph.D. theses.[2]

III.

With affirmative answers to the foregoing questions in mind, we composed some Guiding Principles for an Experimental Program:

A. Because we recognize that students are very different from one another, we propose to foster diversity in education: to go as far toward an individualized program for each student as we can. We desire to find a way of education that will help each student to develop according to his own potential.

B. We recognize that maturing adolescents are strongly influenced by physical and emotional drives and that a meaningful education must take these drives into account. Entering freshmen already have many problems of adjustment, and it would be a large additional problem for many freshmen to adjust rapidly and without help to a completely free and undirected academic environment. Therefore, we believe that guidance toward the use of freedom should and can be given to inexperienced individuals.

C. We believe that an excessively unstructured program could be as unwise for some students as a completely structured one now is for some others. But we doubt that students who continue to need to have their educations completely planned for them, or their freedom to learn restricted to the privilege of selecting from among an assortment of scheduled subjects of instruction, will find this proposed experimental program congenial. Thus although we believe that planning of a student's activities is necessary, in the proposed experimental program we envision that the student will create (and modify) his own plan as much as possible. If he becomes interested in some topic, then we want to show him how to delineate his own ignorance about it. After interest has been awakened and ignorance recognized, we believe learning can proceed at a rapid rate. If each student is to set his own plan for learning, then there cannot be very much formal structure in the academic environment itself.[3]

[1] See Valley and Stuart, Reference Manual (1968) Section G.

[2] For the views on these questions of students who are not members of the Experimental Study Group, see Appendix A of this report, and also Reference Manual (1968) Section H by Valley and Stuart.

[3] Appendix H.

IV.

Consistent with these principles we include the following among the Goals of the Program.

We think the student should come to understand himself as well as his associates; to join group activity, or not to join, depending on the group's purpose and the student's own understanding of his needs and his potential for being helpful to the group; to learn how to cooperate freely with others; to learn how to search out information and how to judge it wisely, neither blindly rejecting the unpalatable nor blindly accepting that which is attractive; and above all to learn how to educate himself, guiding himself by consultation with others.[4]

Another goal has to do with the influence of this program upon M.I.T. education in the large. We hope that some of the methods and procedures developed and used successfully in this program might come to be adopted generally throughout M.I.T.; to be used in the education of all students. We note that this is the principle objective of the "Experimental College" at Tufts University.[5]

V.

We now present An Overview of the Proposed Program. Since this description of the Program necessarily refers only briefly to new and possibly unfamiliar features, these are explained in more detail in a following Section VI.

The Program of the Experimental Study Group will not be committed to experimentation for its own sake. Rather it will offer a more flexible alternative to the Freshman year than is currently available. Specifically: if a freshman student wants to enroll in several upperclass courses such as psychology, political science, etc. he should not be denied this liberty. But, if he wants to enroll in Chemistry 5.01 and Physics 8.01, then he should review his reasons for joining the Program.

We will not define now what content the Program will have, but what it may have. We ought to plan to reduce the formal content of this program and let it develop naturally next September.

The students who join the Program will participate in the M.I.T. community. They will welcome outside visitors to their place of work. However, students as well as faculty members will be encouraged to commit themselves firmly, or not at all, to the Program for at least one year. We recognize the possibility that students or instructors may join us shortly after the fall term begins, as word about us spreads. We feel, though, that the Program has more to offer than just a better way of taking courses, and that students who want to join us in mid-term may have missed too much to justify their leaving their regular program so late in the term. A natural break will occur after one term, and special cases will have to be handled as they arise.

As far as "social interaction" or "group learning activities" is concerned, undoubtedly some learning is best done in groups, for example the humanities subjects. However, some things, such as doing mathematical proofs, are not. Alternatively, if every activity the Program sponsors is, in a sense, a "learning activity," then the Program should sponsor group events like lecture parties, a la Course IV, teas, theater parties and mixers. Even physics may be contemplated in a beer party as Feynman's article suggests.[6]

[4] See Appendix J

[5] See Appendix J

[6] R.P.Feynman "The Development of the Space-Time View of Quantum Electrodynamics," Science 153, 699 (1966).

Getting the Program Started

In the spring we will ask freshmen to return a card to us indicating their interest in the Program. We will then ask them to write us explaining their reasons for wanting to be in the Program. We feel the best number for the Program is between 50 and 75 students, but we will start with a smaller number and let it grow. We will invite students to an "orientation" meeting some time during Residence Week. The purpose of the meeting will be to meet the College's faculty and to begin to discuss "educational theory." This will allow freshmen to make up their minds about the Program and their own goals as they talk with other freshmen and upperclass students. If they are still interested, the first meeting of the College on/after Registration Day will be an all-day seminar to begin the planning of curriculum and statement of goals. This seminar will last for as many days as is necessary to define each student's educational goals and interests. It will not last more than two weeks, preferably one. Because of the group's size, it is clear that it will have to split into sub-groups, each perhaps dealing with a particular area (for example, "mathematics", etc.) There may have to be a "planning board" composed of faculty, tutors and freshmen. Because of the diversity of the sub-groups, there will be needed a daily record of the proceedings, such as a mimeographed news sheet. Perhaps one of the senior tutors can edit it. Each student will have a faculty adviser to whom he is responsible for demonstrating progress in his activities.

A General Colloquium should be a formal weekly activity for and by the participants. It will remain open to any topic. There seems to be no reason why we couldn't invite speakers to it. Accordingly, the mimeographed bulletin will continue perhaps in a weekly format. We anticipate that there will be many diversified activities and that there should be a way to publicize the members' projects. The bulletin should, therefore, grow so that members can publish articles in it.

Facilities

Dorms and classrooms will not be in the same building, although a "student center" type lounge would be required (comfortable couches for napping, lots of books, etc.). A kitchenette and dining room, for lunches (cold cuts and bread, letting people cook on Fridays, snacks, coffee, etc.) is needed. A CTSS computer console is a good idea.

Faculty and Instructors

The faculty in the College will be informal, flexible, and involved.

The faculty will be responsible to the College. Faculty authority derives from experience, not the institution. Professors are the elder learners in the College.

The tutors will have had immediate experience with M.I.T. They will be either seniors or graduate students.

We feel typical freshmen do not have enough contact with the engineering departments, therefore, we encourage the proposal of having faculty from the School of Engineering give seminars or lead field trips.

