GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT INITIATION

Date: September 11, 1979

Project Title: The Social Sciences and Humanities in Scientific and Technical Education

Project No: G-43-502 (Sub-projects are E-20-548/Mayer/CE, E-25-531/Winer/ME, G-34-511/Moore/ENG, G-36-515/Gough/ICS, and M-50-516/Wolf/IM)

Project Director: Prof. J. J. Johnston

Sponsor: Exxon Education Foundation; New York, NY 10020 (through Georgia Tech Foundation)

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Agreement Period: From 3/1/79 Until ~~12/31/79~~ OPEN

Type Agreement: Grant per letter dated January 15, 1979

Amount: $105,567 (Partially funded at $50,000; Partially budgeted at $46,582 -- G-43-502/$27,431; E-20-548/$5,387; E-25-531/$7,502; G-34-511/$1,906; G-36-515/$1,759; M-50-516/$2,597)

Reports Required: Semi-Annual Progress Report; Final Report

Sponsor Contact Person (s):

Technical Matters	Contractual Matters (thru OCA)
—	Dr. Leon Bramson, Program Officer - 212/398-2273
	Mr. Robert L. Rayton, President
	Mr. Walter Kenworthy, Vice President
	Exxon Education Foundation 111 West 49th Street New York, NY 10020

Defense Priority Rating: N/A

Assigned to: SocSci(CE/ME/ENG/ICS/IM) (School/Laboratory)

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GA-3 (3/76)

GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

Date 6/30/86

Project No. G-43-502 School/Lab

Includes Subproject No.(s) E20-548/Mayer·CE/ E-25-531/Winer ME; G-34-511/Moore, Eng.
G-36-515/Gough/ICS; M-50-516/Wolf IM E-21-524/Ray EE; D-48519/Templer Ar

Project Director(s) J. J. Johnston GTRC / GIT

Sponsor Exxon Education Foundation; New Yourk, NY 10020

Title The Social Sciences and Hunamities in Scientific and Technical Education

Effective Completion Date: Open (Performance) --- (Reports)

Grant/Contract Closeout Actions Remaining:

All finished -- Closeout per Teresa/Soc. Sci.

- ☐ None
- ☐ Final Invoice or Final Fiscal Report
- ☐ Closing Documents
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GEORGIA INSTITUTE OF TECHNOLOGY
ATLANTA, GEORGIA 30332

DEPARTMENT OF
SOCIAL SCIENCES

August 8, 1979

Dr. Leon Bramson, Program Officer
Exxon Education Foundation
111 West 49 Street
New York, NY 10020

Dear Dr. Bramson:

This is to constitute a progress report and is accompanied by an expenditure report, which the Foundation has requested.

We have been busy. The structure of our work, the personal involved, and the substance of our accomplishments thus far are essentially those outlined in the initial proposal and are progressing at a rate close to that which we had anticipated. Some small deviations and expansions of personnel are mentioned below. The core group has worked steadily and thoroughly on our subject matter. The internal and external support groups have worked more sporadically but still successfully.

With respect to the core group, we have: 1) interviewed those administrators responsible for curriculum on this campus, regarding their views of the place of the social sciences and humanities in professional (and particularly engineering) education. On the whole, they have received us with enthusiasm; the President of the Institute was particularly supportive. 2) We prepared an instrument for the determination of student views, and the 1,000 replies we have received is presently being synthesized. In addition to the use of the instrument, the core group met in subcommittees with specific groups of students. Finally, we have prepared and are disseminating this week an instrument which will go to selected alumni. The data received from these surveys will be analyzed over the coming months. 3) Through a subcommittee, we have analyzed the extant literature, particularly as it bears on engineering education. The engineering profession has been much more concerned and articulate in our subject matter than most of the other professions, and there is a long history of their attempts to reconcile the exigencies of engineering education and human/social scientific education. The literature continues to grow, but the proportion of valuable material is rather steady. 4) We are continuing to review the curricular innovations related to the project which occurred or which are occurring in various other institutions across the country and in Europe.

We are roughly on schedule at this time. There are, of course, a few tardy position papers, and I have returned a few papers to their authors for revision. The analyses of these papers may require, however, more time than I had anticipated. I will keep you informed as to any change in schedule that this might call for.

With regard to personnel, Dr. Timothy Hall, a political scientist, who was to be a member of the departmental support group, has taken a leave of absence for the coming year. Rather than replace him with another member of the political science faculty, I have asked four members of the English Department to prepare briefer analyses related to our charge, which will be ready at the end of this month.

We have met no problems that were not anticipated, i.e., the difficulties of any multiplinary group are ours. Their solutions lie in time, hard thought, and good will. The funding is, I believe, adequate; the time originally specified in the proposal may not be; hard thought and good will are our responsibility.

You will note from the enclosed expenditure report that the funds received thus far have been utilized. We therefore request that the balance of the grant be forwarded to us.

The restriction of this report to one page, a restriction I could not quite meet, has cramped my rhetorical tendencies as well as the body of information I might have sent you. We continue to appreciate the confidence you have placed in the Institute. I look forward to hearing from you.

Sincerely,

Jon J. Johnston
Principal Investigator

JJJ:gv

SEMI-ANNUAL EXPENDITURE REPORT TO THE EXXON EDUCATION FOUNDATION

REPORT PERIOD: FROM January 15, 1979 TO July 31, 1979

NT RECIPIENT	PROJECT DIRECTOR
orgia Institute of Technology--Dept. of Social Sciences	Jon J. Johnston

JECT TITLE The Social Sciences and Humanities in Scientific and Technical Education: Georgia Institute of Technology as a Case Study

AL AWARD	PAYMENTS TO DATE				TOTAL PAYMENTS
05,567		$50,000			$50,000

EXPENDITURE		PREVIOUSLY REPORTED	CURRENT HALF-YEAR	TOTAL
ALARIES	PROFESSIONAL		$ 44,568	
	CLERICAL			
	STUDENT			
	OTHER			
PLOYEE BENEFITS			4,667	
NSULTING FEES				
AVEL EXPENSES				
UIPMENT				
PPLIES				
BLICATION				
TOTALS			$ 49,235	

EXPENDED BALANCE	DATE OF REPORT
$765.00	7/31/79

PLEASE TYPE	NAME OF CHIEF BUSINESS OFFICER	TITLE
	Dr. Gene M. Nordby	Vice President - Business & Finance
	NAME OF PERSON PREPARING REPORT	TITLE
	Jon J. Johnston	Acting Head Department of Social Sciences

SIGNATURE OF ABOVE BUSINESS OFFICER

SIGNATURE OF ABOVE PROJECT DIRECTOR

TABLE OF CONTENTS

I. ORIGINS AND CONTEXT OF THE PROJECT

A. Project Objectives

A review of the literature of engineering education, especially the reports written under the auspices of the American Society of Engineering Education (ASEE), yields a recurrent and now familiar litany of problems in the professional education of engineering students: the intense professional and career concern on the part of students which seemed to limit their intellectual openness to more "liberal" studies, recalcitrant attitudes and practices on both sides of the science/humanities fence, irresolvable conflicts between demands on the "cultural" and "utilitarian" sides of the humanities curriculum, a host of methodological and intellectual lacunae that hindered an integrated curriculum, and pervading all problems, the severe and unavoidable limitation on the curricular time available to the humanities and social sciences in professional undergraduate education. To treat and elucidate, if not to resolve these problems, we have sought to examine four key questions. Each has a particular reference to Georgia Tech, but also to professional technical education in general:

(1) What have been and what are the relationships between Georgia Tech (and the technological traditions it represents) and the society of which it is a part?

(2) What kind of humanistic and social scientific instruction have taken place at Georgia Tech, both explicitly in courses offered by the departments of Social Sciences, English, and Modern Languages, and implicitly throughout the curriculum and in the campus community as a whole?

(3) What kinds of humanistic and social scientific instruction should be offered at Georgia Tech?

(4) Assuming that 2 and 3 are not identical, what specific steps can be taken to bring practice into line with needs and aspirations, both through curricular reform and through the continuing development of the faculty?

The examination of these questions has had a further and more ultimate objective, namely, to provide the factual and prescriptive information on the basis of which we can contribute to the development of a general education and core curriculum for all students at Georgia Tech.

The objectives of this project go well beyond the analysis presented in this document. Subject to a critical appraisal of this report within the Institute, we intend:

(1) to make specific recommendations for reform of the undergraduate curriculum and for specialized multidisciplinary program development in the social sciences and humanities;

(2) to devise practical mechanisms for sustaining discussion among faculty members in the social sciences and humanities, engineering, science, and management on the subject of technical professional education and its interaction with society. Once initiated, these mechanisms would be used to foster acceptance and facilitate implementation of curricular changes;

(3) to prepare a series of working papers for publication and presentation at professional meetings which communicate the findings of the study not only to the Georgia Tech community, but also to wider circles of educators.

B. Approach: A Case Study of Georgia Tech with National Comparisons

Our approach and the recommendations which stem from it have a dual focus. They concentrate on a single institution, Georgia Institute of Technology, but simultaneously view that case in comparison with developments

in other intensive undergraduate professional programs in the United States. This dual focus of the project applies both to our research design and to implementation strategies (see IV.B.). The case study approach affords the opportunity to examine a very large issue (the role of humanities and social sciences in professional education) within a manageable framework. At the same time, analysis of one case lends itself to comparative study, for Georgia Tech was shaped at its inception by a deliberate and systematic study of national practices in engineering education, and has been influenced by national trends since that time. As a research design the case study-comparative approach has allowed us to measure what has happened over time in one institution of higher learning against a wide range of experiments, plans, and proposals for the integration of humanities/social sciences and professional education.

This dual focus applies to implementation as well as to research. Since the 1930s, major reports and recommendations regarding humanities/social sciences in engineering education have been issued at the rate of about one per decade. All have called for closer integration of technical and humanistic/social scientific instruction and have outlined plans for doing so. But the extent to which those plans have been implemented over the last fifty years has been woefully small. In most instances the recommendations of those reports have been either largely ignored or implemented on a small scale involving a limited number of engineering students. Focusing first on our own institution, we intend to present a plan of curricular reform which both speaks to the need for enhancing the quality of the humanistic/social scientific component of professional education and which has a realistic prospect of being implemented. Implementation of such a plan would improve the educational experience of all

our undergraduate students, not just the few who might opt for a specialized new offering in the humanities/social sciences. If we can succeed in implementing these innovations on our own campus (which, in some crucial ways, is archetypical of state-supported, professionally oriented undergraduate institutions), then that success may well have a greater prospect of stimulating similar innovations elsewhere than a stack of committee reports on curricular reform.

1. A Brief History of Georgia Tech*

Georgia Tech was founded in the 1880s in response to a perceived need for engineering education in the Southeast. Rather than looking at nearby land grant colleges of agriculture and mechanical arts for models--Georgia already had a state-supported agricultural school--the architects of the new school examined leading technical institutes in the Northeast for suggestions about what kind of school to establish in Georgia. After visiting MIT, Cooper Union, Stevens Tech, and Worcester Tech, they settled on Worcester as an appropriate model for the Georgia School. More than any of the other schools it seemed to fit the needs of an "underdeveloped" region which was trying to industrialize itself and to provide practical industrial training for its young men. Worcester stressed the value of shop work in the training of engineers. That idea sat well with the Georgians for moral as well as practical reasons. The instilling in the state's youth the character traits of "industry" or diligent attention to work was a central reason for the establishment of an engineering school. Furthermore, items produced in the shop by the Worcester students were sold to produce income for the School.

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*Details of what follows can be found in Brittain and McMath (1977).

The Worcester shop system, along with that school's curriculum in mechanical engineering, were adopted for the new Georgia school when it was chartered in 1885. To this singular curriculum were later added professional courses of study in other branches of engineering and, after the turn of the century, degree programs in the sciences, architecture, and industrial management, but not in the humanities and social sciences (with the exception of psychology and economics).

Although the issue of humanities/social sciences instruction for engineers was not of primary concern to the school's founders, the selection of Worcester rather than MIT as a model had a profound impact. Worcester represented the old "shop culture" approach to the training of mechanical engineers, in which hands-on experience accompanied classroom instruction which was rigidly "practical." Almost all humanistic vestiges of the classical collegiate curriculum were abolished at Worcester and they were not replaced by work in the nascent social sciences; nor, of course, were majors offered in these fields. At MIT, on the other hand, not only was engineering based more on scientific instruction and laboratory work, but the engineering curriculum also included courses in the humanities which were offered concurrently with the technical studies. The same was true of the emerging land-grant colleges, including ones established in the Southeast during the same decade as Georgia Tech.

When the Georgia School of Technology opened in 1888, all non-technical instruction devolved upon the chair of English. The work offered consisted mainly of composition and rhetoric, with a smattering of literature and other humanistic studies thrown in. Ten years later, when the school was asked to join a state intercollegiate Oratorical Association, President Lyman Hall declined the invitation, saying, "Our courses are exclusively scientific and we have but little time to devote to oratory."

The diminution of non-technical studies in the Georgia Tech curriculum of the late nineteenth century was both a matter of pedagogical preference and of political necessity. The notion of a "pure technical institute" fit well with civic leaders' plans for industrial development in the state and region, and with the educational philosophy of the school's faculty. That body was dominated by M. P. Higgins, superintendent of the shops at Worcester, who was brought to Atlanta for a year to establish a curriculum for the new school. Furthermore, the establishment of such a tightly-focused curriculum enabled the new school to avoid direct competition with the politically powerful state university in Athens. Both the political and pedagogical rationales for such a division were stated during Tech's opening ceremonies by Nathaniel Harris, a graduate of the University and a leading figure in the establishment of Tech: "The head is in Athens; the hands are here. We have here thought versus work; practice against theory; the shop against the study; the hammer against the book; the blouse against the cutaway."

Although Georgia Tech's proscription of most non-technical instruction was more thoroughgoing than was the case at many other engineering schools, the marriage between engineering education and the classical collegiate curriculum across the country was never a happy one. By the end of the nineteenth century so-called "culture" courses were increasingly coming under fire from leading engineering educators. However, by that time many of those same educators were coming to believe that the new social sciences--economics, psychology, political science, and sociology--could have direct utility for the professional engineer. The practice of engineering was increasingly linked to large-scale business organizations, and it was known that as many as two-thirds of all engineers were moving

into management positions within fifteen years of graduation. The development of "scientific shop management" under mechanical engineer Frederick W. Taylor and the rise of modern business management as a professional specialization brought into focus the utility of training in the social sciences. Men in positions to influence engineering curricula--in industry as well as in the schools--were coming to believe that such studies could do more than add a veneer of refinement or instill a sense of civic duty in the students: they could make them more efficient engineers and managers. Such training, noted one, "gives power over men" (Noble, 1978, p. 32).

2. Humanities and Social Sciences at Tech

At the turn of the century the new utilitarian view of the social sciences and humanities was having an impact on engineering curricula around the country, but it apparently had only limited effect at Georgia Tech. Although a course in economics was added to the requirements for some majors early in the century and a school of commerce was established in 1913, the basic non-technical requirement for engineering graduates remained courses in composition, English literature, and (after 1904) modern languages.

A substantial shift occurred in Tech's humanites requirement in 1934. The sophomore course in English literature was changed to become a "Survey of the Humanities," still literary in focus, and a year's course of study in "social science" was offered as an option to the required modern language course. The course was offered through the Department of Economics and Social Sciences, a non-degree granting unit established that year following the abolition of the School of Commerce. In 1948, after the establishment of a new degree-granting School of Industrial Management, the Department of Social Sciences was established as a separate unit. It was also

non-degree granting, and the basic freshman instruction in the social sciences was offered through that department.

The social science course established in 1934 was a study of western civilization, essentially since medieval times, designed to introduce students to "the facts and processes by which the world of men in which they live has come to be what it is, so that with a clearer understanding they may feel inspired to do their part in loyal service to their fellow men." (GIT Bulletin, 1934). In 1936, according to the catalogue description, the objective of the course was modified to be the preparation of young men for "useful citizenship."

This early social sciences instruction at Tech did not seem to arise from the narrowly utilitarian emphasis described above. Rather, it fit in with the concern for social responsibility which had been evident in the engineering profession since the turn of the century. With the optimistic vision of engineers, social scientists, and practioners of other professions early in the twentieth century, that professional expertise, in the hands of dedicated individuals, could help resolve the nation's social and economic ills. The emphasis of this course also coincided with the views of several instructors in the humanities at Tech during the 1930s, among them Glenn Rainey, a professor of English whose inspired teaching and social activism gained him a reputation as a gadfly on and off the campus.

The curricular changes of the mid 1930s at Tech followed by only a few years publication of a comprehensive report on engineering education sponsored by the Society for the Promotion of Engineering Education and headed by William E. Wickenden. In the main, these specific innovations at Tech were consistent with the recommendations of the Wickenden Report

concerning the humanities and social sciences. However, there is no available historical evidence to suggest that these local changes were implemented in response to the recommendations of the Wickenden report, or, for that matter, in response to any rigorous analysis of the role of humanities and social sciences by the general faculty at Tech.

The one-year course in social sciences remained as an alternative to modern language in the curriculum until 1969, although following the school's transition from the semester to the quarter system it became a three-quarter requirement in 1946. The course content changed from time to time. But according to one professor who began teaching part of the course in 1947, the changes reflected the interests of individual instructors and administrators responsible for it (and occasional directives from engineering department heads) more than any systematic or campus-wide effort to examine the role of social sciences and humanities in the engineering, management, and architecture curricula.

After World War II (and at about the same time that a separate Department of Social Sciences was established), the sequence of courses came to include greater emphasis on recent and contemporary events, including American government and the United States' role in world affairs (although during the late 1940s two of the three courses were given over to the University of Chicago's Great Books program). In 1957, the western civilization portion of the sequence became a two course study of "Contemporary American Society." As was the case before the war, the changes in course content seem to have reflected local concerns, particularly the pedagogical interests of the administrators and staff directly responsible for the courses, rather than responses to national reports of recommendations concerning the role of the social sciences in engineering and professional education.

Two external forces did noticeably influence the content and variety of social sciences instruction in the post-war era. First, beginning in 1954 all students in Georgia's state colleges were required to pass an examination in U.S. and Georgia history. A similar exam on the U.S. and Georgia constitution had been required since the 1930s. At Georgia Tech these requirements could be satisfied by completion of courses in American history and government as well as by examination.

Second, beginning in 1960 the state university system (including Tech) adopted a "distribution requirement" of 24 quarter hours in the humanities and social sciences. Students were permitted to elect from a fairly extensive group of specialized courses in literature, history, political science, sociology, philosophy, economics, and psychology. The courses, offered through various units on the campus, had been gradually added to the catalogue since the 1930s. These offerings had grown in an incremental and unplanned way. Beginning in 1960 they served not just as free electives or as requirements for particular majors, as had been the case for decades, but as the mechanism for meeting the state-mandated distribution requirement.

In 1970 the distribution requirement was increased to thirty-six hours, eighteen of which were to be in humanities and eighteen in social sciences. Previously, the distinction between the humanities and the social sciences (a taxonomical puzzle which had fueled debates in American universities for years) had been somewhat blurred at Tech. In the parlance of engineering educators, they had been lumped together as the "humanistic/social stem" of professional education. Also, departmental responsibilities for instruction in these areas had been divided on a basis that owed more to historical accidents than to curricular planning. For administrative reasons specific to Tech, since the late 1940s instruction in history and philosophy (which could certainly be labelled humanities)

had been offered through the Department of Social Sciences. But instruction in economics and psychology (generally recognized to be among the social sciences) was offered in separate degree-granting units.

3. Recent Developments in Relating the "Humanistic/Social Stem" to the Tech Mission

The rigid curricular distinction between humanities and social sciences which was imposed by the University System in 1970 was no doubt intended to provide a clearer focus for study by narrowing somewhat the range within which elective courses could be chosen. However, when imposed on the hodge-podge of administrative arrangements and course offerings at Tech--without simultaneous efforts to establish connections between the courses which each student elected--no such focus was assured. As was the case at many American universities during the 1960s, Tech students were presented with a bewildering array of courses, from which some fashioned coherent programs while others merely collected credit hours. That system is still in place, although it is now possible for students to pursue various "minors" or "certificates" in the humanities and social sciences through which they are assisted in organizing an integrated sequence of elective courses based on their particular interests.

The distribution requirements established in the 1960s and 1970s did not replace all requirements for specific basic courses in the humanities and social sciences, although there were some major reductions and alterations. Notably, the Engineering College dropped the year-long English requirement. In 1969, the three-quarter freshman sequence in the social sciences was scrapped. This year-long sequence of courses in contemporary American society and government had been taught by political scientists, sociologists, historians, and philosophers who made up the faculty of the Social Sciences Department. The old sequence was replaced by courses

in American government, American history, sociology, and philosophy, each taught by specialists in those fields, with the first two courses coming to be required of almost all students in lieu of the state-mandated examinations in history and government. All of the courses were applicable to the eighteen hour distribution requirement in the social sciences. That arrangement is still in effect.

The changes in the basic freshman social science course occurred during a time of considerable interest among both faculty and students in curricular innovations in the social sciences and humanities. Between 1968 and 1972 that interest resulted in several substantial innovations and recommendations. Among them were the following: (1) Numerous elective courses were developed, including courses relating to science, technology, and society (some jointly offered with members of the engineering faculty); courses in Afro-American and urban studies; and courses which involved students in community service in public housing projects located near the campus. In all, the elective course offerings of the Social Sciences Department virtually doubled. (2) In cooperation with the Department of Military Science the department developed a series of conferences on international affairs which brought nationally and internationally prominent speakers to the Tech campus. (3) There were formal proposals made for an undergraduate dual degree (B.S. with interdisciplinary focus on science, technology, and society), and for a minor's option in the social sciences. (4) The Franklin Foundation and the Georgia Tech President's Office funded the development of a crossdisciplinary course using lecturers external to the Department. (5) An endowed chair was created within the Department. Research had begun to be encouraged in the Institute, and Social Sciences made a large paper transfer from I (instructional) to E (state-sponsored

research) funds (both then managed by the Academic Vice President), ostensibly to reduce teaching loads and promote research activity.

4. Social Sciences and the Pettit Years

The discussions, proposals, and innovations of the late 1960's and early 1970's provided a groundwork for change in the social sciences at Tech which was further strengthened by administrative support from, among others, the President, the Vice President for Academic Affairs, and the Dean of the General College. In the state Board of Regents system beyond Georgia Tech, however, support for further development of social sciences at Tech was non-existent as the Chancellor's Office continued to define Tech's mission solely within the confines of educating professionals in science and technology.

In 1972, Joseph M. Pettit became President of Georgia Tech. This administrative change carried with it significant importance for Georgia Tech as a whole and for the Department of Social Sciences as a specific case. Pettit urged the Tech faculty to concentrate on a balanced combination of undergraduate teaching, graduate education, and research, rather than on primarily undergraduate teaching which had been the case in the past. Correspondingly, pressures to publish and to develop external sources of funding to support research increased throughout the Institute.

Pettit's changed emphasis also clarified for the Department and for the Institute as a whole the significance of alterations in promotion and tenure guidelines which had been adopted by the Board of Regents system in the years immediately before Pettit took office. The new promotion and tenure guidelines stressed teaching, research, and community service as prerequisites to either promotion or tenure. With Pettit's

clear emphasis on research as well as teaching, uncertainty as to how the new guidelines would be applied at Tech was removed. Research would matter.

For the Department of Social Sciences, the changing emphases and accompanying pressures exacerbated internal tensions caused, at least in part, by the four-discipline composition of the Department and by disagreement over where and how rewards were to be apportioned across disciplines and areas of endeavor (i.e., teaching or research). To be sure, research and publication had occurred during the 1960's in the Department, but it was not regularly rewarded.

Similarly, external support for research had been obtained on occasion during the 1960's, specifically through a National Science Foundation grant to Georgia Tech which included support for the Department of Social Sciences and through an American Political Science Association Congressional Fellowship awarded to a faculty member. Again, however, these endeavors were not regularly rewarded. Thus, after 1972, a changing administrative emphasis and its byproduct of a changing reward system within the Department of Social Sciences added to the sense of anxiety felt by a social sciences faculty which believed itself to be considerably isolated from the wider Georgia Tech community.

Even as those developing trends gathered some momentum, other events occurred within the Department and at Tech which accelerated the transition of the Department from one which was concerned almost exclusively with undergraduate teaching to one which was research/teaching oriented. Chief among these events was an aggressive recruiting posture, particularly during 1972 and 1973. In those two years alone, nine new tenure-track faculty

members were hired by the Department. (These nine positions represented 43 percent of the total tenure track positions in the Department at that time.) Included among these new faculty members was Melvin Kranzberg, who assumed an endowed chair in 1972. The possessor of a long and distinguished research and publication record, Kranzberg gave the Department of Social Sciences a national visibility which it had previously lacked.

Additionally, at the Institute level, the Sloan Foundation awarded a grant in 1972 to Tech's Engineering College (as well as to other major engineering institutes in the U.S.) with the objective of improving the social sciences aspects of engineering education. Under the auspices of this grant, members of the Department participated with engineers in a study of various engineering/social sciences curriculum issues. Despite the fact that no long-term cohesive program emerged from this grant, Georgia Tech engineers and social scientists were again reminded, as they had been four years earlier by the Franklin Foundation project, that they could communicate successfully in the discussion of complex contemporary issues.

The following five years were years of intellectual and organizational ferment and creativity within the Department. Discussion, debate, and disagreement over the goals and objectives of the Department increased as it became apparent that the past era had indeed departed. Individuals, disciplines, and interdisciplinary groups found themselves increasingly in conflict as they perceived their interests and their futures to be potentially threatened by the uncertainty of what lay ahead.

That uncertainty was real, the product of four factors in addition to those already discussed. First, the promotion of the Department Head to

Associate Dean in 1977 served as one source of uncertainty as the faculty wondered what course the Department would follow under a new head. Second, in 1978, the Department approved a Graduate Program in Technology and Science Policy. Institutionalized in May 1980, the Graduate Program further accentuated extant anxieties as the faculty assessed the Program's potential impact on their interests and careers. Third, yet another "new wave" of faculty was hired in 1977 and 1978, filling 26 percent of the tenure track positions (6 of 23) which existed in those years. Finally, a minor certificate program implemented in 1977 recognized not only the existence of the traditional disciplines of history, philosophy, political science, and sociology within the Department, but also the legitimacy of interdisciplinary fields of study in international relations; science, technology, and society; and urban studies.

In conjunction with this tension, research and publication proliferated. Externally funded research expanded from zero dollars in fiscal year 1972 to almost $100,000 in fiscal year 1979. The number of published articles increased by an order of magnitude in the same period. Fourteen books were published by faculty members during the 1972 to 1980 period, as compared to two during the preceding eight years. Equally impressive was the fact that three internationally recognized journals made their editorial homes in the Department.

It is little wonder, then, that given this decade of ferment and change the Department of Social Sciences thought it necessary to examine its role in engineering education and its position on Tech's campus. The specific mechanism for this examination was provided by the Exxon Education Foundation which, in 1978, awarded a grant to the Department for that purpose.

In keeping with the tradition established by the past decade of change, it is probable that the study will produce not only recommendations for certain specific changes within the Department (now School), but also the seeds of continuing debate, conflict, and productivity.

5. Summary

Since its inception almost a century ago, Georgia Tech has had a clear sense of its own mission in training young men (and now young women as well) for careers in engineering and other science-based professions. The Institute has also had a rather clear understanding of its own place in the spectrum of American technological education. But the Institute has lacked a sense of the role which humanities and social sciences are to play in the undergraduate professional education of its students. With very few exceptions, the Institute has neither heeded the repeated recommendations of blue ribbon committees from the engineering profession itself for making the "humanistic/social stem" more than an isolated twig in the curriculum, nor generated its own internal dialogue and planning process with regard to this dimension of professional education.

Georgia Tech has prided itself on its historically defined mission of producing practically-oriented, scientifically-educated professionals. In planning a curriculum appropriate for the societal needs of the twenty-first century, we can be guided by that tradition and by the particular historical circumstances which have shaped this institution without becoming prisoners of them. It is, after all, a tradition and a history rich and varied enough to include both the boast that "our courses are exclusively scientific and we have but little time to devote to oratory," and the hope that as a result of serious involvement with liberal studies Tech students "may feel inspired to do their part in loyal service to their fellow men."

This report is thus submitted to the Tech community as one small contribution to what we hope prompts new dialogue and traditions, not only on this campus but as part of the ongoing national quest to strengthen the role of humanities and social sciences in professional education.

C. Project Organization

1. Definition of Groups

Because the Exxon grant was awarded, in effect, to the Department of Social Sciences, it was decided at the outset to involve as many Department faculty in the project as would be feasible. These participating faculty were divided into two groups: a "core" group and an "internal support" group. The core group consists of the principal investigator plus a member of each of the disciplines represented (as of 1978) in Social Sciences--history, philosophy, political science, sociology--and two engineers recruited from the schools of Mechanical Engineering and Civil Engineering, respectively. This group is hereafter referred to as the core. The second, internal support, group consists entirely of Social Sciences faculty--two historians, two sociologists, a political scientist, and a philosopher.

In addition to these intra-Department groups, it was deemed important to draw on local Institute talent. Thus, a group of consultants designated as the "external support" group was constituted. Six faculty members from Information and Computer Systems/Modern Languages (a joint appointment), English, Electrical Engineering, Architecture, Management, and Physics served on this third group. During the first months of the project, the core recognized the need to constitute a fourth faculty group (of five) consisting exclusively of representatives of the Department of English.

Within the organization of the project, then, approximately two dozen members of the Georgia Tech faculty--representing all four colleges plus seven schools and departments therein--served as a member of one of four functional groups. (See Appendix A for rosters of all project groups.) While the core has met regularly throughout the life of the project, meetings with the various support groups has been irregular. Most communication has occurred through numerous memoranda, phone calls, and impromptu conversations.

2. Definition of Tasks

Although the project was organized to encompass the array of faculty talent and perspectives germane to the subject of humanistic engineering and professional education, a concentration of tasks in the core group has occurred. Apart from the various data-collection and analysis tasks described below, perhaps the most valuable activity of the core has been its ongoing discussion of the literature, national educational trends, and local issues in curriculum reform. The continuous exchange of ideas has been intense and candid; it has gone very far in forging bonds of collegiality and mutual respect, if not understanding. It is a process that we wish the other project groups could have experienced.

Project tasks were defined in accordance with the kinds of information we sought to develop. These sources of information were utilized to develop perspectives on the chief project objective -- the role of the humanities/social sciences in undergraduate education at Georgia Tech--and tapped four categories of personnel: current students, alumni, and administrators at Tech, and administrators at a national sample of institutions which confer baccalaureate engineering and professional degrees. Direct faculty input, of course, was supplied through the groups discussed above.