Academic Programs

We recognize five varieties of instruction: self-study, concentrated study, seminars, lectures, and Institute courses. Our problem is to present a way of offering a combination of these methods of instruction to form a meaningful program without overburdening our resources. We believe it can be done.

Our practical goal is to prepare a student for a second year program. The nature of certification then will be like transfer credit. Our subjects will not be geared to say, "4 weeks of concentrated study equals 12 units," but rather "1 year equals 90 units."

Our ideal goal is to introduce a student to a body of learning, to show him that knowledge is made by men, not handed to us engraved on tablets. Therefore, we do not expect the faculty to spend much time preparing formal lectures with neat logically planned developments. Rather, we prefer to have faculty teach by talking out problems on the wing in seminars and concentrated study classes.[7] Besides, there will already be the formal lectures for the regular freshman program.

We believe that certain activities will be very likely — seminars, lectures and possibly concentrated study (with and without lab) in physics and chemistry; seminars, lectures and possibly concentrated study in calculus. We believe humanities would be best offered in small groups, or seminars.

We also expect certain small, short seminars will occur naturally. (Professor X remarks, "About seven students have asked me about partial differential equations. Why don't I talk about this for a while?" Professor Y says, "Several of the physics students have asked me about the magnitude of the electron and proton charges. Why don't I help them build an experiment to show they are equal?" Professor Z comments, "This is an election year. Let's study the political techniques of some of the candidates.") Since there is an overlap between some parts of freshman physics, mathematics and chemistry, it will be easy to interrupt a physics subject for a time in order to study mathematics.

These seminars and concentrated study activities will, hopefully, arise naturally out of our initial seminar. We can propose the initial programs of students for about eight weeks. After this period the Program should be a dynamic organism, changing its allocation of resources to fit the students needs. A concentrated study session may change from a group of twelve to self-study for one; a seminar may change to lecture, a lecture may change to self-study, and so on. A student can always drop everything for a short while to participate in concentrated study.

[7] See Section VI.J.

Appendix H: The First Prospectus of the ESG

Experimental Study Group
c/o Professor George Valley
M.I.T. Room 13-2070
Cambridge, Massachusetts 02139

August 6, 1969

Dear Friends of the Class of 1973:

Here is a more extensive description of the Experimental Study Group. We hope it answers most of your questions.

If you remain interested in joining the ESG after you have read this paper, we would like you to write to us. Your letter will help us to be prepared to discuss your interests with you when you visit us during Residence-Orientation Week.

Sincerely,

George E. Valley, Jr.
For the Experimental Study Group

GEV:elt

The Educational Program of the Experimental Study Group

The Experimental Study Group consists of upperclassmen and professors who have been studying the problems of college education for the past year. We have concluded that much of the formality of traditional educational methods (formal lectures, classes, assigned homework, exams) although entirely suitable for many students, is not suitable for all students. We believe that some people would learn better in a less formal educational environment — one in which the atmosphere in some way resembles that of a graduate school, a research laboratory or a community of scholars.

Broad Principles on Which the Program is Based

We want to emphasize guiding students to teach themselves. (Students who learn to teach themselves will be able to continue teaching themselves after they graduate.)

The Program described here is not intended to appeal to every freshman; different people need to be educated in different ways. Nor is it an honors program. It is an approach to education which allows each student to study at his own speed and to concentrate on topics which interest him until he has reached a level of mastery which he finds satisfying. It may well involve the student in longer (but perhaps more enjoyable) periods of study than does the usual M.I.T. curriculum. The Experimental Study Group has not discovered any easy way to learn. It still has to be done the old way — chair, table, lamp, books, apparatus, pencil, paper, and brain.

The Program will involve approximately 30 freshmen, about 10 upperclassmen as tutors, and about 10 professors as "elder learners." The Program is designed for the freshman year. Whether it can be extended to four years is not clear at this time. Even if it is not formally extended, the doors of the ESG will remain open to its former students. The ESG desires to provide a complete academic program for the freshman year. There is no partial membership. While we will allow, and in many cases encourage, ESG freshmen to take a regular Institute course, we would not expect a freshman to join the ESG and also take chemistry, physics, mathematics or humanities in the regular curriculum, although he might listen informally to the lectures.

Independent Self-Directed Study

The Program will emphasize independent, self-directed study. By independent study we mean that when the student chooses to study a particular topic (e.g. Xenophon's description of Socrates, basic biochemistry, Shakespeare's tragedies, or the orbit of the moon), he agrees that he will be able to discuss that topic, or otherwise demonstrate his knowledge, by a particular date — say two weeks from next Wednesday. In order to learn, the student may read the books used in a corresponding M.I.T. course with supplemental material suggested by faculty member or Senior tutor, or he may use journal articles or other "primary" sources. He may attend seminars organized by ESG people to discuss the subject matter, or he may elect to take a course in the regular MIT program. There will be people around for guidance, elaboration, or plain help.

A freshman may study a number of topics at the same time, or concentrate on just one — whatever suits him best. He can, of course, study different subjects in different ways, i.e. his method of studying physics may differ from his method of studying sociology. He also may experiment with different methods of study in the same subject area. We will go on to describe some learning methods we have envisioned but we would like to emphasize that the student has complete freedom in choosing the way he learns. He is certainly not limited to methods outlined in this paper. Our main requirement is that he demonstrate

that he has learned. The laboratory and computer facilities of the Institute will be available to the same extent as they are available to any freshman. There will be a small lab in the ESG building itself, and also a computer console. The ESG freshman will have an advantage in obtaining other equipment because he will get to know the "ways of the Institute" quickly and to know the people to see.

If a subject necessarily involves doing homework problems, there will be long lists of problems from which the student can select some which are neither too easy nor too difficult; and he will do these because he feels a need to do them, not because the faculty demands their solution. Upperclassmen will help freshmen with homework and other problems which involve the learning of skills and facts. These upperclassmen will also help freshmen "learn the ropes" at MIT. There will be motion pictures available to supplement the learning process, and we will have our own projectors so that these pictures can be viewed privately.

What the Professors will Do

The professors who are members of the ESG do not intend to limit themselves to formal "teaching." They will regard themselves as "elder learners." There will be a great deal of informal contact — coffee breaks, lunches, and so on — so the students and faculty can discuss serious topics in a friendly atmosphere. We shall endeavor to engage all freshmen as partners with us in the life of the intellect.