Six sources form the empirical foundation for our interpretations and recommendations reported in sections III and IV. These include two surveys--one administered by mail and one in classrooms, two sets of panel discussions with representatives of two categories surveyed--alumni and current students, interviews with Tech administrators--president, vice-presidents, deans, and school directors, and detailed information transmitted by phone and mail from program administrators at nine selected universities in the U.S. (see II.B.).

Before this multifaceted collection of primary data was undertaken, however, the core group retrieved and reviewed the formidable literature on engineering and professional education. Local library holdings provided relevant professional engineering society and accreditation reports of the last half-century, plus the monographic and serial literature of undergraduate curriculum experiments, reforms, successes, and failures. To augment these sources, keyword searches of various computerized data bases were designed. The more compelling pieces retrieved from these searches were added to the project shelf; some were reproduced and distributed for all core members to review. Roughly a quarter of our meetings were consumed by discussions of specific articles and chapters which afforded a contextual background for evaluating the "official histories" and policy recommendations contained in the ASEE reports.

The reading-note-taking-discussion regimen of the core was complemented by assigned reading and writing by the support group members. Every internal and external support group member produced a position paper devoted to some aspect of the project, e.g., the role of one's discipline in undergraduate education at Tech, suggested innovations for enhancing the humanities/social sciences component of the major college school (engineering, management, architecture) curricula, specific courses and collaborations

that would implement some proposed innovation. After circulation of a draft, each author was individually invited to discuss his/her paper with the core to elaborate and clarify points raised, and to advise us as to "next steps," future considerations, lacunae of our focus, etc. Revised versions of many of those papers are contained in Appendix B.

In summary, the major tasks of the project were three: critical review of an extensive literature; collection, analysis, and interpretation of primary data, i.e., those generated expressly for the project; and collation/translation of these diverse impressions and findings into a set of recommendations that could be implemented at Georgia Tech and perhaps adapted for use at other institutions nation-wide. Before we turn to a discussion of our case study findings, a review of the various literatures that have been germane to our tasks and of the commentary we developed first-hand from those who have been engaged in the process of undergraduate instruction at other institutions is in order.

II. THE HUMANITIES AND SOCIAL SCIENCES IN ENGINEERING EDUCATION: THE LITERATURE AND SELECTED CURRICULA

A. Literature Reviews

The literature on engineering education is historically extensive and quantitatively vast. The same may be said for discussions of the humanistic and social aspects of engineering and science education. It began in earnest somewhat after the period when engineering and science students were not allowed to dine at Yale with more civilized scholars in the arts, no doubt after the engineers reflected on that and similar practices. In the decades after the first World War, this literature represented a sustained and growing concern for the humane dimensions of technological education by an articulate minority of professionals. Its development illustrated every cliche as to the repetitiveness of thoughts and events, with variations primarily determined by the developing self-conceptions of engineering as a profession. The problems of a crowded curriculum, of a quest for a common content in the immense variety of educational programs, of methodological and social isolation, of a need for skill in communication, and of bridge-building between technology and humanities studies were steady through the years. Similarly, a desire for cooperation, on a variety of terms, between the humanistic and social scientific disciplines and engineering education has been a recurring theme, as has been the difficulty of effecting this cooperation in particular institutional settings.

It is somewhat surprising, therefore, that the only published bibliography directly related to the charge of the project was "The Humanistic/Social Stem of Engineering Education," Cooper Union Bulletin (Engineering and Science), 33, 1955. The references in this volume began in the latter third of the 19th century and are almost exclusively American. In general, the richest sources of material are the various reports

published by the American Society of Engineering Education (ASEE) and its predecessor, the Society for the Promotion of Engineering Education (SPEE), the so-called Mann (1918), Hammond (1940 and 1944), Burdell (1956), Olmsted (1968) and Giannini (1974) reports. These represent critical summaries of much of the related literature; each generates its own critical response, although their official imprimatur may be of greatest importance. For the period after 1955, this literature was supplemented by a computer search utilizing key words in the humanities/science/engineering spectrum. The material discovered on this basis tended to refer to particular course experiments in various institutions. A scattered but steady flow of useful articles is found in the pedagogical and curricular journals of the various science and engineering subdisciplines. (An annotated bibliography of selected publications appears in the Appendices.)

The literature reviewed by the core group and, on occasion, by members of the various support groups, falls into a number of distinguishable substantive categories: (1) The literature of the 19th century during which engineering schools and departments were established and the relations between disciplines in the sciences and engineering were fixed at a variety of institutions. (2) The curricular literature of the individual professions and subdisciplines within engineering, including the formal reports of the ASEE and the SPEE. Engineering is the most self-conscious of the professions in its perennial concern for the humanities and social sciences in its curriculum, but the literature of the hard sciences illustrates a sporadic interest, and of late, architecture has been similarly self-concerned. (3) The literature generated over the last two generations concerning "general education," a movement that still has life, but needs adaptation to a new set of needs and educational imperatives

within professional education. (4) The literature of a variety of pedagogical and intellectual perspectives which has been concerned with science and technology as aspects of culture and which should inform any effort of the kind we have undertaken. The "two cultures" hypothesis and its aftermath is the most pertinent case in point. Categories (1) and (2) are consolidated under the rubric "Engineering Education and the ASEE Reports" below, followed by a review of "The General Education Literature."

1. Engineering Education and the ASEE reports

Up to the closing decades of the 19th century, the curricular literature of engineering education is more concerned with the reduction of credit hours allotted to humanistic subjects than with their rationalization or expansion. The usual origin of engineering schools in a liberal arts environment left a substantial residue of literary and foreign language requirements that was viewed as unsuitable to the purposes of technological education. The initial concern of the SPEE, which was founded in 1893, was for the expansion of the engineering curriculum, the relative weighting of the sciences and practical experiences, and for relations with more established academicians. From the turn of the century to the publication of the Mann Report at the end of the first World War, the themes of professional discussion involved the institution of appropriate relations between engineering education and industry and the difficulties of responding to the expansion of industrial needs for scientifically-trained personnel. To be sure, the decades between the founding of the SPEE and the Mann Report in 1918 ring with the rhetoric of social responsibility and the potential social importance of engineering. But apart from an emphasis upon engineering administration, little attention was paid to the needs of a curriculum that might give a substance to that rhetoric.

With the publication of the Mann Report, engineering education embarked on a long voyage of self-scrutiny which resulted in a major study roughly every decade up to the present time. Despite its flavor of age and the fact that its recommendations were almost totally without effect, the Mann Report was a significant document in the history of the social consciousness of engineering education. Far more coherent than the Wickenden Report of the next decade, Mann noted that there was a consensus among professional engineers "that considerable attention should be paid to humanistic studies like English, Economics, Sociology, and History, not merely because of their practical value to the engineer, but also because of their broad human values." The need for this attention in the contemporary curriculum was not met because the "difficulty in present school practice evidently lies in the exclusion from the technical work of all consideration of the questions of human values and costs; and, conversely, the isolation of the humanistic studies from all technical interest." With no little prescience, Mann saw that the separation of technical mastery from values that characterized engineering education invited the "serious danger of actually becoming too materialistic, thereby sacrificing powers of abstract thought and humanistic ideals on which real progress ultimately depends. Efficiency in the mastery of materials without humane intelligence to guide and control it is now recognized in all civilized countries as a curse."

As a consequence of this danger and as a consequence of the perennial concern for the linguistic skills of students and their lack of interest in liberal subjects, it was apparent to Mann and his committee that the humanistic side of engineering education offered the "greatest opportunity" for curricular change. His suggested solutions for these problems

anticipate the recommendations of many later reports: 1) The usual method of teaching humanistic subjects in short independent courses should be eliminated; rather, "it seems reasonable to expect that the extension of this work into a consecutive course extending thru the entire curriculum and consisting of live discussions and extensive study of the best that has been thought and said concerning the immediate and ultimate values in life, offers the most promising solution of the problem of culture for engineers." 2) It is not reasonable to expect students to write clearly or to appreciate the social sciences if their professors of technical subjects exclude clarity of thinking and a discussion of human values and costs from their teaching. That is, the humanistic charge is not that of the humanists alone. (3) Just as technical study is more impelling when it includes a consideration of values, so "humanistic work becomes significant, and therefore educative, when it starts from and builds upon the professional interest." That is, the relationships of professional life and judgment should be reflected in the relationships of the parts of the curriculum.

This explicit concern for the inclusion (or re-inclusion) of the social sciences in the engineering curriculum was given a formal nod of approval in the 1,600 page Wickenden Report of 1930 with the comment that the social sciences "must have a more generous place in our teaching." Mastery of English and economics are to be required. The latter, Wickenden proposed, should join mathematics and the physical sciences as theoretical underpinnings of engineering education. The emphasis is a practical one, for as he put it, "The ability of the engineer to extend his influence in industrial organization and in public life, to claim his due share of leadership and to discharge more adequately his function in society in

large, now appears to hinge primarily on his attainment of greater competency and greater recognition on the economic and social side of his work."

The Hammond Reports of 1940 and 1944 were occasioned by discussions of extending the curriculum to five or six years and of the desirability of liberal arts study prior to admission to engineering schools. The Reports did not recommend the latter; rather, they recommended that the engineering curriculum consist of two major sequences, the scientific/technological and the humanistic/social, the latter to comprise one-fifth of the curriculum. This stem was to exclude business courses and courses in strict composition; its object was to "produce well educated engineers," knowledgeable of the social, political, and humane dimensions of their culture. The most radical aspect of this proposal was the recognition that the scientific/technological stem would require "careful pruning" to essentials if the objects of the humanistic/social stem were to be effected.

Pruning is one of the most arduous of academic tasks, and in the face of rapidly expanding technical knowledge, the long-term effect of this aspect of the report was a tendency to expand the number of credit hours required for graduation rather than carefully eliminate inessentials. There is little doubt that the latter elimination of ROTC courses as "humanities" can be traced to this suggestion.

An important consequence of the Report was the strengthening of the Humanistic-Social and the English Divisions of the ASEE. These divisions of the Society, seeking a clearer charge, provided the initial impetus for the "General Education in Engineering" Report under the Chairmanship of E. S. Burdell, which was published in 1956. This Report, accepting as a

premise the humanistic/social stem of the Hammond Committee and the proportion of curricular time that should be devoted to that stem, exhaustively analyzed the structural, administrative, and substantive problems associated with humanistic and social studies in engineering education. Of equal importance, the Burdell Report provided a full discussion of the objectives which should be served by the humanities and social sciences. The Hammond Report asserted an obligation; the Burdell Report analyzed the difficulties, the conditions, and the varieties of its fulfillment.

To begin with, it should be noted that themes which were significant in earlier reports were absent from Burdell. The industry/education connection is gone, the emphasis on the social sciences as a tool for the management of men is missing, and the notion that the engineering school is the supply side of an economic equation is notable in its absence. The first report to make concrete suggestions as to content, it recommended the following as objectives of the humanistic/social stem: (1) an understanding of the evolution of the social organization within which we live and of the influence of science and engineering on its development; (2) the ability to recognize and make a critical analysis of a problem involving social and economic elements; (3) the ability to organize thoughts logically and to express them lucidly in oral and written English; (4) an acquaintance with some of the great masterpieces of literature and an understanding of their setting in and influence on civilization; (5) the development of moral, ethical, and social concepts essential to a satisfying personal philosophy, to a career consistent with the public welfare, and to a sound professional attitude; and (6) the attainment of interest and pleasure in these pursuits and thus of inspiration to continued study.

The breadth of these aims required a carefully planned curriculum such that each course is an integral part of a total scheme in which interrelationships were emphasized. Neither standard courses in the various disciplines nor a free elective system were adequate to this task. Without specifying the type of integration or recommending any single integrative principle, the Burdell Report insisted on the need for a thread of intellectual coherence that will provide the basis for that integration of knowledge and experience, fact and value, thought and feeling that was ultimately the task of the student.

This readable and persuasive document was followed by yet another report in 1968, suggesting that the continuum of concern for these issues is not likely to cease anytime soon. The Olmsted Report was a response to "widespread dissatisfaction" with the earlier Reports, although it is not clear whether this dissatisfaction is with the intellectual stance, the policy and substantive recommendations, or the practical effects (or the paucity of these effects) of those Reports. There were new emphases, partly in response to new trends and events, partly in response to new insights as to the needs of science-based professionals. The tendency toward narrowness among engineering students, the decline of general education, the development of greater elective freedom in many institutions, the difficulty of holding outstanding faculty in the humanities and social sciences without the promise of majors and graduate students, the professionalization and consequent narrowness of these disciplines and their shift away from liberal objectives to a focus on disciplined and precise subject matters, were all factors which prompted and were considered by the Olmsted Report. These items--some new, some old--were certainly matters of relevance to a committee charged with considering the humanities in engineering education, but they were hardly sufficient to transform the terms of reference, the modes of

analysis, or the values involved in such a task. That there is nothing new under the sun is by now a well-confirmed empirical datum.

The Olmsted Report distinguished four objectives of the humanities and social sciences: utilitarian, cultural, developmental, and contextual. The Report advocates an emphasis on the latter two, the first focusing on the development of the student as a person and the second focusing on the student in his professional role. Under different labels and with similar intent, these objectives are given studied emphasis in the Mann, Hammond, and Burdell Reports. Similarly, the recommendation that "the humanities and social sciences should be treated not as a separate stem, but as an integral part of a liberal engineering education" is one with which many writers of earlier Reports would surely agree. The most striking emphasis was on the direct relevance of the humanities and social sciences to the professional practice of engineering. An inclusion of the plastic and visual arts in the humanities and a welcome addition, as was an insistence on adequate advising and informal teaching methods.

The Giannini Report of 1974 was an evaluation of the Olmsted Report in terms of its practical effects. The Report had little to report. On the whole, the requirement for humanities and social sciences remained the same, there was little increase in joint research efforts between engineers and humanities or social scientists, many members of the ASEE continued to be dissatisfied with humanities and social science curricula, and the primary accrediting agency decreased the minimum hours required in the humanities and social sciences.

A number of observations may be made on this litany of Reports. First, they have had little immediate effect on curricular practices. That this is so should not be surprising. Of necessity, the Reports have been

general in tone and in recommendation; their applicability to a wide variety of institutions cannot be clear. Their effective translation into practice requires qualities of intellect and character that are rare. Each Report suggests experimentation in terms of its recommendations, yet nothing is so resistant to experiment as a curriculum. University curricula have their roots in the deepest strata of the status quo where they are bound by interests which seem ancient and prescriptive to their holders. Still, whatever the difficulties and inadequacies of practice and performance, it must be remarked that the concern of the engineering profession for the humanities and social sciences has been unrelenting. This extraordinary concern has not been without benefit; it has blunted the narrowness that attends all specialized education; it has prompted tentative experiments of great illustrative value, although most of these do not travel well; and it continues to prompt educators, both humanist and technical, to a more careful thought of their obligations to their students.

What is it that these Reports indicate that engineers want? In 1918 Mann wrote: "The sciences are usually treated as sciences pure and simple without regard to their function in engineering; in the mechanical arts the instruction shops are as a rule purposely separated from the construction shops; and the humanities generally strive consciously and vigorously to get away from engineering in order that the student may get at least a glimpse into the mysteries of language and of literature and a touch of culture." This theme, this plaint of separation, of the isolation of intellectual and practical cultures recurs throughout all of the Reports with the exception of Wickenden. It is the intellectual side of Perrucci's analysis of engineering as a profession "without community." It represents a plea for an intelligible connection, the intellectual

correlate of self-identity, between the three aspects of engineering education and engineering practice; i.e., the pure sciences which have always been confident of their social and cognitive credentials; technological mastery which bridges theory and practice; and values which guide, or should guide, that practice. That there are intelligible connections is obvious to anyone of historical sense; that one can live a whole life in abstraction from them is obvious to anyone familiar with the work of Lord Snow. That there is a need for an account of them in technological education is equally apparent.

2. The General Education Literature

The literature of General Education is of particular relevance to the project for two reasons. First, many of the problems in American education to which the general education movement was a response are identical with those that led Mann and Hammond and Burdell to their recommendations for engineering schools. These problems are still with us, some of them in new clothes. Second, the intellectual and institutional factors which vitiated the movement and led to its erosion are relatively constant factors in engineering education. The programs initiated at Columbia, Chicago, and Harvard a generation ago had a wide influence and were adapted in many liberal arts colleges, and in abbreviated form in various engineering schools, including Georgia Tech.* Although the consideration by engineering educators of the problems of liberal learning in a specialized undergraduate context pre-dated the

*The locus classicus in each case is the Carman Committee Report (1946), The Higher Education in America (1936), and General Education in a Free Society (1945), the "Redbook." It might be noted that the title of the Burdell Report was General Education in Engineering Education.

general education movement, the development of general education programs gave those concerned with the humanistic/social stem an impetus to thought and experiment. The commitments, premises, and aims were similar.

Of these aims, most important from the perspective of our project was the attempt to counter the growing specialization of scholarship and teaching. In engineering education, intensive undergraduate specialization is generic and purposive; hence the aim of the humanities/social sciences must be to enrich, question, and complement the context of specialization, not to counter it. To address this problem there were varied attempts to design courses and programs that elucidated the common aspects of specialized inquiry and which emphasized the unities of knowledge and experience, either historically or methodologically. The substantive core of general education was the humane and civic heritage of Western civilization. Its central premise was that the Western heritage constituted a common culture which was the indispensable ground of moral and social unity. Without this common educational grounding, understanding, values, and practice would lie in disarray. It was to be achieved as students were brought together around a shared syllabus and as faculties merged their different skills for the sake of common aims which seemed at risk in the face of increasing specialization and growing student diversity. Pedagogically, the key term, method, and commitment of the movement was "interdisciplinary."

The response to these developments in engineering education was positive, but the specific programs which developed were cramped in a small credit-hour allotment, and of necessity, were more determinate in aim. In terms of content, they tended to be cast in a more contemporary mode. The chief worry among engineering educators was that these experiments would only provide a fragile patina of the aims sought.

The problems which general education sought to solve were instrumental in its fragmentation. The social dialectic of professionalization--pressures for a career decision on students, a clamoring market for highly trained professional labor, the difficulties of recruiting faculty for general education courses when faculty rewards lay elsewhere, the pressures on existing faculty to pursue more narrow interests, competition by departments for lower-division credits, and the expansion of social purposes served by the university--worked to undermine the premises of unity and integration, and perhaps the leisure upon which general education seemed to rest. As faculties responded to the sweet song of specialization, the intellectual problems that attended the interdisciplinary aims and character of general education were accentuated. As interdisciplinary general education courses became conventional and routine, they lost their charm in competition with the intellectual challenges of the mastery of a discipline. It became difficult to maintain a consensus as to the ground of synthesis and as to the appropriate content of courses.

The problems of pedagogically joining the social sciences, which were closely linked in intellect and subject matter, became more difficult as individual disciplines developed even greater conceptual distinctiveness. The belief in a consistent intellectual framework and the unity of experience on which general education rested was weakened, perhaps quite inappropriately, by the relativising growth of new knowledge, new epistemologies, and new disciplines. While the faculty was trying to make up its mind, the students made up theirs. Student demand in the late 60s for relevance, for choice, and for freedom from an educational tradition that seemed to be implicated in national tragedy was met on the supply side by uncertainty and, faute de mieux, by an experimentalism and a relaxation of requirements.

Faculties were not altogether unhappy with these developments, for the freedom to learn apparently sought by students was matched, willy nilly, by a freedom to teach. Curricula blossomed like weeds in a barnyard, and the "reforming" of general education had to wait for a decade. The recent Rosovsky Report is as much epitaph as re-inspiration; as its core is a set of distribution requirements in which a coherent sequence of courses, much less common courses, is easily avoidable.

Whatever the fate of general education in the liberal arts tradition, and at this point its prospects are unclear, the technological institution is one in which its imperatives should survive, or rather, be revived. The orthodoxies and provincialism of technical expertise, the desirability of a wide professional range, the paucity of hours available to the humanities and social sciences, the improbability that these hours may be best used by student luck or design, and the need for a home for pure non-utilitarian intellectual adventure make an integrative effort toward general education imperative.

B. Curricula at Selected Engineering Institutions

The ASEE reports and general education literature provide a conceptual basis for humanities and social sciences (HSS) in engineering education. Nonetheless, a conceptual basis provides only a guideline for implementation, not the form of implementation. It is not surprising, therefore, that science and engineering institutes have had widely varying HSS curricula.

With this in mind, a survey was undertaken to determine the role, organization, and perceived impact of HSS studies within science and engineering institutes today. In selecting the schools to include in the sample, diversity was sought both in size and in geographical location. The schools included in the survey were: the School of Engineering, University of California at Berkeley; Cal Tech in Pasadena; Carnegie-Mellon University in Pittsburgh; the School of Engineering, Case-Western Reserve University in Cleveland; the College of Engineering, University of Central Florida in Orlando; the College of Engineering, Clemson University in Clemson, SC; the Colorado School of Mines in Golden, CO; the College of Engineering, Illinois Institute of Technology in Chicago; the College of Engineering, Lehigh University in Bethlehem, PA; the School of Engineering, Massachusetts Institute of Technology in Cambridge; the College of Engineering, University of Michigan at Ann Arbor; the School of Engineering, University of Missouri at Rolla; Rensselaer Polytechnic Institute in Troy, NY; Rose-Hulman Institute of Technology in Terre Haute, IN; the School of Engineering and Applied Sciences, Southern Methodist University in Dallas; the School of Engineering, Stanford University in Stanford, CA; Stevens Institute of Technology in Hoboken, NJ; and the College of Engineering, Texas A & M University in College Station.

Original contact with the various deans and vice presidents of the above institutes was made by letter. Several weeks after the original letters were sent, follow-up phone calls were made. Responses from the various deans and vice presidents to both the letters and the phone calls varied. In some cases, those surveyed either refused to participate or claimed no knowledge of the original letters which were sent. (In the latter case, those surveyed promised to send letters in response to questions posed over the phone. In no case did we receive those letters.) In other instances, those surveyed remembered the original letter, and promised to respond. (Only one did.) In eight cases, extensive interviews were conducted via telephone. (One interview lasted for over two hours.) Three of the eight individuals interviewed by telephone promised to send additional comments in letters. (All did.) Thus, the original sample of 18 institutes was reduced to an effective sample of nine. Table II.1 summarizes the distribution of responses to the study group's letters and phone calls.

The responses we received cannot be easily categorized. Spokesmen for seven of the nine institutes declared that they saw considerable room for improvement in HSS instruction on their campus, but only three said that their institutes had already made or were now making such improvements. The other two spokesmen declared that they were satisfied with HSS instruction at their institutes as it was presently conducted. When asked if certain specific HSS courses were more useful than others for their graduates, the responses were diverse. More and better courses in oral and written communications, economics and financial analysis, engineering ethics, Western civilization, and the role of government in research and development were just some of the courses suggested. None of the

administrators' institutes offered HSS courses specially designed for engineers, and of those administrators who were asked if such courses would be perceived as advantageous, only one responded affirmatively.

TABLE II.1

RESPONSES FROM VARIOUS U.S. ENGINEERING INSTITUTES TO COMBINED LETTER AND TELEPHONE SURVEY

Letter response only	1
Telephone interview granted; letter also sent	3
Telephone interview granted only	5
Refused to participate	1
No knowledge of original letter; no response to follow-up	3
Promised to respond to letter, but never did	5
Total Contacted	18

When asked if their social sciences and humanities faculties felt that they occupied a second-class position within their respective institutes, responses ranged from one extreme to the other. One administrator declared "that a sense of second-classism used to be true, but it is not true anymore," while another stated that "that view is much more than simply a perception. It's real." All appeared convinced that social sciences and humanities had several roles to play in engineering education, but there was no widespread agreement as to what those roles should be. Suggestions included focusing on the interrelationship between science and society, broadening the basis of engineering education, developing practically oriented courses that engineers could use in their business, and making engineers realize that their disciplines were not the only disciplines.

Following the letter-telephone survey, the catalogs of the 18 institutes selected for the survey were examined to determine the approximate units needed to graduate in engineering, the minimum social sciences and humanities needed within the respective curricula, and the outstanding characteristics of the humanities/social sciences (HSS) courses which were offered at the respective institutes. Table II.2 presents the results of this examination which, including Georgia Tech as the nineteenth institution, were compiled from the catalogs of the institutes, as well as from letters and interviews with administrative spokesmen for them. Because of the approximate nature of the "units needed to graduate" heading, the precise HSS/total units ratio could not be determined. However, the ratio at all schools ranged between .126 and .2. On the table itself, all ratios were rounded to the nearest .05 because of this lack of specificity.

Surprisingly perhaps, of the eight schools in the list below which are viewed primarily as engineering institutes, five have some type of humanities or social science major. Cal Tech, Carnegie, Illinois Tech, MIT, and RPI all have HSS majors of some type, whereas Colorado School of Mines, Georgia Tech and Rose Hulman do not, although at Rose Hulman an HSS major is possible.

Several of the institutes demand that students cluster at least some of their HSS units in one or another discipline or interdisciplinary field of study. Institutes requiring clustering include University of California-Berkeley, Carnegie, Case Western Reserve, Colorado School of Mines, Illinois Tech, Lehigh, MIT, and RPI. Five schools, Berkeley, Colorado Mines, Illinois Tech, RPI, and Rose Hulman, require students to take at least some of their HSS units in upper level courses.

At some institutes, specific types of courses within either humanities or social sciences are required. For example, Carnegie requires nine units

each of history, English, and economics. Similarly, Central Florida demands that a student take a number of introductory courses within what is designated an "environmental studies" series. At both Georgia Tech and Missouri-Rolla, state requirements necessitate students to take some combination of U.S. history, U.S. government or state history courses. MIT requires that students take courses in three separate fields of humanities, while the University of Michigan requires a 6-unit "Great Books" course and 6 units of literature and/or rhetoric. At Rose Hulman, four units in non-Western studies are required.

Two final points should be emphasized. At the introductory course level, no single pattern emerges at all. Also, from institute to institute, the definition of social sciences and humanities differs. Thus, at some institutes history may be designated a social science while at other institutes history may be designated a humanity.

To summarize: this survey of selected American engineering institutes suggests that there is little consensus within engineering institutes as to either the role and position of HSS within the respective curricula or how thus to organize the HSS aspects of the engineering curriculum. On the basis of interviews, letters, and catalogs, it is evident that the purpose and organization of HSS studies is dependent on localized factors. This dominance of localized factors in determining the purpose and organization of HSS studies on various engineering campuses clearly implies the difficulty, if not the impossibility, of making recommendations that will be widely implemented. Rather, local environments must weigh proposed curricular innovations and adapt them to current constraints and practice. Such is the fate, we suppose, of any proposed modification of curriculum, but especially the case for the humanities/social sciences component of engineering education.

TABLE II.2

CURRICULUM CHARACTERISTICS OF U.S. ENGINEERING INSTITUTES

SCHOOL	Approximate Units to Graduate (Engg.)[a]	Minimum Soc. Sci Units Needed[b]	Minimum Humanities Units Needed[b]	Minimum Total S.S & Hum. Needed[c]	HSS Units Total Units[d]	NOTE
Cal Berkeley	180	9	9	27	.15	1) 3 courses must be from a single dept., 1 of these 3 must be upper division
Cal Tech	600	27	27	108	.2	1) Hist is a humanity 2) 3-course fresh. hum. requirement 3) offers grad. & undergrad. HSS degree
Carnegie	575	see note	see note	72	.15	1) S.S. includes mgt. 2) undergrad. major offered 3) 9 units each of hist, eng, econ, & soc. sci required 4) clustering encouraged
Case Western	144	3	3	21	.15	1) 12 hrs. must be taken in depth in one area or discipline
Central Florida	192	see note	see note	35	.15	1) UCF has an "environmental studies" requirement which requires students to take a wide variety of intro courses
Clemson	140	see note	see note	24-32	.2	1) required courses and total hours are apparently set by engineering major field
Colorado Mines	140	see note	see note	18	.15	1) all students take same intro course freshman year 2) each following year student takes 200, 300, 400 level course in lit, hist, philo, poli sci, etc.

TABLE II.2 (cont.)

SCHOOL	Approximate Units to Graduate (Engg.)[a]	Minimum Soc. Sci Units Needed[b]	Minimum Humanities Units Needed[b]	Minimum Total S.S. & Hum. Needed[c]	HSS Units Total Units[d]	NOTE
Georgia Tech	196	18	18	36	.2	1) 3 unit list req'd 2) 3 US Hist & 3 US Govt units req'd.
Illinois Tech	140	12	12	24	.15	1) UG major in HSS 2) requirements exist both for clustering and for upper level courses
Lehigh	140	see note	see note	25	.2	1) clustering is required though hours are not specified
MIT	360	see note	27	72	.2	1) must take at least 8 courses 2) clustering required either disciplinary or interdisciplinary 3) humanities required in 3 separate areas
U Michigan	124	see note	see note	24	.2	1) 6 hr Great Books 2) 6 hr literature & rhetoric 3) 12 hr "other HSS" 4) Sch. of Engg. has dept of humanities
U MO-Rolla	132	6	6	24	.2	1) State history or US Govt required
RPI	127	9	9	24	.2	1) UG major in HSS 2) clustering in upper levels required

TABLE II.2 (cont.)

SCHOOL	Approximate Units to Graduate (Engg.)[a]	Minimum Soc. Sci. Units Needed[b]	Minimum Humanities Units Needed[b]	Minimum Total S.S. & Hum. Needed[c]	HSS Units Total Units[d]	NOTE
Rose Hulman	195	12	12	36	.2	1) required writing course 2) at least 4 credits in SS or Hum. at upper levels 3) at least 12 HSS credits at upper level 4) at least 4 credits in non-Western studies 5) can minor
SMU	120	6	6	18	.15	1) 6 hrs Eng 2) 6 hrs "human condition" 3) 6 hrs social sci.
Stanford	180	9	9	23	.15	1) it appears as if tech. & soc. courses may not re-receive HSS credit
Stevens	145	6	6	24	.15	
Texas A & M	144	see note	see note	see note		1) The hour and distribution requirements appear to vary widely from one engg. major to another

[a] Units needed to graduate very widely within an institution depending on which engineering major is being pursued. Thus, these figures should be regarded as "typical" rather than "exact."

[b] Social sciences and humanities are defined differently at separate institutions. For example, history is considered a social science at some institutions, and a humanity at others.

[c] At some institutions, certain engineering courses may be used to fulfill HSS elective requirements.

[d] Since total units are only approximate, all figures were rounded to nearest .05. (No figure, even before rounding, exceeded .2).

III. CASE STUDY FINDINGS

Our case study of Georgia Tech centered on the collection and analysis of information provided by the principal members of the Tech community--past and present. In this section, we describe our primary data sources and major findings. The procedures by which these data were generated--survey instruments, interview schedules, etc. -- are deposited in Appendix D.