The only requirement for formal contact with a professor will be that each freshman, at least every other week, spend an hour or so with a professor discussing his progress in the subject he is studying (but this does not mean that he will be talking to that professor only every other week). At this time the professor will discuss the deeper, perhaps more philosophical aspects of the subject. The professor will be able to answer questions, and will also find out what progress the freshman is making. These periodic interviews constitute the single requirement placed on the freshman: he will come for an interview at a regular time. One, or several of these professors, will eventually become the student's "freshman advisor", and the freshman himself will choose who this is.

Getting Started in the Program

We know that most students have spent their lives thus far attending classes and working on assignments that were more or less rigidly prescribed by their teachers. We know that many are not used to being educated in the way outlined above. We have devised methods by which freshmen can adjust to an environment in which they learn how to learn for themselves.

Let us take physics as an example. We believe that if students are to derive a deep appreciation and understanding of physics they should find pleasure in studying it. This means to us that a student should be allowed to study at his most effective speed and should have some choice in the subject matter. Therefore, we shall first help each student to find out how fast and in what manner he should study physics, while also helping him to make the transition from teacher-directed study to independent study.

We foresee that some students will find textbook study uninspiring, even on an independent basis. Freshmen might prefer studying science from research papers, using texts only as reference books. This would be a "topic oriented" (i.e. space flight) rather than "discipline oriented" (i.e. mechanics) learning process. The same material will be learned, and the student will gain valuable insight into how basic concepts are used in practice.

Independent Study Based on Research Papers

Suppose a paper (or a series of papers) has to do with the lunar landing program, describing how the Apollo is launched, how it is placed into orbit, and how the lunar landing module is to descend to the surface of the moon and return. Part of freshman physics is to understand forces, momenta, and so on, well enough so that one can understand the various intricacies involved in launching a rocket. So, we would expect the student to read the first part of the paper which would have to do with the launching of the rocket, and to understand such questions as why the particular fuel was used, and why the rocket is launched in stages. This would involve an understanding of about half the regular freshman physics course, and the student would need to refer to texts for detailed explanations of the phenomena and principles involved. He would find himself working some problems to deepen his understanding of these principles, but he would assign these problems to himself. In addition, about half the regular calculus syllabus and some chemistry would have to be learned. Then he would go on to study how the vehicles are placed in orbit, how they maneuver, and how they get home. This would involve most of the rest of the regular freshman physics course: potential energy, rotating coordinate systems, gravitation, plus more calculus. The advantage of this procedure is not only that the student would have learned Newtonian mechanics in studying the paper, but he would also have learned something about one of the interesting events of our age. He would incidentally have become familiar with the moon and with the problems of interplanetary navigation. While doing this he would consult regularly with physics, math and chemistry members of ESG — both formally as mentioned above, and also informally.

But perhaps the lunar landing program does not interest a particular student. Suppose a student would like to play with electronics. He might spend a few weeks learning the fundamentals of circuit analysis, the characteristics of common circuit elements, and perhaps design himself a small amplifier. In the process, he would learn a good bit of freshman calculus, sophomore physics, and a bit of electrical engineering. We will have other kinds of research papers too, and these need not be limited to things a student would normally encounter as a freshman.

We shall also post, from time to time, "open-ended" problems. These are problems so broadly stated as to have no single correct answer. We may, for example, suggest that students criticize both the scientific and the literary antecedents of a novel such as "Brave New World."

We expect, therefore, that toward the end of the term some students would be studying physics, mathematics, chemistry, or humanities, not necessarily from fixed assignments, and not only from carefully written textbooks, but also from professional papers.

Concentrated Study

Suppose that a few students feel the need for more formal work in some particular subject. In this case, one of the professors might suggest that those interested spend say a week with him intensively studying that topic, whatever it might be — differential equations, relativity, or the Detroit riots. This intensive study would not be highly polished or carefully organized. The professor in his role of "elder learner" might be stumped by a student's question, and the whole group might then spend the next two hours exploring all possible ways to answer it. The emphasis in this kind of learning experience would not be to transfer specific facts from the professor's head to the student's head (after all, our basic assumption is that students can read). What the professor would be demonstrating is how an experienced scholar finds his way out of intellectual difficulties. We think education should consist of learning how to think, not simply of learning facts and skills. Facts and skills are very necessary, but we place primary reliance on students' ability to learn facts and skills by themselves, with help when needed.

Humanities

Although we expect many ESG students to be interested in the natural sciences or engineering, we are prepared to engage ESG freshmen in non-technical areas either as a major field of study or as work to complement a technical concentration. We hope that there will be no sharp lines drawn between the disciplines, since, for example, a deep understanding of science involves understanding philosophy and history. We further hope that the ESG student will naturally wish to broaden his education and we will assist him fully in so doing. The ESG has a strong representation from the Department of Humanities. We also expect frequent visits from faculty and staff not formally members of the ESG, in humanities as well as other fields.

Will There Be Exams?

Of course no one likes to be judged, but it is a fact that everyone's knowledge and ability is judged by those with whom he comes in contact — in school or out. Our problem is to find realistic ways of assessing progress which are acceptable to all people concerned.

The ESG does not regard examinations as infallible guides to assessing the progress of students. Exams are at best artificial. In the real world one is not asked to put down on paper in one hour, or even in three hours, everything he knows about a particular topic; in the real world one is not expected to do five problems in fifteen minutes. Rather one is expected to agree with a superior that one might undertake to do a single problem in, let us say, fifteen days.

But when the job is done, one is expected to defend his results, in any of several ways. For instance, one might have to make an oral report in front of an audience, explaining what had been accomplished, how it had been accomplished, and what further work ought to be done. Or one might write a paper to be published in a Journal; this might be written in formal language, complete with diagrams, data, tables, and so on. We expect students to have the opportunity to give talks and to write papers, and we are going to have our own journal. Although we shall not force anyone to talk who does not want to, students will find out that learning to communicate is a necessary part of an education.

Professionals are ordinarily expected to think on their feet. We see no reason why students should wait until after graduation before they take part in serious conversations about serious subjects. In the ESG students will encounter faculty members engaged in serious arguments, each defending an opposing point of view. The students will express their opinions, ask questions, or criticize what is going on. They will be expected to partake fully in the intellectual life about them.

Because some of us are considerably older, this does not imply that freshmen should accept everything we say as gospel truth; we expect to be questioned. We do not expect a student to believe everything we say just because we say it, and we do not expect him to believe everything he reads in books, regardless of who wrote them, unless he is convinced that what he has read or heard is reasonable and valid.