A. Alumni Survey

Designed to gain a longitudinal perspective on the perceived relevance of the Tech curriculum as preparation for the work and social worlds, a six page survey was sent in July 1979 to a random sample of alumni who were graduated in the years 1950, 1955, 1960, 1965, 1970, and 1975. The total of this six-cohort population, as defined by Tech Alumni Office rosters, was 6392. Thirty-six percent of the names listed as belonging to each cohort were selected to receive the mail survey. Of these 2082, 812 returned (by December 1979) a usable questionnaire, an overall response rate of 39 percent. As Table III.1 indicates, however, considerable variation in response occurred across cohorts, ranging from a low of 29 percent in 1955 to a high of 48 percent in 1965 (see page 45 for Table III.1). We have no ready explanation for the variation in cohort response, but can report that 5-10 percent of the surveys were returned to us due to an incorrect (and lack of forwarding) address. That members of the 1950 and '55 cohorts were more likely to be deceased, unbeknownst to the Alumni Office, probably also contributed to the more modest response ratios. The 1975 response, in contrast, stems from the considerably smaller mailing (a 22.6 percent sample) to this cohort.

TABLE III.1
Distribution of Exxon Alumni Respondents,
by Cohort Year

Cohort Year	N Graduated B.S. Only	N Surveys Mailed	N Surveys Returned	Response Rate (%)
1950	1432	513	170	33.1
1955	839	299	87	29.1
1960	844	291	135	46.4
1965	799	274	133	48.5
1970	1246	426	198	46.5
1975	1232	279	89	31.9
TOTAL	6392	2082	812	39.0

Nonetheless, the magnitude of the response allowed us to stratify our analysis both by cohort/class and by major college/school. Findings are reported below in terms of these two principal independent variables. The sampled alumni were asked to evaluate not only the humanities/social sciences courses they took at Tech, but were also asked comparable questions about other aspects of the curriculum, the advising system, and how their views of their undergraduate education have changed over the course of their professional career. Ample opportunity to prescribe as well as describe was afforded by the questionnaire and a quarter of the sample volunteered, often forcefully, additional observations in the space provided.

Displayed in Table III.2 is the distribution of alumni survey respondents by major college/school and degree cohort/class. The percentages suggest a decline in the proportion of Engineering majors over time and a concomitant increase in Management majors. Smaller gains in the conferral of College of Sciences and Liberal Studies (COSALS) and Architecture degrees,

except from 1970 to '75, are also noted. Overall, then, our survey respondents consist roughly of two-thirds degree recipients in Engineering, one quarter in Management, and a combined 10 percent in Sciences/Liberal Studies and Architecture.

TABLE III.2

Alumni Survey
Distribution of Respondents by
College/School* and Cohort/Class,
in Percentages

	50	55	60	65	70	75	All
Engineering	75.3	66.7	60.0	66.9	57.6	57.3	64.2
Management	18.2	26.4	28.9	20.3	30.3	22.5	24.6
COSALS	1.8	3.4	6.7	10.5	7.6	11.2	6.6
Architecture	4.7	3.4	4.4	2.3	4.5	9.0	4.6
n =	170	87	135	133	198	89	812

* Key to aggregation of major college/school:

Engineering = aerospace, ceramic, chemical, civil, electrical, engineering economic systems, engineering science, industrial, mechanical, nuclear, textile, textile chemistry, textiles, health systems, unclassified engineering

Management = economics, industrial management, management science, unclassified management

COSALS = applied biology, applied mathematics, applied physics, applied psychology, chemistry, information and computer science, physics, unclassified general

Architecture = building construction, industrial design, architecture, unclassified architecture

1. Demographic Characteristics

Three demographic characteristics are of immediate relevance to interpreting alumni experiences. The first is the "initial post-Tech (B.S.) experience." We defined five "first job" categories: technical/engineering, management/administration, graduate/professional education, architecture, and other (including military service and self-employed). Although no clear

over-time trend emerges from the cohort data, approximately half of the Tech alumni, regardless of graduation year, moved directly into a technical, "bench" engineering job. Likewise, from our second demographic variable, "length of time in first job," we found that more than half of the alumni respondents spent two years or less in this position. A comparison of "current job," our third variable, with "initial job" reveals an observed shift out of bench engineering and into management positions. Whereas less than 12 percent of the cohorts combined began their careers in management, 40 percent of these alumni in 1979 were so employed. Comparing the proportion of each cohort which commenced their career in engineering jobs with the proportion currently in bench engineering vs. management, the transition is striking. The earlier one launched one's career in an engineering position, the more likely he/she is now in a management position. Overwhelmingly, too, Tech alumni enter and remain in the private sector.

Examining the demographic variables by major college/school sheds some additional light on the trends discerned thus far. Predictably, two-thirds of the alumni with degrees conferred in engineering enter that profession. But of the 200 management majors, only 30 percent begin their career in management positions. Half do something unrelated and only 5 percent pursue a higher degree. (This contrasts with the 54 COSALS majors of whom over a third enrolled in graduate programs and continued in them for 3-5 years.) Years later, 43 percent of the engineering majors hold engineering positions while 38 percent are in management. Similarly, the current distribution of management majors finds 54 percent in management positions.

2. Satisfaction with Tech Education

With these demographic trends in mind, we turn to questions of satisfaction with one's job and the preparation afforded by a Tech undergraduate education. In response to the question, "How satisfied are you with your current job?", the proportion of each cohort indicating "satisfied" is high, but not uniformly so. Interestingly, both the 1950 and the 1975 cohorts indicate the least enthusiasm, with 70 and 73 percent, respectively, satisfied/very satisfied. This contrasts, for example, with the 88 and 87 percent satisfied/very satisfied in the 1955 and '60 cohorts. Current job satisfaction by major is consistently higher, with 78 percent of the Engineers, but 81, 84, and 88 percent, respectively, of the COSALS, Management, and Architecture major claiming to be satisfied/very satisfied.

A set of questions was designed to link alumni's satisfaction with their education at Tech to significant facets of their adult life. These include first job, subsequent positions, citizenship or participation in civic/community activities, and personal growth or interests and hobbies pursued for pleasure rather than professional advancement. Table III.3 summarizes our findings on these satisfaction questions (see page 49 for Table III.3). In both parts of this table, i.e., responses by cohort and by major, we observe that over 85 percent claim that Tech was moderately or very successful in preparing them for their first job. Among the cohorts, this perception declines to an average satisfaction of 75 percent when preparation for subsequent positions is considered. It is notable, too, that the largest aggregate decline occurred in the 1955 and '75 cohorts.

TABLE III.3

Alumni Satisfaction (%) with Tech Education: Percent Claiming Moderately/Very Prepared for 1st Job, Subsequent Positions, Citizenship, and Personal Growth

A. By Cohort/Class

	50	55	60	65	70	75	All
1st Job	86.1	90.5	84.0	89.9	76.7	90.4	86.8
Subsequent Positions	84.9	72.9	75.8	78.4	70.4	72.0	74.6
Citizenship	48.2	32.1	33.1	39.3	36.6	39.0	38.6
Personal Growth	59.4	54.8	47.0	60.0	56.2	67.8	58.0
n*=	162	81	128	124	184	79	758

* Actual cohort n responding to each question varies slightly; average proportion of each cohort responding to any question is 93 percent.

B. By Major College/School

	Engineering	Management	COSALS	Architecture
1st Job	90.4	78.9	91.5	86.4
Sub. Pos.	72.0	90.4	67.5	76.4
Citizen.	39.0	48.9	37.8	50.0
Pers. Grow.	67.8	65.9	51.9	64.8
n =	522	200	54	37

(continued on page 50)

TABLE III.3 (cont.)

C. For 1950 and 1970 Engineering and Management Cohorts

	1950		1970	
	Engin.	Mgt.	Engin.	Mgt.
1st Job	86.4	80.0	83.0	63.8
Sub. Pos.	82.5	90.0	64.7	85.4
Citizen.	46.3	50.0	32.4	46.3
Pers. Grow.	58.1	60.0	50.4	64.4
n =	123	30	106	56

In III.3.B., we see disjunctions in these trends by major. A reversal in the perceptions of engineers vs. managers is evident with the former feeling less prepared for subsequent jobs, while the latter claim greater preparation for post-entry level positions. Part C of this table illustrates these differences even more clearly for the 1970 cohort. Still, these findings may be confounded by the intervention of time, and therefore further education and work experiences, in altering perceptions. That is, what we have attributed to education at Tech may be traced to a diversity of sources, most of which were not directly measured by, but instead inferred from, our survey.

Nonetheless, the message of Table III.3 is difficult to misinterpret. Tech alumni claim the least satisfaction with the preparation of their education for citizenship roles. A considerably greater proportion -- 11 to 22 percent across all cohorts--feel satisfied with their college education as a stimulus, if you will, for adult activities that they could pursue in their leisure time and from which they derived not only pleasure, but

personal enhancement. This is especially true of 1970 management alumni. The relative lack of satisfaction with citizenship-related courses, viewed retrospectively, have implications for the humanities/social sciences course data reported below, and moreover, for the enduring aspects of undergraduate education, i.e., those that bear on one's functioning as an adult, such as voter and participant -- if not leader -- in community affairs.

In Table III.4 responses to questions regarding alumni satisfaction with humanities/social sciences courses are reviewed (see page 52 for Table III.4). In general, the proportion claiming moderate to very much preparation for first and subsequent positions is half that for overall Tech education (seen in Table III.3). However, the increased satisfaction from first to later jobs (40 to 54 percent) among management majors is striking. Alumni satisfaction with humanities/social sciences courses excels for the category of personal growth. Again, management majors (see Table III.4.B), and the oldest and youngest cohorts (but see part C), seem the most satisfied. We would proffer wisdom and naivete, respectively, as the reasons for this bimodal distribution. If any over-time trend emerges from these data, however, it would be that the alumni find humanities/social sciences courses of decreasing relevance to first job duties since 1950 (45 to 32 percent in Table III.4.A). Such a conclusion is borne out by the satisfaction data reported in Table III.5. By ratios varying from 4.5 (1970) to 2.5 (1950) to 1, alumni express more satisfaction with their overall Tech education than with its humanities/social sciences component (see page 53 for Table III.5). By major, Engineering graduates are the least satisfied with this component, with the comparatively few COSALS and Architecture graduates most satisfied. This finding is supported by the disaggregated analyses in part C of Table III.5.

TABLE III.4

Alumni Satisfaction (%) with Tech Humanities/Social Sciences Courses:
Percent Claiming Moderately/Very Prepared for 1st Job,
Subsequent Positions, Citizenship, and Personal Growth

A. By Cohort

	50	55	60	65	70	75	All
1st Job	45.2	41.3	37.1	32.2	31.8	32.9	36.6
Sub. Pos.	47.5	45.1	48.8	34.2	40.0	40.0	44.9
Citizen.	43.4	31.0	34.1	33.9	30.3	35.0	34.8
Pers. Grow.	54.0	38.5	47.4	43.0	39.3	53.0	45.8
n*=	155	81	127	119	180	77	739

* Average n, see Table III.3.A.

B. By Major

	Engineering	Management	COSALS	Architecture
1st Job	33.9	40.4	44.2	42.4
Sub. Pos.	39.5	54.6	43.2	66.6
Citizen.	31.2	40.9	49.0	33.4
Pers. Grow.	41.5	52.8	55.1	52.8
n =	470	191	44	36

(continued on page 53)

TABLE III.4 (cont.)

C. For 1950 and 1970 Engineering and Management Cohorts

	Eng. 1950	Mgt. 1950	Eng. 1970	Mgt. 1970
1st Job	42.6	48.3	31.0	32.1
Sub Pos.	52.7	66.7	32.6	47.1
Citizen.	40.8	46.7	28.3	31.6
Pers. Grow.	52.5	56.7	35.5	44.1
n =	115	30	103	56

TABLE III.5

Alumni Satisfaction (%) with Tech Education Overall & with Humanities/Social Sciences Courses: Percent Satisfied / Very Satisfied

A. By Cohort

	50	55	60	65	70	75	All
Overall	85.4	84.5	89.5	81.2	81.1	87.2	84.4
Hum/Soc. Sci.	38.1	25.0	29.0	24.0	17.1	26.1	26.6
n* =	152	76	122	124	178	74	726

* Average n, see Table III.3.A.

B. By Major

	Engin.	Mgt.	COSALS	Arch.
Overall	85.0	84.5	75.5	88.9
Hum/Soc. Sci.	24.4	29.6	34.9	51.4
n* =	467	178	46	36

C. For Three Engineering and Management Cohorts

	50		60		70	
	E	M	E	M	E	M
Overall	85.5	80.6	89.2	85.3	83.6	76.9
H/SS	34.2	41.4	24.6	32.4	13.9	19.6
n* =	112	30	74	34	102	52

One area in which alumni expressed less than overwhelming satisfaction is academic advising. As seen in Table III.6, barely more than half of our respondents considered their advising adequate or excellent.

TABLE III.6

Alumni Satisfaction (%) with Academic Advising at Tech
Precent Claiming Adequate/Excellent Advising

A. By Cohort/Class

	50	55	60	65	70	75	All
Adeq./ Excell. Adv.	49.4	44.6	55.8	53.2	50.9	59.8	54.1
n =	156	77	120	124	179	76	732

B. By Major

	Engin.	Mgt.	COSALS	Arch.
Adeq./ Excel. Adv.	54.4	50.1	56.3	60.1
n =	471	178	48	36

C. By Cohort for Engineering and Management Majors Only: % and (Total n)

	50	55	60	65	70	75
Engineer.	47.0(115)	48.1(52)	58.3(72)	56.0(84)	53.8(104)	72.1(43)
Manage.	45.2(31)	63.2(19)	51.5(33)	46.2(28)	47.0(51)	66.7(18)

The most recent graduates surveyed (1975) and architecture majors express the greatest satisfaction with advising (see Table III.6.C, but note the small n's). We suspect that most of the advising innovations instituted by some of the engineering schools, e.g., Electrical, were too new to have any discernible impact on the alumni we surveyed. It is here that our current student survey and panel data more accurately reflect changes in the effectiveness of advising at Tech.

Returning to the humanities/social sciences component of the various Tech curricula, two encouraging results warrant discussion. One stems from the question, "How, if at all, has your perception of the usefulness of humanities/social sciences courses changed since your graduation from Tech?" The data (not shown) suggest that whereas 40-50 percent of the cohorts and the major aggregations indicated no change, for those who did report a change, positive outstripped negative shifts in perception--without exception--by at least 3 to 1. The 1950 and '65 cohorts lead the way with ratios of 9 to 1. Only COSALS majors depart from this formidable shift in the perception of usefulness of humanities/social science courses with a modest 3 to 1 ratio.

The second encouraging result is found in Table III.7 (see Table III.7 on page 56). The alumni were asked to evaluate a list of ten course emphases. Which would they endorse as a way of enhancing their undergraduate education if they had to do over again? Such an attitudinal question seemed to us to tap the perceived relevance of various kinds of non-major courses--some disciplinary and others problem-oriented--to later career pursuits. What we found is a widespread recommendation that business/management/economics courses deserve a more central place in the curriculum of every college and school at Tech. And perhaps as independent confirmation of what we have all read, felt, and lamented in recent years, the alumni rank technical writing/public speaking courses as a second need which requires strengthening in the curriculum. In further recognition of the admitted ill-preparedness of citizenship roles observed earlier, we find politics and government courses the next-most recommended. Below these three emphases (which garnered the endorsement of three-quarters or more of the respondents), the following ranking obtains: history; fine arts and

literature; international affairs/comparative culture; and courses on science, technology, society and the professions.