His knowledge will be assessed in ways which are satisfactory to the student and, as nearly as possible, realistic in the sense that they are the ways in which the world outside of school would judge him. Consequently, unless a student prefers to have his knowledge assessed by means of formal examinations, there will be few of them.

The Study Schedule and Credit

MIT defines certain required courses which must be taken in order to graduate. They do not necessarily have to be taken in the freshman year, although most MIT freshmen do take them. Many ESG students

will want to study the subject matter of some of these required courses during their first year, because this is a logical place to begin a college education. We expect that by the end of the freshman year, a student will have demonstrated competence in the essential subject-matter of some discipline(s). For example, if he wants to spend his first month here studying calculus, and nothing but calculus, that's all right; a freshman could easily cover a term's work in a month that way. If he finds calculus or some other branch of mathematics extraordinarily interesting and wants to study it almost exclusively for a whole year, we'll try to help. Of course we would anticipate pretty complete mastery in such a case. That particular student would probably have to spend his sophomore year studying all the rest of the things which he might otherwise have studied in his first year. More likely a student might want to study a particular subject for a while until he feels saturated by it, and then move on and study another subject. This may be a natural way for some people to study; others might better study several subjects simultaneously. We can also organize some concentrated study courses, for those with a common interest who would like to study more formally with a professor.

Although the ground a student elects to cover will probably be more or less similar to that covered during the freshman year by students who are taking the regular Institute courses, this need not be the case. Moreover, we do not expect that every last topic which is taught in the regular courses will necessarily be studied by everyone, nor do we expect that everyone will limit himself to only those topics which are covered in the freshman courses. A student with advanced placement credit will be allowed to keep this credit. In his work in that particular field, he can just pick up where he left off in high school, or he can engage in a brief review assisted by one of the faculty or tutors.

If a faculty member decides that a student has demonstrated a level of competence in a given field that entitles the student to credit for a general Institute requirement, he will award this credit. This credit in 18.01, for example, will count toward graduation just as if the student took 18.01 in the regular curriculum (though the Institute may require that the freshman take an examination before granting a freshman upperclass credit (e.g. 18.05 or 6.01) toward graduation).

A student will get credit toward graduation for any Institute requirements he satisfies or any other subjects or skills he masters in the ESG. This does not imply that he has covered exactly what was covered in 18.01 (for example) that term, but that he has learned an equivalent amount of introductory material. Any courses he takes in the regular curriculum will be graded pass-fail, and we will see that he is credited with having taken these courses.

The Risk To You

It is only fair to warn you that we cannot guarantee that you will learn as much in the ESG as you would by taking the regular course with lectures, assigned homework, recitation classes, regular exams, etc. This is up to you. We hope you will learn more; however we should warn you that there is a risk that you might learn a great deal less. The risk lies in joining this group when it really does not suit your personality. Obviously we have considered the risk, and we are aware of it when we propose the program. Part of our planning for this new method of study has been to consider how to minimize your risk. We believe that one way to minimize risk is to see that you have as much information as possible before you begin.

The initial piece of this information must come from you: you must now decide, if you haven't done so already, just why you want to come to college; if you understand your motivation for college, you will be able to assess the suitability of this program for you. In order to help you, we have enclosed descriptive paragraphs (see last page) which describe four possible reasons why a student might want to go to college. None of these reasons may be entirely your own. We present these paragraphs to you so that you can start

thinking, not so that you can tell us which one of them you prefer. Although the results of your thinking are your private affair, we urge you to consider the matter carefully.

Joining Up

We are aware of the difficulties involved in deciding whether to join a group such as the ESG. Each freshman must examine himself in light of the basic educational premises upon which the ESG is based and determine whether he could function successfully in such a group. We hope to facilitate this decision by providing as much information as possible, and by organizing our own "joining-up" program beginning around Registration Day.

We cannot guarantee that the final admission to the ESG will be governed entirely by the student's wishes, but we are trying to avoid any sort of acceptance-rejection procedure. Our "joining-up" program is designed to make the freshman suited for the ESG feel right at home and to help the freshman who is not suited for the ESG to realize this for himself.

We are seeking the student with an attitude toward education which would suit him for the ESG — not only the student with the highest I.Q., most past accomplishments, or best academic record.

If this more detailed outline of the ESG program has further stimulated your interest, come and spend as much time with us (6th Floor, Building 24) as you can during Residence-Orientation Week. In this way, you will get to know the ESG first hand. By Registration Day, you will have to decide between starting classes in the regular curriculum, or attending the ESG "joining-up" program. On Registration Day you will formally register in the regular curriculum with other freshmen (a week later you can transfer your registration to the ESG, if you and we agree that it is in your best interest to do so).

You will receive more information about this along with autobiographical sketches of the present ESG members early in September. If you have further questions or comments in the meantime, do not hesitate to write to us.

Leaving the ESG

We foresee two situations in which a freshman might want to leave the ESG and return to the regular curriculum.

After a week of the "joining-up" program he may realize that the ESG is not for him. In this case he would simply continue his registration in the regular curriculum, and pick up the regular courses. One week's material is not a great amount to make up at the beginning of the term. We consider this way of leaving "normal"; it was built into the "joining-up" program.

A more serious problem would be encountered by a student who decided after two months that he wished to leave the ESG. A more natural time to join the regular curriculum would be between semesters. We would advise this student to spend the rest of the term in ESG, while concentrating his study on the material of the regular curriculum. He would rejoin the regular curriculum at intersession and get credit for whatever work he did in the ESG. We would like to avoid this situation and we hope that our initial activities will assure that everyone who starts his freshman year in the ESG will complete it in the ESG. We expect that all ESG freshmen will be able to prepare themselves for any of the professional upperclass programs that begin in the sophomore year.

How We Think It Will Operate

There will be a coordinating professor who will serve as the agent of a steering committee, composed initially of a few upperclassmen and professors (freshmen will be added to the committee later). The steering committee would decide which administrative actions needed to be taken. It would report periodically to general meetings at which all faculty and students in the Program would attend. At these meetings, which may be once a week or once every other week (depending on what we find desirable), everyone will have the opportunity to suggest new procedures, to suggest the buying of new books, the purchase of new films, and so on.