TABLE III.7

Course Emphases Endorsed (in Rank and %)* by Alumni, by Major

	Engin.		Mgt.		COSALS		Arch.	
	r	%	r	%	r	%	r	%
Business/Mgt./ Econ.	1	92.0	1	91.5	2	79.6	1	94.6
Technical Writ./ Public Speak.	2	89.6	2	90.5	1	81.5	2	91.9
Politics & Govt.	3	75.9	3	79.0	3	75.9	3	88.2
History	4	61.5	5	65.0	4	66.7	5	75.7
Sci., Tech. & Soc'y Professions	5	59.0	8	55.6	7	59.2	6	73.0
Fine Arts/ Literature	6	58.6	6	64.0	6	63.0	3	88.2
Internat'l Affairs/ Compar. Culture	7	55.9	4	65.5	5	64.8	7	70.3
Philosophy	8	50.2	7	56.5	7	59.2	7	70.3
Sociology	9	49.6	9	52.5	9	44.4	9	64.9
Foreign Lang.	10	37.4	10	43.5	10	40.7	10	51.4
n =		522		200		54		37

* Multiple choices permitted; percentages reflect proportions of total in that major endorsing a particular course emphasis.

One interpretation of these findings would be that a mandate for the School of Social Sciences exists. The low ranking of philosophy and sociology courses, however, serves to temper such exultation. To our

surprise (and regret), the "multinational connection" of international affairs/comparative culture; of the social aspects of science, technology, and the professions; and of foreign language seems to have gone unheeded by our respondents (though international affairs is ranked fourth by graduates of the Management College). We will see later, for example, that the augmentation and diversification of the Social Sciences faculty since 1975 has not gone unnoticed by more recent Tech students, faculty, and administrators. The terminal cohort encompassed by the alumni survey would not have encountered the newest of these faculty. Finally, we note the high proportion of the Architecture respondents who endorsed nine of the ten course emphases. The number of respondents is too small to read any major significance into these endorsements, but the implication is either greater dissatisfaction with the curriculum and/or greater appreciation for the eventual contribution of so-called service courses to career demands.

Together with the other data discussed in this section, Table III.7 gives us an empirical basis for considering some specific curricular changes. These proposed changes (see IV), therefore, emanate in part from alumni who have faced the challenges of applying their Tech education in a vocational context and, for a multitude of reasons, felt inadequately prepared to cope with a portion of those challenges.

3. Summary and Comparison with Views of National Advisory Board

Our survey of Georgia Tech alumni yields a statistical portrait of remarkable stability. Tech graduates 1950-75 exhibit little variation in job experiences, satisfaction with their undergraduate education, or views as to how to make it better. Be this poor recollection, strong rationalization, or a tribute to a timeless Tech culture--where both classroom

wisdom and shielded ignorance are constants--we can only conjecture. What we do know is that "the more things have stayed the same" at Tech, the more urgent has become the need to change them. Our alumni respondents have helped to specify in what areas such changes might profitably occur.

A meeting between the Social Sciences faculty and members of the National Advisory Board on 16 November 1979 reiterated the very same concerns that our alumni survey illuminated: the need to improve oral and written communication skills, a deeper understanding of economic and management principles that would facilitate the engineer's transition into the corporation's managerial and executive ranks, and a skepticism that a coherent collection of humanities/social sciences courses could be integrated into the curricula of the major colleges/schools at Tech.

Next, we examine whether the retrospective assessments of alumni parallel the perceptions and experiences of current Tech undergraduates. Have changes in the appraisal of the major colleges/schools' curricula occurred, and how has the performance of humanities/social sciences courses fared within those curricula--as seen by the classes of 1979-82?

B. Student Survey

In the Spring of 1979 the core group conducted a survey of Tech undergraduates to record in a systematic way their assessment of their educational experience and recommendations for its improvement. Together with the alumni survey the student survey constitutes a rich source of information about the attitudes of Tech students toward the liberal studies component of their education.

The student questionnaire was pretested on 40 students, revised, and finally administered in May and June of 1979 to students in 23 classes, 20

of which were offered in the Department of Social Sciences, and 3 in Mechanical Engineering. (As explained below, although almost all of those surveyed were in social sciences courses, they were taking them to fulfill degree requirements, and thus would not necessarily be favorably predisposed toward the social sciences.) The 908 anonymous responses represented 8.6% of the undergraduates enrolled at Tech in the Spring quarter of 1979.

1. The Sample and Key Analytical Variables

Table III.8 summarizes the distribution of survey respondents in comparison with the whole student body, by college and class (see page 60 for Table III.8). While no effort was made to select a perfectly representative sample by college and class, comparative figures from Table III.8 show that, in fact, the sample is extremely representative by college and fairly representative by class, although freshmen are somewhat overrepresented and juniors are somewhat underrepresented. Most of the students sampled were still in the process of completing their required coursework in both the humanities and social sciences. (At present, Tech students are required to complete 18 quarter hours in humanities and an equal amount in social sciences.) When surveyed, 57 percent of them had taken no more than half of the required work in humanities and over 60% had taken a like amount of the required hours in social sciences. At the other extreme, the proportions of students who had already completed all of their required coursework in humanities and social sciences were 11.8% and 8.9%, respectively. In the student survey, like the alumni survey, the distinction between humanities and social sciences was defined according to the present Georgia Tech curriculum usage, with courses in English, music, and modern languages counting as humanities, and courses

in history, political science, philosophy, sociology, economics, psychology, and some courses in modern languages counting as social sciences.

TABLE III.8

Distribution of Students Surveyed
Compared to Total Tech Undergraduate Population,
Spring 1979

A. By Class

	Survey Sample		Undergrad. Student Population	
	n	%	n	%
FR	340	37.4	2391	22.6
SOPH	168	18.5	2409	22.8
JR	125	13.8	2370	22.5
SR	259	28.5	3161	30.0
Grad/Other	24	2.7		
Total	908	100.0	10543*	99.9+

B. By College

	Survey Sample		Total Population	
	n	%	n	%
ENG	641	70.6	7152	67.8
COSALS	91	10.0	1276	12.1
MGT	120	13.2	1344	12.7
ARCH	46	5.1	771	7.7
Missing	10	1.0	-	-
Total	908	100.0	10543	99.9+

*Includes 47 JEPHS students and 156 special students
+Rounding error

Before analyzing the survey data, we tabulated the frequency distribution (both absolute and relative) of responses to each item. Several of the survey items were "open-ended" questions, and categories were devised by which answers to these items could be grouped. (Examples of this kind

of question and of the categorization of answers are presented later.) After tabulating frequency distributions, we crosstabulated responses by college and class of the respondent. The former enabled us to look for variations in attitude among the various major colleges, and the latter gave us the best approximation of a measure of change over time without actually surveying one class of students throughout their undergraduate careers. In addition, responses to some items were crosstabulated by the number of courses which the student had already completed in both the humanities and social sciences and by the size of the class in which the student was presently enrolled. (Both these variables were measured on an ordinal scale.) The "level of experience" variable, like the class variable, gave a more useful assessment of responses to certain questions which could best be answered by hindsight. The class size variable enabled us to measure the much-discussed effect of large classes on student attitudes. Of the students surveyed, 36.8 percent were currently enrolled in social sciences courses with 90 or more students, 18.7% were in classes of 40-89, and 44% were in classes with fewer than 40 students. (All of the ME classes surveyed fell into the latter two categories.)

2. Measures of Satisfaction

Table III.9 displays responses to questions in which students evaluated their educational experiences in both humanities and social sciences on a five-point scale (see page 62 for Table III.9). Nearly 38 percent of the respondents ranked humanities courses in the top two quintiles of that scale, and 58% so ranked social sciences courses. Satisfaction with both humanities and social sciences was highest among students in the College of Sciences and Liberal Studies (COSALS), and lowest among Engineering students, although in the case of social sciences the college-linked difference was not substantial. When measured by class,

the level of satisfaction with both was lowest among seniors. However, crosstabulation by number of courses completed reveals that the level of satisfaction with social science courses increased from 55.4% among those who had completed three or fewer courses to 69.4% among those who had completed more than six.

TABLE III.9

RESPONSES TO THIS QUESTION: "On the following scale, how would you evaluate the educational experience in the _____courses you have taken at Tech?"

A. Total

	Humanities		Social Sciences	
	n	%	n	%
(1) Unsatisfactory	31	3.4	16	1.8
(2)	166	18.3	93	10.2
(3)	313	34.5	267	29.4
(4)	283	31.2	390	43.0
(5) Most Satisfactory	59	6.5	135	14.9
Missing/unusable	56	6.2	7	0.7
	908	100.0	908	100.0

B. Percent Satisfied/Very Satisfied with Humanities and Social Sciences Courses, by Class

Satisfied/Very Satisfied with	Class			
	Fresh	Soph	Jr	Sr
Humanities Courses	45.5	40.3	46.5	30.6
Social Sciences Courses	59.2	60.5	63.4	53.3

(continued on page 63)

TABLE III. 9 (cont.)

C. Percent Satisfied/Very Satisfied with Humanities and Social Sciences Courses, by College

Satisfied/Very Satisfied with	College			
	Engin.	Mgt.	COSALS	Arch.
Humanities Courses	38.5	40.3	57.1	39.0
Social Sciences Courses	56.9	62.7	63.0	57.8

D. Percentage Satisfied/Very Satisfied with Humanities Courses and Social Sciences Course by Number Taken of Each

Number of Courses	Humanities Courses		Social Sciences Courses	
	n	%	n	%
0-3	199	42.9	302	55.4
4-6	99	35.9	162	60.4
7+	44	39.3	61	69.4

The level of satisfaction with both humanities and social sciences among the students surveyed was much higher than among Tech alumni who were asked a similar question--in the case of social sciences, over twice as high (Alumni Survey Table III.5). We would like to think that this increase reflected improvement in the quality of instruction and a broader perspective on the part of current Tech students. However, the students surveyed were either currently enrolled in social sciences and humanities courses or had recently completed them, while a surprisingly large number of the alumni surveyed had little or no recollection of courses in the humanities and social sciences, even though such courses were, in fact, required during the student days of all the alumni surveyed. In some cases, therefore, the alumni/student differential which we observe is merely

one of recollection, not evaluation. We can only speculate about how many of the present students, if questioned 10 or 20 years from now, would have any recollection of their humanities and social sciences course work at Georgia Tech.

Unfortunately, the student survey did not include an item concerning satisfaction with the overall educational experience at Tech, so we have no way of comparing the present students' level of satisfaction with the humanities/social sciences and training in their major field, as was possible with the alumni. Conversations with students in panel discussions (see below), and in other settings, suggest that the gap indicated by alumni (Table III.5) may have narrowed considerably.

The levels of satisfaction with humanities as compared to social science courses is significant, but it may be attributable in part to the attitudes which students bring to the courses in literature rather than to the conduct of the courses themselves. In order to ascertain what students like and dislike about humanities and social sciences at Tech, we asked them to specify which of several terms they considered applicable to courses they had taken. Multiple answers were allowed, and respondents checked an average of 1.67 items concerning humanities and 1.82 concerning social sciences. The overall positive and negative assessments of humanities and social sciences in Table III.10 are consistent with those displayed in Table III.9 (see page 65 for Table III.10). While a relatively large number of students indicated that they found both humanities and social sciences courses to be useful or a refreshing change of pace, those who found them stimulating and the larger number who found them boring suggest that some of the dissatisfaction may relate to the

motivational aspect of humanities and social science courses. Some of the dissatisfaction may stem from the problem of stimulating interest in courses that do not have an immediate and obvious bearing on the "main business" of the students. This motivational problem is apparently compounded in large social sciences classes inasmuch as students assessed each of the six terms more positively in small classes than in large. In three cases the differences were substantial.

TABLE III. 10

RESPONSES TO THIS QUESTION: "Which of the following terms would you consider applicable to the _____ courses you have taken? (Check as many as necessary.)

Descriptive Term Checked*	Humanities n	Humanities % of 908	Social Sciences n	Social Sciences % of 908
Stimulating	172	18.9%	342	37.7%
Impersonal	188	20.7	192	21.2
Irrelevant	171	18.8	92	10.1
Refreshing Change	217	23.9	373	41.1
Useful	410	45.2	413	45.5
Boring	361	39.8	246	27.1

*To determine the overall postive and negative assessment in responses to the terms "stimulating," "refreshing change," and "useful" were summed, as were the responses to "impersonal," "irrelevant," and "boring." These totals were divided by the average number of responses (1.67 for humanities and 1.82 for social sciences) and the results divided by the total number of students in the sample. This resulted in a positive/negative rating for humanities of 52%/47%, and for social sciences of 68%/32%.

(continued on page 66)

TABLE III. 10 (cont.)

B. Descriptive Terms Checked by Class Size, in Percentages

Descriptive Term Checked[a]	Class Size		
	Small[b]	Med[c]	Large[d]
Stimulating	43.1	36.3	32.4
Impersonal	17.5	20.8	25.2
Irrelevant	11.5	8.9	9.4
Refreshing	47.1	53.0	27.9
Useful	46.6	49.4	42.4
Boring	20.6	27.4	35.2

a Multiple checks permitted
b < 40
c 40-89
d > 89

C. Descriptive Terms Checked by Number of Social Sciences Courses Taken, in Percentages

Descriptive Term Checked[a]	Number of Courses		
	0-3	4-6	7+
Stimulating	59.6	40.1	33.2
Impersonal	10.0	19.7	23.5
Irrelevant	50.6	50.6	35.0
Refreshing	58.4	49.4	41.9
Useful	7.9	9.7	10.8
Boring	18.0	23.0	30.0

[a]See note to III. 9.B.

Crosstabulations of responses to the satisfaction question by college (not shown) are fairly consistent with similar crosstabulations presented earlier. The distribution by class reveals that the item

decrease in satisfaction level among seniors has flattened out, and in one case ("refreshing change") reversed. Concerning social sciences courses, 49 percent of the seniors checked "refreshing change" as compared to 34.7% of the freshmen; for humanities courses there was almost a doubling from about 16 to 30 percent. Furthermore, when the "terms descriptive of social sciences courses" item was crosstabulated by number of social sciences courses completed, the greater the number of courses completed, the higher was the positive ranking for each item.

3. Course and Content Preferences

Because the survey is designed to advise as well as to judge, a series of questions were asked to measure student preferences concerning the kinds of information and skills they wanted to acquire from humanities and social science courses, and (with reference specifically the social sciences) the kinds of courses they would prefer. One might suppose that students would respond to a question about course preference by saying "whatever course is offered at 10 AM by an interesting professor who is lenient in grading." The data do not confirm such a supposition. To be sure, positive and negative judgments about professors per se figured prominently in an open-ended question concerning students' likes and dislikes about humanities and social sciences, but course content was also mentioned frequently in response to that question. And in comparing the importance of various factors in registering for elective courses in humanities and social sciences, 43 percent said that interest in the subject of the course was the most important factor, as compared to 18% for the time the course was scheduled, 8% for knowledge of the instructor, and 7.5% for reputation as an easy course. Among the "veterans" who had taken more than the required number of social sciences courses, interest

in the course subject was still twice as important as any other factor, although among that group knowledge of the instructor ranked second. Even when we allow for the tendency of some students to select the "correct" answer to a question like this, it is clear that Tech students do have preferences among humanities and social sciences course subjects and, when elective choices come into play, are willing to act on them (but see section B.4 below).

Table III.11 summarizes categorized responses to an open-ended question regarding the kinds of information and skills which students would like to acquire in humanities and social science courses at Tech. Again, multiple responses were allowed, and the average number of responses was 1.4. The inevitable arbitrariness in categorizing individual response suggests that we do not overemphasize particular numbers in the table, but the overall results give a rather clear picture of student preferences. These can be compared with alumni preferences (see Table III.7).