We expect that the students will play a real part in running the place. For instance, we intend to have a library for our own use, and we expect that there would be a student library committee in charge of these books. We expect to have a number of pieces of audio-visual equipment — hi-fi, tape recorder, projectors, etc. Also we expect that some students will take care of this equipment — to know where they are, and to see that they are sent out to the appropriate repair shop if they need repairs. There are other responsible tasks in which we shall expect the students to interest themselves.

We shall have available Coca Cola and coffee mornings and afternoons, and we plan to eat lunch together. (We hope that students will monitor the menus.)

We are planning to operate the Program in its own suite of rooms (6th Floor, Building 24), none of which will be like a classroom in the usual sense. We intend that these rooms and facilities will be available for student use at all times, though we do not intend that students live there. Experimental Study Group students should expect to reside with the other undergraduates, and to participate in extracurricular activities with them.

August 6, 1969
ESG:elt

Your Philosophy of Higher Education

(The following was prepared by Professors Martin Trow and Burton Clark of University of California at Berkeley.)

On every college or university campus, students hold a variety of attitudes about their own purposes and goals while at college. Such an attitude might be thought of as a personal philosophy of higher education. Listed below are descriptive statements of four such "personal philosophies" which, there is reason to believe, are quite prevalent on American college campuses. As you read the four statements, attempt to determine how close each comes to **your philosophy of higher education.**

Philosophy A: This philosophy emphasizes education essentially as preparation for an occupational future. Social or purely intellectual phases of campus life are relatively less important, although certainly not ignored. Concern with extracurricular activities and college traditions is relatively small. Persons holding this philosophy are usually quite committed to particular fields of study and are in college primarily to obtain training for careers in their chosen fields.

Philosophy B: This philosophy, while it does not ignore career preparation, assigns greatest importance to scholarly pursuit of knowledge and understanding wherever the pursuit may lead. This philosophy entails serious involvement in course work or independent study beyond the minimum required. Social life and organized extracurricular activities are relatively unimportant. Thus, while other aspects of college life are not to be forsaken, this philosophy attaches greatest importance to interest in ideas, pursuit of knowledge, and cultivation of the intellect.

Philosophy C: This philosophy holds that, besides occupational training and/or scholarly endeavor, an important part of college life exists outside the classroom, laboratory, and library. Extracurricular activities, living-group functions, athletics, social life, rewarding friendships, and loyalty to college traditions are important elements in one's college experience and necessary to the cultivation of the well-rounded person. Thus, while not excluding academic activities, this philosophy emphasizes the importance of the extracurricular side of college life.

Philosophy D: This is a philosophy held by the student who either consciously rejects commonly held value orientations in favor of his own, or who has not really decided what is to be valued and is in a sense searching for meaning in life. There is often deep involvement with ideas and art forms both in the classroom and in sources (often highly original and individualistic) in the wider society. There is little interest in business or professional careers; in fact, there may be a definite rejection of this kind of aspiration. Many facets of the college — organized extracurricular activities, athletics, traditions, the college administration — are ignored or viewed with disdain. In short, this philosophy may emphasize individualistic interests and styles, concern for personal identity, and often contempt for many aspects of organized society.

Appendix I: The Fourth Prospectus of the ESG, sent to freshmen in the summer of 1973

The Educational Program of the Experimental Study Group

You probably have many questions about the Experimental Study Group and we will try to answer some of them. However, like any other living or study group at M.I.T., the E.S.G. is largely what you make it. We can only describe what it has been for us these past four years, and tell you about some of our ideas for next year.

General Philosophy of the E.S.G.

The E.S.G. consists of students and staff who believe that many of the traditional educational styles (formal lectures, classes, assigned homework, exams), although suitable for many students, are not suitable for all. We have found that some freshmen prefer to study in an environment which is less formal than the regular M.I.T. curriculum. We therefore offer you freedom of choice in methods, rates, and areas of study. We also encourage, but do not force the development of close relationships among teachers and students in our learning community.

We have found that this environment helps many freshmen gain confidence and ability in formulating and pursuing their goals. We particularly emphasize interactive styles, in which a student works in a group or with a teacher or one or more other students, but we also recognize that some students will want to work more on their own. We try to help both types of students as much as we can.

What the Members of the Teaching Staff Do

In our community, the members of the teaching staff regard themselves as elder learners who are teaching themselves and each other as well as freshmen. There is a great deal of informal contact – so the students and faculty can discuss interesting things in a friendly atmosphere.

Besides simply "being around", the staff members take an active part in E.S.G. activities. They will start seminars on topics that they or students find interesting, give occasional talks on subjects suggested by students or by their own musings, and take students out to dinner; sometimes they will seek out a student who hasn't been around for a while, or who seems in some way or other to be in need of assistance, academically or otherwise. In a number of cases, a student has found a teacher more helpful as a friend on a personal basis, than as someone who could solve a particular problem from a book.

During the first week each student will choose an dvisor from the E.S.G. staff or one will be chosen for you. After you have become familiar with the staff members, you may change your advisor whenever and as often as you like. The only requirement for formal contact with an advisor will be that you meet with and keep your advisor informed of your progress at least every other week.

The Study Schedule

As an E.S.G. member, you may study a number of topics at the same time, or concentrate on just one — whatever suits you best. Different subjects can, of course, be studied in different ways; your personal approach to physics may differ from your personal approach to sociology. You may experiment with different ways of studying the same subject. You will have complete freedom in choosing the way you learn. The laboratory and computer facilities of the Institute will be available to the same extent to you

as they are to all freshmen. The E.S.G. also has a small workshop and a computer console of its own, and plenty of blackboards and study space.

Although the ground you elect to cover will probably include much that is similar to that covered during the freshman year by students who are taking the regular Institute subjects, this need not be the case. Moreover, we do not expect that every topic which is taught in the regular subjects will necessarily be studied by everyone, nor do we expect that everyone will limit himself to only those topics which are covered in the traditional freshman subjects. If you get advanced placement credit, fine, or you can pick up a subject where you left off in high school, or you can engage in a brief review assisted by one of the teaching staff.

Credit and Institute Requirements

At the end of each term, each E.S.G. freshman in good standing gets 50 credits toward graduation. (Don't ask what "good standing" means — there haven't been any freshmen in "bad standing" yet.) These E.S.G. credits will stand as free elective credits on your record, along with a list of the completed Institute requirements. You can fulfill the Institute requirements by convincing an appropriate E.S.G. faculty member that you know approximately what you would have known if you'd passed the subject in the regular curriculum. In humanities, the freshman requirement can be satisfied by doing an appropriate amount of work in a non-science field, whether or not that field corresponds to anything in the regular freshman humanities program.

How Students' Work Will Be Evaluated

Of course no one likes to be judged, but it is a fact that everyone's knowledge and ability is judged by others — in school or out. There are different kinds of judgment. We feel it is important for freshmen to develop a capability for self-judgment, and that the staff's judgment of students can be an important help to students who are learning to judge themselves.

Unless you prefer to have your knowledge assessed by means of formal examinations, there won't be any. You can show us you've learned physics, for instance, by any of the following ways: doing an exam with or without books, reading a scientific paper and writing a commentary on it to show you understand it, giving a speech, taking an oral exam, or any other way you suggest. Last year many freshmen elected to study physics with self-paced subject material furnished by E.S.G. staff members, and this will be available again this year.

Because some of us are considerably older, this does not imply that freshmen should accept everything we say as gospel truth. We expect to be questioned. We do not expect a student to believe everything we say just because we say it, and we do not expect him to believe everything he reads in books, regardless of who wrote them, unless he is convinced that what he has read or heard is reasonable and valid.

Getting Started in the Program

We know that most students have spent their time at school attending classes and working on assignments prescribed by their teachers; many are not used to being educated in the E.S.G. pattern. We are trying to devise methods by which freshmen can learn how to learn for themselves.

This year we're planning to simply start right in with regular activities. Various people will begin trying out their new ideas for seminars and group work.

A freshman can start in any of a number of ways: join a seminar, study math with one of the staff, review some topic from high school, or take some time to think about his goals. We hope that anyone who joins a seminar will make a commitment to stay with that seminar for a while, so that the group can get over the initial hurdles which so often seem to be present before things begin to run smoothly. Also, we hope that those who wish to examine their goals and reasons for being at M.I.T. will not do so in a vacuum, because we have found that taking advantage of the environment of the E.S.G. can help them reach meaningful answers to their questions.

Many of the questions you have may be similar to those the faculty members and upperclassmen also faced when they were freshmen, and you may find it helpful to hear of their experiences. Therefore, we believe that if you join the E.S.G., you should plan to participate often, both to get a feeling for what it is like to work with the others in the group and to make the process of learning how to learn, without the usual external pressures, an easier one.

Governance of the E.S.G.

An informal organization like E.S.G. does not have or need a complicated set of rules and government. Everyday decisions are made by a student committee meeting once or twice a week. Membership on the committee is open to all who are interested and all meetings are open to everyone. (General bookkeeping, typing, and fighting with the Registrar's computer is handled by our administrative assistant.) Major decisions are referred to a General Meeting. These would include such things as staff assignments, and major expenditures. These meetings include students and faculty on a completely equal basis.

Joining (and Leaving)

The E.S.G. provides a complete academic program for the freshman year and at present it is designed primarily for the freshman year. (Sophomores in E.S.G. are required to take at least half their work in the regular curriculum.) A freshman may not join the E.S.G. and also take all of the regular freshman subjects in the regular curriculum, although he may listen informally to lectures and sign up for one or two subjects in it. For instance, a seminar, a project lab, a language or an upperclass humanities subject would be likely to supplement your E.S.G. work, and thus you might want to enroll in one of these.

Since the E.S.G. does not provide a four-year academic program, its students must at some point leave the E.S.G. to pursue their formal upperclass course work. This doesn't mean leaving the E.S.G. community — many E.S.G. Juniors and seniors meet friends, study, eat, and listen to music at E.S.G. However, they also attend regular classes. The reaction of E.S.G. students upon returning to the regular curriculum has been varied. Some have felt it's easy, because someone else makes up your mind for you. Others have felt restricted by narrowly defined and required subject matter, testing procedures, and homework assignments. Some have taken "reading courses" to get more flexibility in what they can do. Few people have had any difficulty doing the work required in regular classes.

The E.S.G. helps upperclassmen who are ready to enter a formal course in a number of ways. Most importantly, E.S.G. provides an atmosphere and facilities for people to work together on common problems or subject areas. Also, it is possible to do special projects or reading for credit with E.S.G. staff members, as well as with any other willing M.I.T. faculty member.

There are two situations in which a freshman might leave the E.S.G. and return to the regular freshman curriculum.

After a week or so in the program he may realize that the E.S.G. is not for him. In this case he would simply continue his registration in the regular curriculum and pick up the regular courses. One week's

material is not a great amount to make up at the beginning of the term. We consider this way of leaving normal; we want to give you time to decide if the E.S.G. is for you.

A more serious problem would be encountered by a student who decided after two months that he wished to leave the E.S.G. A more natural time to join the regular curriculum would be between semesters. We would advise this student to spend the rest of the term in E.S.G. concentrating his study on the material of the regular curriculum. He would rejoin the regular curriculum at intersession.

Rewards and Risks

We expect that all E.S.G. freshmen will be able to prepare themselves for any of the upperclass programs that begin in the sophomore year. However, it is only fair to warn you that we cannot guarantee you will learn as much formal subject matter in the E.S.G. as you would by taking regular subjects with assigned homework, recitation classes, regular exams, etc. This is up to you: we hope you will learn more; however, you might learn less. The risk lies in joining this group when it really does not suit your individual taste. We believe that one way to minimize this risk is to see that you have as much information as possible before you begin.

On the other hand, most freshmen who accomplished less in the way of subject material than those in the regular curriculum have felt that their time in the E.S.G. was very well spent. Many of these felt that they learned why they were in school, and that they could now use their ability to learn for themselves to pursue their studies more effectively. Some found that M.I.T. was not the place for them, and therefore they went to another school or simply left school to do what they enjoyed. Briefly stated, there is much more to the freshman year than formal academic work and, for a number of E.S.G. students, the struggle for personal understanding and growth is the most important aspect of their first year.

When you visit the E.S.G. you will be able to talk to upperclassmen who were freshmen in E.S.G. and they will tell you about their experiences.

Where We Are

We occupy most of the top (6th) floor of Building 24, which is in the middle of the main campus. There is an elevator, which is slow, and stairs, which are as fast as you are. During R/O Week many of us will be present most of the time; we look forward to talking with each of you individually then.

How to Join E.S.G.

1) You should register as a regular freshman.

2) During R/O Week you do what everyone else is doing — take the tests, listen to the speeches and so on. You should also find enough time to visit with us. You will want to talk with several students and faculty members. We will have coke, coffee and cookies for you.