While most of the categories are adequately explained in Table III.11, two need clarification (see page 69 for Table III.11). "Knowledge that relates major and career to society" included, but was not restricted to, responses focused on the study of science, technology, and society. "Broadening" was a residual category for responses which expressed interest in expanding one's educational experience beyond the technical major in ways which were not strictly utilitarian, such as communications skills.

The students surveyed, like their counterparts among the alumni, ranked communications skills very highly, but unlike the alumni they did not give a particularly high ranking to managerial skills, and ranked literature at the bottom. The overall distribution of responses indicates a

strikingly broad range of interests among Tech students. Almost as many named as a subject of interest one or more of the social sciences (history, political science, sociology, and philosophy) as named communications skills; and a large number gave responses which fit into the "broadening" category. A definite minority registered a preference for knowledge of international affairs and other cultures, management, topics relating the social sciences to their major, and literature.

TABLE III.11

CATEGORIZED RESPONSES TO THIS OPEN-ENDED QUESTION: "What kinds of information or skills would you like to acquire in humanities and social science courses at Tech?"

A. Types of Information/Skills Preferred by Students

Information/ Skills	Preference Indicated[a] n	% of 908
Communication Skills (reading, writing, speaking)	238	26.2
Knowledge of specific social science disciplines	234	25.8
Broadening	192	21.1
Awareness of world affairs/ Knowledge of other cultures and international relations	120	13.2
Managerial/administrative skills (interpersonal relations)	107	11.8
Knowledge that relates major and career to society	101	11.1
Knowledge of literature and fine arts	73	8.0

[a]Multiple preferences permitted

(continued on page 70)

TABLE III.11 (cont.)

B. Types of Information/Skills Preferred by Class

Information/ Skills	Number with Preference (and Its Rank within Class) Fr	Soph	Jr	Sr
Communication	94 (2)	29 (3)	27 (3)	88 (1)
Social Science Disciplines	96 (1)	54 (1)	33 (2)	48 (3)
Broadening	66 (3)	34 (2)	35 (1)	52 (2)
World Affairs/ other cultures	42 (4)	24 (4)	21 (4)	36 (5)
Managerial/administrative	28 (6)	16 (6)	19 (5)	41 (4)
Major & Society	30 (5)	20 (5)	10 (7)	33 (6)
Literature/fine arts	27 (7)	14 (7)	12 (6)	17 (7)

C. Types of Information/Skills Preferred by College

Information/ Skills	Number (Rank) within College Engin	Mgt	COSALS	Arch
Communication	183 (1)	26 (2)	12 (3)	5 (4)
Social Science	159 (2)	22 (3)	26 (1)	15 (2)
Broadening	126 (3)	43 (1)	21 (2)	17 (1)
World affairs	88 (4)	14 (4)	8 (4)	3 (5)
Managerial	81 (5)	14 (4)	4 (5)	6 (3)
Major & Society	77 (6)	2 (7)	1 (7)	3 (5)
Literature	56 (7)	4 (6)	6 (6)	2 (7)

The distribution of rankings by college reveals that the dominant position of communications skills as a topic of interest reflects the views of engineering students, who constituted over 2/3 of the sample. Similarly, the distribution by class shows that the seniors indicated by

a wide margin the preference for communications skills; they were the only class to rank this category first. In sum, the high level of interest in communications skills derives from engineering students whose present requirements in English are the lowest of those in any college on the campus, and from seniors, many of whom are no doubt contemplating the immediate prospect of working in positions where communications skills will be required.

Student preference for course content was also measured by another question, this one with structured responses (see Table III.12).

TABLE III.12

RESPONSES TO THIS QUESTION: "What sort of humanities and social science courses would you like to see offered at Tech?"

	n	%
Courses which are explicitly related to scientific and technical concerns of your profession	108	11.9
More broadly based courses on a wide variety of subjects	329	36.2
Both of the above	327	36.0
No preference	121	13.3
Unusable	23	2.6
TOTALS	908	100.0

This question, unlike the preceding one, was restricted to the social sciences. Although the structured responses were not identical to the categories applied after the fact to individual responses for Table III.11, the two tables can be usefully compared. The option in Table III.12 for "courses explicitly related to scientific and technical concerns" is logically related to the category in Table III.11 of "knowledge that relates major

and career to society," and possibly to "managerial and administrative skills." Given a choice between courses focusing on science, technology, and society and more broadly-based courses, students opted for the latter by 3 to 1, a result which is consistent with the pattern which emerges in Table III.11. Equally important, however, is the fact that almost 3/4 of the students favored either the "more broadly based option" or that plus the scientific/technical concerns options.

Crosstabulations of these results contain no major deviations from the overall pattern. Not surprisingly, students from Engineering and COSALS were somewhat more supportive of the "science/technology concerns" option (13.3% and 12.5%) than were students in Management and Architecture (8.5% and 9.1%). Among the students who had taken more than the required number of social science courses, 4.5% preferred "science/technology concerns" as compared to 13.2% expressing a similar preference among those who had completed less than half of their social science requirements.

Several studies of the role of social sciences and humanities in engineering education, reviewed earlier, advocate curricular innovations which focus on the social dimensions of science technology or on the "interface" between science technology and society. A strong pedagogical case can certainly be made for such a focus, but Tables III.11 and III.12 plus alumni Table III.7 show rather clearly that there is no great support among Tech students, past or present, for making that the singular, or even a primary, focus of undergraduate instruction in the social sciences.

Two additional questions sought to measure student preferences for introductory level courses in the social sciences. (Students currently take courses in American history and government to meet the State requirement,

and can elect courses in philosophy, sociology, and the history of technology. At the advanced level, they presently can elect from among a broad range of junior-senior-level courses.) Offered three basic options, plus all combinations of the three, students gave sharply divergent answers concerning introductory, and advanced-level courses (see Table III.13).

TABLE III.13

RESPONSES TO THIS QUESTION: "At the _____ level, which of the following kinds of courses would you prefer? (Check as many as necessary.)"

A. Student Preferences for Introductory Level and Advanced Level Courses

	Level			
	Introductory		Advanced	
Course Focus	n	%	n	%
Focused on a single discipline (e.g. history of philosophy)	304	33.5	139	15.3
Focused on a particular topic cutting across disciplines in the social sciences (e.g. the history and sociology of cities)	138	15.2	138	15.2
Focused on a particular topic involving social sciences and your major field (e.g. social implications of energy policy)	178	19.6	332	36.6
Both 1 and 2	55	6.1	30	3.3
Both 1 and 3	82	9.0	64	7.0
Both 2 and 3	90	9.9	108	11.9
All 3	38	4.2	61	6.7
Missing/unusable	23	2.6	36	4.0
TOTAL	908	100.0	908	100.0

(continued on page 74)

TABLE III.13 (cont.)

B. Focus of Introductory and Advanced Courses* by Class (in %)

	Focus					
	Introductory			Advanced		
Class	Single discipline	Cross disc topic	Soc Sci/ major	Single discipline	Cross disc topic	Soc Sci/ major
FR	37.3	14.8	16.6	14.8	14.2	41.0
SOPH	39.3	11.7	21.5	14.8	17.9	34.0
JR	32.8	14.8	23.8	19.8	9.9	38.8
SR	28.0	19.8	22.2	16.5	19.7	37.0

C. Focus of Introductory and Advanced Courses, by College (in %)

	Focus					
College	Introductory			Advanced		
	Single discipline	Cross disc topic	Soc Sci/ major	Single discipline	Cross disc topic	Soc Sci/ major
Engin	35.2	14.8	19.8	15.5	17.0	38.4
COSALS	41.7	19.4	15.3	15.3	18.1	40.3
Mgt	28.4	19.0	24.1	16.7	14.9	38.6
Arch	20.5	18.2	20.5	17.8	2.2	37.8

* Combinations of options, which remained fairly constant across both class and college, were omitted from the table.

Relative levels of interest in courses focusing on a single discipline and on a specific topic involving social sciences and the major field were inverted, from 33.5% and 19.6%, respectively, for introductory courses, to 15.3% and 36.6%, respectively for advanced courses. Interest in cross-disciplinary topical courses not necessarily related to the major, and interest in some combination of the three choices stayed constant at 15 percent and just under 30%, respectively.

Crosstabulations of the results by college reveal some interesting patterns. In the question concerning introductory-level courses, the "single discipline" option was first choice in all colleges, but among Management and Architecture students, the social science/major field option was a close second (among Architecture students it actually tied for first). On an earlier question about types of courses preferred (Table III.12), students from those two colleges had indicated a very low preference for "courses which are explicitly related to scientific and technical concerns of your profession." When the option is broadened to mean "a particular topic involving social sciences and your major field" (as here in Table III.13), interest among Management and Architecture students rises sharply. The same effect is seen when responses are tabulated by number of social science courses completed. There, among those who have already completed the required number of courses, primary interest in these two choices increases from 4.5% to 25.0%. It would seem that those students were not equating "scientific and technical concerns of your profession" with "topic(s) involving social sciences and your major field." In the question concerning advanced level courses, the high preference among management and architecture students for the "social sciences/major field" option goes even higher, and is now joined by an equally high level of interest among Engineering and COSALS students who had given a low rating to that option on the introductory-level question. Students from all four colleges, for whom courses on "a particular topic involving social sciences and your major" had a variety of meanings, ranked that option highest for advanced-level courses, at around 40%. When expanded to include those combinations of options which included "social sciences/major field," almost 2/3 of the students expressed a preference for such courses at the advanced level.

This result is consistent across colleges and across classes. However, it is not consistent with another statistical measure of student interest. According to the actual figures for preregistration for advanced elective courses in the social sciences, demand for courses which would be classified as fitting the social science/major field option has been well below the demand for courses fitting the other two options.

Whatever the explanation for this divergence of figures, it is very clear that any plans for altering or coordinating upper-division elective offerings in the social sciences need to include considerable emphasis on courses, or a series of courses, which link the social sciences and the various major fields of undergraduate study at Georgia Tech.

4. Summary of Student Survey and Comparisons with Student Panels

Emerging from this mass of quantitative data are several qualitative insights. Among the most useful may be the following: (1) Tech students prefer small humanities/social sciences (HSS) classes; (2) in general they are more satisfied with social sciences than with humanities courses (their appreciation of literature upon entering Tech is slight and, in a finding not reported above, they do little reading for pleasure); (3) communications skills are foremost among those sought from HSS courses, especially by seniors and engineering majors (knowledge of specific social science disciplines is overall the second-most sought); and (4) at the introductory level, a single-discipline course focus prevails, while at the advanced level cross-disciplinary and problem-focused courses involving the student's major are the choice.

In the interest of probing some of the questions asked in the student questionnaire--the responses had not yet been analyzed--the core group

convened a series of student panels. The 44 student volunteers, all of whom had indicated on the questionnaire a willingness to share their views, were assigned to one of the five panels (ranging in size from 4 to 14 students) which met in May 1979. As Table III.14 shows, the distribution of students in the panels are representative by class of those who participated in the survey.

TABLE III.14

Distribution of Tech Students
by Class Who Participated in
the Exxon Panels and Completed
the Student Survey

CLASS	PANELS n	PANELS %	SURVEY n	SURVEY %
FR	19	43.2	322	37.5
SOPH	6	13.6	165	19.2
JR	5	11.4	120	14.0
SR	14	31.8	252	29.3
	44	100.00	859*	100.0

*The difference between this total and the 908 reported earlier is due to special student status and missing information.

For most of the students it was the first time that any attempt had been made to seek their views on the serious matter of their own education. After the initial disbelief was met and overcome, there was in each panel a profitable exchange of feelings and judgments. We sought information on the educational value of present HSS courses, the character and source of that benefit, the scheduling aspects of those courses, advising, and the effect of courses in major fields on the formation of social and ethical

opinion. We were not very successful in this latter effort. It is apparent that an analysis of the social science content conveyed in engineering and science courses will require a far deeper probe and a more precise investigation than either the panels or the survey allowed. In general, the information elicited in the panels was valuable beyond its scope and helpful in its immediacy.

Student opinion of social science courses was, on the whole, consistent with that evident in the survey -- high. But this favorable view must be understood in an educational context in which courses of this kind are essentially peripheral to student purpose. In an honest effort to convey the views of their peers, the students made this point repeatedly. As one student put it, a social science course is to be enjoyed as an "island" quite separate from the serious continent of scientific study. The students also suggested that the hard sciences were concerned with "facts," while the social sciences and humanities dealt with only "opinions" a point dramatized by the fact that the latter lent themselves to much classroom discussion while the former did not. Although students did not like large classes, a finding corroborated by the survey, it was clear for some that a stimulating professor counterbalanced the distaste.

Student concern for the quality of advising was clearly voiced, a concern shared by the administrators interviewed (see section C below). Advisors tended to give uninformed or shallow advice outside of their own field and few knew the details of humanities/social sciences offerings. Most students depend on their peers for academic advice. This was particularly true in the humanities and social sciences where course value is considered highly teacher-dependent.

On the subject of their native language, the students were at odds with themselves. On one hand, they recognized their deficiences in writing and speaking skills and the professional penalties associated with that deficiency. On the other hand, they hoped to avoid those courses where those skills might be practiced and sharpened. There were few kind words for composition courses and pure exercises in composition were regarded as irrelevant. The aversion to literature that many students bring to Tech was not relieved by the English courses they have encountered. Finally, because major requirements take priority, it has been difficult for students to schedule HSS courses in a coherent sequence or even to schedule a preferred course. "In scheduling," as one student said, "Humanities and Social Sciences courses are just ahead of Physical Education." The consequence is that students often choose a course at a given time merely because it fits a schedule and fills a distribution requirement, with minimal regard for content, relation to an educational goal, or the reputation of the professor. This finding diverged from that in the survey which identified student interest in the course as the chief criterion for selecting it. It is possible that scheduling constraints are so severe that students are unable to act on their substantive interests.

In one panel consisting only of upperclassmen, Georgia Tech was seen as tough and grueling, narrow and utilitarian in purpose--all in all an arduous but worthwhile experience. It was worthwhile because of its relation to material success.

C. Views of Tech Administrators and Faculty

In addition to student opinion, we sought the views of both administrators and faculty, though in different ways. We invited

administrators to talk informally with the core group about the role of HSS in the Tech mission; we invited faculty from around the campus to join the project in the capacity of support group members and asked them to commit their views and expectations to paper.

1. Interviews with Administrators

Perhaps the most vital source of "official" information about curriculum content, ECPD requirements, and strategies for implementing changes in the humanities/social sciences component were the 60-90 minute interviews we had with selected administrators at Tech. During June and July of 1979, members of the core group visited President Pettit, Academic Vice-President (and now Chancellor of the University System) Crawford, Research Vice-President Stelson, Engineering Dean Sangster, Management Dean Gearing, Architecture Dean Fash, Sciences and Liberal Studies Dean Valk, Electrical Engineering Director Paris, and Mechanical Engineering Director Kezios.

Each of the administrators was sent a letter describing the goals of our project and a list of questions to which we requested he devote some thought in preparation for the interview. The questions varied somewhat with the particular position the person occupied in Tech's table of organization and his past experience. Many of our interviewees possessed intimate knowledge of the ASEE and ECPD's curriculum concerns, shifts in emphasis, and the responses of the engineering community to these shifts. We sought to tap this expertise whenever possible.

Although there was a range of opinion as to the mission of the humanities and social sciences, the administrators' comments were, on the whole, supportive, sympathetic and helpful. There was a sense of "It is a job that needs to be done, and we are glad you are doing it." The following

summary account provides a vignette of the range of comment and concern.