3) You will initially be assigned a Faculty Advisor who is not a member of the E.S.G. You should see him and fill out and sign any forms he may have for you, and otherwise comport yourself as though you were expecting to join the regular curriculum. You should not expect your advisor to be particularly well informed about all the details of the Experimental Study Group. This information you will learn from us. Turn in your registration material just as the others do.

4) On Monday, September 10, Registration Day, follow the normal procedure.

5) E.S.G. will begin its activities for the term with a general meeting of old and new staff and students on Registration Day at 1 P.M. If you think you wish to join, we ask that you make it to this meeting if at all possible. You need not make a formal decision to Join the E.S.G. until a week after Registration Day.

The E.S.G. Staff

The Staff for 1973-1974 will include the following people as well as several upperclass tutors who will be around to help you with math, physics, humanities, chemistry and biology.

Donald Bell - Assistant Professor of Humanities
Jerry Budzik - Graduate Assistant of Chemistry
Charlotte Fishman - Instructor of Philosophy
Nathaniel Frank - Professor of Physics
Jerrold Grossman - Graduate Assistant of Mathematics
Robert Halfman - Professor of Aeronautics and Astronautics
Stanley Hirschi - D.S.R. Staff, E.S.G. Physics Instructor
Steven Robbins - Instructor of Mathematics
Edna Torgerson - Administrative Assistant
George Valley - Professor of Physics

We all hope to see you R/O Week!

elt 5-30-73

Appendix J

Passages from "A Portrait of Three Experiments," by Judson Jerome in Change, July-August,

After an initial period of euphoria, the program spiraled into gloom. By January 1968. when I first met her, Elizabeth Sewell spoke of Bensalem with the spectral voice of one who had seen into the otherworldly depths of human disorganization. She had experienced for the first time human relationships with no holds barred, no protective artificialities, no institutional havens. It had been an encounter with terror and despair; she had been torn by love that both poisoned and sustained. And yet she was committed more deeply than ever to this pattern of education, for any other — she believed — would merely protect one from the knowledge which, however painful, is the only rock on which a faith may be founded. "The vision was naive on two counts," says Kenneth Freeman, who has since succeeded Miss Sewell as dean. "Because people are friends, it does not follow that they can live together compatibly. And it does not follow that students can be absorbed in a pattern of friendship. Elizabeth assumed that people would want to do things together — Urdu, creative writing — that they would come together and share. It doesn't work that way at all. The philosophy of 'do your own thing' dominates everything."

Again and again I have said, and have heard other people say, when faced with the squalor and anguish of these programs which launch people into arenas barren of the usual expectations, requirements, schedules and monitoring: "At least it is real!" Freedom, when defined as absence of form, is not liberating; it is difficult, frightening, and savors of blood, sweat and tears. Survivors are generally exhausted, pale and shaken to the roots; but the experience is addictive because it gives one the sense of at last seeing life without pretense. A little over a year later Elizabeth Sewell and I were comparing notes, weeping, as it were, in our martinis, about our experiences — mine at Antioch's Inner College, hers at Bensalem — and wondering whether there was some Freudian dynamic in these little programs which created the necessity for killing the father (or mother, as the case may be). She was planning at least a temporary retreat, to a nice little conventional college where she would have a light load as a distinguished scholar. The toll on the nervous system and body can become too great, and one gets ill, creates defenses, or flees.

Experimental programs are always the subject of salacious interest and gossip because most of us imagine that if the restraints were removed we would ourselves be unbridled hedonists. A garage mechanic who gets his kicks beating up hippies said, "You think I wouldn't like to let my hair grow and run around smoking dope and screwing everybody in sight and never holding a job? You're damned right I'd like it — but that's not reality. You got to face reality." The envy of boards of trustees and pillars of the community is usually better disguised, but is no less strong.

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A powerful personal presence, particularly in a position of authority, is a great burden for a program to endure, especially if it emphasizes egalitarianism and self-direction. Love-hate relationships of great intensity develop, and problems of identification with the leader and resentment of him are equally oppressive. It is probably well that such leaders move on, after they have contributed their creative force. Even when the programs go well, they have not been truly tested until they show the ability to survive their initiating leadership.

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But inside experimental programs, lust as outside them. there are more people miserable because of lack of self-fulfillment, lack of sensual gratification. lack of experimentation with life than are engaged in intemperate reveling.

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To be hired a faculty member has to win, as it were, the approval of the whole student body. He is

invited to do this by going around to the apartments, knocking on doors, and asking for an interview. "You are the bad guy automatically because you are getting paid," one faculty member commented. Another went there for interviews and left inside twenty-four hours. "If some snotty kid can keep asking me what right I have to draw a salary, what right I have to privacy, and if getting and keeping a job depends on pleasing him, well, I figured, who needs it?" A faculty member is an advisor, not a teacher — and it sometimes seems that YMCA or camp counseling experience might be more relevant than academic preparation. "I can prepare to deal with about five students a week in tutorials; that's my limit — and I have very little contact with the others. They make me constantly aware that I'm not doing one damned thing for them and keep raising the question of why I should draw a salary."

Another version of the same split separates those who regard community as a major goal and those who are more concerned about individual pursuits (such as academic study). During the first year this split the house until the community-minded people moved out and set up a kind of commune elsewhere. Consensus was the mode of governance for the first couple of years, and political battles were endless and destructive. Freeman said, "I came to see that consensus is one of the most inhuman ways to govern imaginable, as it does not permit one to disagree."

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Appendix K: People Who Have Been In E.S.G.

Joined 1969-70 as Freshmen

Joseph Ardin
H. Reyer Band
Michael Button
Christopher Cavanagh
Michael Cedars
Harold Choate
Paul Chu
E. Scott Conner
Stephen DiPietro
Jay Edelman
Joseph Garza
David Gero
Michael Greenspan
Roger Hale
John Hodges
Robert Horowitz
Bruce Hubbard
Hobard Hudson
Lane Hughston
Kalle Kang
Richard Katz
Donald Kollisch
Michael Lavine
Arthur Lee
David Levy
Herbert Lin
Glynnis Lomon
Alan Luse
Charles Macias
Sidney Markowitz
Raul Martinez
David Moberly
Gregory Moore
Michael Moritz
Denis Perlman
Claude Raifaizen
Kevin Rhoads
Dana Roberts
Robert Rolla
Carl Rosenberg
Timothy Sammons
Beverly Seavey
Dennis Solomon
Judith Somberg
Randall Weiss
Carl Wieman

Joined 1970-71 as Freshmen

John Ankcorn
Allen Baum
Daniel Bernstein
Robert Bickerton
Richard Buirkle
Stephen Crane
Mark Davison
Alan Dubin
Edwin Ferris
Jay Flynn
James Given
John Hakes
Steven Harris
Roy Haupt
Peter Hobbs
Holly Horton
Glenn Iba
Jerry Jungster
Henry Lieberman
Michael Linn
Stephen Mark
Matthew Mason
Lawrence Matlow
William Mayhew
Michael Miller
Edward Murphy
Michael Murphy
Patricia Newbold
Fred Nussbaum
Richard Parker
David Polewka
James Reuss
Stephen Reuys
Leon Rivchun
Frank Rodriquez
Andrew Rubel
Roger Steuble
Gary Thackwell
E. Michael Thomas
William Wheatley
Kui K. Yau

Barry Zack
Sondra Zemansky
Theodore Zouros
Susan Wilson

Joined in 1971-72 as Freshmen

Alan Brenner
Ralph Chang
Michael Charek
David DeKanter
Webster Dove
Douglas Foxvog
Terrence Gray
John Gryl
Stanley Jackson
Craig Latham
Paul Lieberman
Cecilia Lo
Carl Mikkelsen
Patrick O'Keefe
James Okun
Sadeq Sayeed
Andrew Shor
Michale VanHilst
Michael Weimer
Arna Zucker

Joined in 1972-73 as Freshmen

Jeanne Abitboul
William Anderson
Peter Beaman
Harry Bochner
Michael Bookman
Evelyn Brody
Jeremy Broner
David Brown
Mark Burstein
Michael Calvetti
Vance Carter
Eugene Chang
Kwong Cheng
John Dorgan
Tevian Dray
David Dreyfuss
James Emineth
Stephen Finneran
Paul Fryd
Paul Gaddis
Harry Gearhart
Algird Gudaitis
Richard Hilliard
Peter Hagelstein
Bruce Ikenaga
Takayoshi Ito
Peter Johnson
Mark Keough
Lila Kobylak
Kenneth Kreischer
Arne Langsetmo
Karen Lease
Frank Lee
Reynold Lee
Michael McIlrath
William Mixon
Richard Ottolini
Kevin Peick
Robert Pyron
John Robotham
Derek Roff
James Shewbridge
Andrew Smith
Terrence Smith
Paul Spiegel
David Stork
Mang Tia
Craig Torell
Ben Williams
Kai Wong
Paul Yen
Rafal Zielinski
Roland Zito

Joined in 1973-74 as Freshmen

Louis Bernstein
Stephen Byan
Donald Davis
James Davis
David DeBruin
Daniel Fairweather
Peter Fiekowsky
Frank George
Daniel Gibson

David Gissen
Mark Goldfain
Jonathan Goodman
Mark Gross
Jawaid Ismail
Aubrey Jaffer
Daniel Klein
Gary Kurzban
Spencer Love
Gene Masters
Douglas May
Samuel Mela
Douglas Milliken
Douglas Nordstrom
Robert Scheinman
Michael Selig
Mark Sherman
Ian Smith
John Toner
Thomas Trobaugh
Frederick Willey
Walter Witryol
Robert Wolff
Don Wright

1968 Original Group

Robert Berman
John Compton
Eric Cosman
Richard Edelman
Joan Etzweiler
Anthony French
Charles Friedman
Robert Halfman
William Holland
James Jamieson
Arthur Kaledin
Daniel Kemp
John King
Fred McGarry
Alan Millner
Steven Pincus
Edgar Schein
Arthur Steinberg
Gilbert Strang
George Thomas
Edna Torgerson
George Valley

1969 Working Party

Robert Berman
John Compton
Richard Edelman
Peter Elbow
Joan Etzweiler
John Franks
Anthony French
Charles Friedman
Richard Goodman
Robert Halfman
William Holland
James Jamieson
R. Kapral
Daniel Kemp
John King
Mark Levensky
Margaret MacVicar
Harold Nussbaum
Steven Pincus
Gilbert Strang
Edna Torgerson
George Valley

1969-70 Staff

Robert Berman
Melinda Bird
John Compton
Richard Edelman
Peter Elbow
Mark Engler
John Franks
Charles Friedman
Anthony French
Richard Goodman
Robert Halfman
Mark Levensky
Margaret MacVicar
Madeleine McClure
Alan Millner
Harold Nussbaum

Steven Pincus
Elaine Savage
Gilbert Strang
Edna Torgerson
George Valley

1970-71 Staff

David Baltimore
Kenneth Bauer
Donald Bell
Robert Berman
Barry Blesser
Paul Bock
Christopher Cavanagh
Peter Elbow
Arlene Fingeret
Nathaniel Frank
Curtis Greene
Robert Halfman
Robert Hobbs
Daniel Kemp
James King
Alan Lazarus
Mark Levensky
Margaret MacVicar
James McIntyre
Lewis Reich
Dana Roberts
Edna Torgerson
George Valley
Mark VanNote

1971-72 Staff

Donald Bell
Robert Berman
Mark Davison
Peter Elbow
Arlene Fingeret
Ned Frank
Robert Halfman
Stanley Hirschi
Jerry Jungster
Donald Kollisch
Alan Luse
Michael Miller
Michael Moritz
Dana Roberts
Gene Speer
Edna Torgerson
George Valley
Paul VanEikeren
Chris Yau

1972-73 Staff

Don Bell
Jerry Budzik
Mark Davison
Charlotte Fishman
Ned Frank
Hy Greenbaum
Bob Halfman
Stan Hirschi
Bob Horowitz
Don Kollisch
Craig Latham
Mike Miller
Jim Okun
Doug Ravenel
Dana Roberts
Nathan Sivin
Ed Stein
Edna Torgerson
George Valley
Henry Walker

1973-74 Staff

Don Bell
Dan Bernstein
Jerry Budzik
Mark Davison
Tev Dray
David Dreyfuss
Charlotte Fishman
Ned Frank
Jerry Grossman
Bob Halfman
Rich Hilliard
Stan Hirschi
Glenn Iba
Craig Latham
Paul Lieberman
Jim Okun
Steve Robbins
Dana Roberts

Derek Roff
Edna Torgerson
George Valley
Henry Walker

ES.291 Learning Seminar: Experiments in Education

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