Several administrators addressed the problem of providing a balance between utilitarian and cultural aims of the humanities/social sciences in engineering education. The Dean of the College of Management stressed the need for a broad cultural exposure for its students, and deemphasized the professional and utilitarian aspects of courses that might be offered by the social sciences and humanities, noting that these were covered in the management curriculum. There was a repeated concern for the effectiveness of student advising, a concern that transcended the humanities and social sciences where there is currently no formal adivising. There was support for joint appointments and courses listed across divergent fields and for a humanities/social sciences program of thematic unity. One administrator proposed a modification of the present sharp distinction between social sciences and humanities credit. There was the universal concern for the verbal skills of engineering majors, and the equally recurring concern that engineers be provided with leadership skills.

In the view of one administrator, the mission of the Institute is distinctly utilitarian in an economic sense, as a source of technically skilled personnel for industry. He argued that the humanities and social sciences should serve professional interests more directly and provide a more quantitative program than is now the case.

It was widely recognized that the half-life of technical information is brief, and further, that the careers of technically-trained students, as often as not, lead them far from their educational base. The emphasis therefore was upon breadth of awareness, the discipline of learning itself,

and the development of those critical and humane skills that would allow students to respond and learn in a world of rapid social change.

2. Faculty Observations and Prescriptions

The faculty who comprised the two project support groups (see Appendix A) were asked to contribute a paper detailing their views of the role of HSS in professional and technical education. These papers, which are reproduced in their entirety in Appendix B, ranged from brief sets of recommendations buttressed by personal observations to exhaustive historical analyses on a grand scale dealing with the interaction between technology and the social sciences. However, several themes were common to a number of the papers, indicating a common core of experience and analysis which was a valuable aid in formulating recommendations. In addition, many of the observations made by these participants amplified impressions received from other sources as reported throughout this section. A summary of these salient faculty views, especially on the subject of HSS curriculum structure and content, follows.

It was suggested that the most appropriate way for professional and scientific faculty to interact with humanities and social sciences faculty is through joint research projects involving students. The reasons for this are more pragmatic than intellectual. The reward structure for faculty is such that relatively little reward accrues from joint teaching of courses while joint research may lead to productive output. Participation in such work is intellectually challenging to the faculty members involved as they try to incorporate their different world views and intellectual values into the process of reorganizing the social aspects of technical and scientific information.

The faculty recognized the Exxon project as fundamental in curriculum development. It offers an opportunity for self-study and the setting of long-term goals for HSS education at Tech, including a complete reevaluation of present HSS undergraduate course offerings. This agenda-setting should lead to a program for faculty development to facilitate the implementation of curriculum revision and to achieve high quality in the execution of instructional responsibilities.

There was support for several specific proposals for curriculum change. One of these was for a series of integrated, interdisciplinary lower-division courses; another suggested groupings of related upper-level courses which would focus the students' course work; a third dealt with the institution of undergraduate theses, directed jointly by a professor from the student's major field and a member of the HSS faculty. These proposals imply criticism of the present "cafeteria" approach to HSS instruction by which students may select a fixed number of courses from a wide range of unrelated offerings. Taken together, they also offer a basis for a revised HSS curriculum consisting of three tiers: a sequence of beginning courses; one or more coherent upper-division "tracks," and, for those students so inclined, a thesis integrating HSS concerns with their major field.

A number of suggestions were put forth regarding the content of HSS courses. An interesting variant on the beginning course was a proposal advocating "initializing" courses rather than traditional introductory or survey courses. "Initializing" courses are closely focused on a particularly topic or theme at a rudimentary level. They are designed to stimulate interest in that topic, and serve as a basis for further systematic study at the advanced level. To be effective, such initializing courses must

whet the students' intellectual appetite. Yet this approach runs the risk of exacerbating the fragmentation of curriculum which characterizes the cafeteria approach.

A need for more courses in the culture and society of such areas as the near and far east, Africa, and South America was expressed. Technology has "shrunk" our world, and professionals trained in the United States are working more and more in other lands all over the globe.

Other intriguing observations on the appeal of course content depending on the student's major were offered. For instance, the HSS needs for Management and Architecture majors are different from those of engineering and science students. For Management majors the social sciences play the role of fundamental knowledge that the natural sciences play for engineers. In Architecture the social sciences are vital for understanding the needs of the users of a building and in understanding the societal context of designed environments. Often, the "broadening" role of HSS courses, widely endorsed by Tech students in section B above, may even divert the student from intensive concentration on the relatively narrow professional curriculum. HSS courses are indeed an "island."

Finally, the importance of the connection between society and technology received thorough treatment. There is a complex relationship between technology and society which can be summarized superficially by noting that at the same time technology produces impacts which modify society, the society determines the form that technology will take--a feedback system operating over time. This complex relationship has existed since the industrial revolution and makes the humanities and social sciences critical in understanding and determining the uses and effects

of technologies. But the engineer has usually been torn between his role as a licensed professional and as an employee of a firm. This tension is compounded by the fact that the engineer is often isolated intellectually and socially in the course of his education. The tension between professionalism and loyalty to the firm coupled with this isolation leads to a concern for the moral role of the humanities curriculum in developing a basis for professional and personal decisions. This role cannot be underestimated.

In sum, the papers of the support faculty prodded the core group to consider a wide range of HSS curriculum innovations -- both in structure and content -- designed to meet present and future needs in professional and technical training. A distillation of this collective faculty wisdom will be operationalized in the recommendations section of this report.

IV. RECOMMENDATIONS

A. Introduction

The recommendations contained in this section are not based upon some body of eternal curricular truth. Rather, they are based upon a literature replete with high ideals and small successes, a reading of the history of this institution and others like it, long intellectual struggles, our own experience as teachers and scholars, personal reflection, carefully collected data, and on the shared feeling that the distance between what the Institute has done and what it might do is greater than it should be. They presuppose that students in science and technology will be better scientists and engineers, not to mention happier people and more effective citizens, if they have a clear sense of the social system in which they will spend their professional lives, and if they have an awareness of the manifold capacity of literature and art to clarify and interpret human experience. These recommendations presuppose that any gap between the two cultures is the locus of missed opportunity rather than an historical necessity or an irresolvable conflict. Finally, they have been devised in the light of a tight constraint on curricular time. This constraint has determined, in part, their structure, their effort after an integration of disparate material that might be treated separately under more leisurely circumstances, and our view that new integrative mechanisms will be required if their aims are to be achieved. The task is a common one, requring a level of cooperation to which we are little accustomed by the usual divisions of academic life.

Our primary recommendations are threefold. First, a required three course introductory sequence which would satisfy nine hours of social

science credit, including the state requirement for instruction in American history and government; second, a required "track" of not less than nine quarter hours of thematically related courses in the social sciences or humanities which would count as joint humanities and social sciences credit; and third, an optional senior honors thesis. These recommendations should be taken as a unified attempt to provide an intellectually coherent curriculum which would combine professionally guided structure with a significant element of student choice.

In the first of these recommendations the four disciplines which compose the School of Social Sciences will jointly determine common approaches and the staffing of the introductory sequence. Our extensive discussions as to the best method of integrating the relevant aspects of these disciplines were, absent experience, inconclusive. As a consequence of this inconclusiveness and to further explore the implications of our recommendations, we propose the implementation of an introductory sequence of a one year experimental nature which would satisfy the nine hours of social sciences credit and which would be followed by intensive evaluation. The School plans to engage in a series of trials to test a number of alternative pedagogical methods. In each trial method faculty member will teach in terms of their own specific intellectual skills and interests, but also with an intelligent awareness of the bearing of all the social sciences on the lives of our students. The tracking recommendation and the optional senior honors thesis require students, each at different levels of study, to engage in systematic inquiry in a field related to their educational and professional goals. These recommendations are discussed in sections II, III, and IV below.

In addition to the threefold recommendation mentioned above, we recommend that a three quarter sequence be instituted in the humanities, a sequence which would fulfill nine hours of the present 18 required humanities credit hours. This sequence would balance the recommended three quarter sequence in the social sciences. The Core Group responsible for this Report has received papers from representatives of the humanities, as the academic area is defined by the Institute. Faculty members from Modern Languages, English, and Architecture have contributed notably to our discussions, but have not had so large a place in our deliberations as those representing the social sciences. As a consequence, we make no recommendations as to specific aspects of this humanities sequence, confining ourselves to a few general remarks. We recommend that this sequence parallel and complement, to the extent possible, the sequence in the social sciences. To effect this complementarity will require close cooperation among academic units and mutual awareness of common aims and problems. In addition to the Faculty of English, which would have a major responsibility for this recommended sequence, the Faculty of Modern Languages and selected faculty members from Architecture and Music would appropriately play significant roles in its development and staffing.

In making this recommendation, one problem before which all others pale remains to haunt anyone hopeful of the benefits of curricular change, namely, the issue of composition and the skills of communication. The continuing source of the problem's intractability is well put in a classic in the history of curricular studies:

> The root of almost all student failures in the adequate use of our language is what seems to us a long standing error--the separation almost a century ago of instruction in writing in the American colleges from the general instruction. This separation was perhaps an economy and a convenience, but its effect over the years has been to

> place all responsibility for sound writing upon a single department, which by the very acceptance of that responsibility lost its power to enforce its discipline upon the written work of any and every other field. The traditional training in command of one's own language...was replaced by the "teaching" of the language as a "subject", generally with a false and usually unrealized literary aim. The final consequence has been the all but complete disregard of a student's written performance in any course but those in composition, on the specious ground that his responsibility in other courses was only for "matter", and that the instructors criticism of writing as writing was an unnecessary if not instrusive niceness.*

The linguistic deficiences of our students are of uniform concern to every constitutency of the Institute, students, faculty, and alumni alike. It is wrongheaded to castigate English departments for a problem of national proportions. If the full panoply of our social institutions--our homes and churches and schools--have all failed to inculcate a sense and practice of precision, clarity of expression, and style in our native language, much less as awareness of its basic mechanics, then it hardly behooves anyone to blame a particular discipline for failing to do in one or two courses what far more powerful agencies have failed to do with greater incentives at their disposal.

As responsibility for this problem does not lie with one particular discipline, neither does its solution. If, as seems clear, skill depends upon practice and motivation, then the provision of that practice and its critical appraisal depend upon the whole educational program of the Institute. The opportunities for writing are perhaps greater in the humanities and social sciences than in other portions of scientific and technological education; it is only in this sense that their responsibilities for the maintenance and inculcation of high standards of writing are

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*A Collective Program in Action, Columbia University, 1946, p. 148.

greater than those of other fields. If students are led to believe by example or indifference that their linguistic abilities are of no moment in their chosen careers, then they will be of little moment to the students. The support of high standards in the use of language and their inclusion in the requirements of any course is, or should be, a common faculty commitment. The acceptance of such a principle and its translation from a hortatory pronouncement into practice will require a variety of formal and informal devices for cooperation between the English Department and major Schools. The emphasis on the responsibilities of the humanities and social sciences in this regard is not meant to suggest that courses in these areas should consist of didactic instruction in the use of language, but rather that opportunities for extensive written work should be provided both in the recommended freshman sequences and in the tracking program, and that the quality of writing should be an integral aspect of course standards. Strict courses in the mechanics of composition may be required where needed, but they would not, under ECPD standards, fulfill humanities requirements.

B. Introductory Social Sciences Instruction

As part of a multifaceted effort to strengthen the role of the humanities and social sciences within the singularly professional undergraduate education offered at Georgia Tech, we propose to offer, on a one year experimental basis, three different modes of a (three quarter sequence of introductory level courses combining history, philosophy, political science, and sociology. The sequences will be designed to coordinate the talents and perspectives of the four disciplines which presently constitute the School of Social Sciences at Georgia Tech, in presenting at the freshman level an holistic, integrated study of society and the social context of human life. The historical

and institutional focus will be primarily, though not exclusively, on the United States, as mandated by state requirements for instruction in American history and government. Topically, the central, but not exclusive, theme will be "industrial culture." That is, one central task of the sequence will be to explain how industrial and urban America got to be what it is.

Our hope is that after experimentation, evaluation, and necessary modification, a version of this sequence would become, along with freshman level instruction in humanities, the foundation of a threefold program of instruction for all undergraduates at Georgia Tech. As noted above, freshman level work in American history and American government presently satisfies state requirements for demonstration of competency in this field. One mode of the experimental sequence includes those two courses plus a course in either sociology or philosophy, both of which are currently offered as electives. These would be adapted to the core material.

Among our colleagues in the School of Social Sciences there exists a commitment to excellence in teaching and dedication to meeting the needs of our particular students. There is, however, a wide variety of opinion about how one should proceed. For that reason, we acknowledge that more time is needed for a discussion of approaches and specific course content in the proposed experimental freshman sequence. While the format of the three mode experiment outlined below can be considered fixed, the specific content which is mentioned should be viewed as illustrative, pending further discussion of it among our faculty as a whole. The Exxon core group spent several months reaching a general consensus on these matters, and our colleagues need time to help us arrive at a shared synthesis of course content.

1. Structure

The proposed experiment for teaching an introductory sequence in the social sciences must satisfy the requirements of (1) Georgia law, (2) feasibility of scheduling, and (3) intellectual integrity. To satisfy these requirements, the proposed courses must first sufficiently cover themes presented in U.S. history and government, History 1001 or 1002 and Political Science 1251.

The feasibility of the experiment has been assured through the cooperation of two large degree granting units of the Institute. About 330 freshmen will be made available by the schools of Mechanical Engineering and Information and Computer Science. The Directors of these schools have agreed to cooperate in reserving a common time for their freshman majors to register for the experimental courses during the Fall, Winter, and Spring quarters of the 1981-82 academic year.

After registration the students will be randomly assigned to one of the three experimental conditions. Each "condition" will consist of a three course sequence described below. Regardless of the sequence to which they are assigned, the students will be pretested at the beginning of the Fall Quarter. This pretest will measure both humanities and social sciences knowledge--historical facts, rudimentary concepts, and approaches--and the expectations of what the students intend to learn, including their preferences for course format, evaluation procedures, and instructor's teaching style. At the end of each course in the sequence, the students will be tested again for understanding gained and an assessment of that quarter's course format and instructor's effectiveness. At the end of the academic year, the entire sequence will be evaluated

using closed and open-ended questions in an instrument administered in class and completed anonymously. (Code numbers assigned at the outset of the experiment will allow us to gauge changes in individuals and aggregated over each condition during the academic year.) In addition, we plan to re-survey the participants at the end of their sophmore, junior, and senior years to measure the enduring effects of each condition, as well as the student's views of the sequences compared to other courses and programs at Tech. Other evaluation strategies are described in the Appendix to this section.

The third requirement that the proposed experiment must satisfy is intellectual integrity. This refers to the core content of the courses and, equally crucial to the experiment, the organization and presentation of that material. We have defined three alternative modes of organization. Each features a particular instructional format. These will differ significantly from condition to experimental condition. We outline these modes here.

1. Disciplinary Control Mode. This is designated a control or baseline mode only in that it is most similar to the introductory courses which are currently offered. In this mode, introductory courses would retain their disciplinary identification. Students would be required to complete a three course sequence including History 1002, Political Science 1251, and Sociology 1376 or Philosophy of Science and Technology 1126.

Because this mode requires four disciplines to participate in a three course sequence, there must be two versions of this experimental condition; both feature the presently required history and political science courses,

but the third course in Mode 1.a. would be sociology, and in 1.b., philosophy of science and technology. However, if the participating faculty are to approach these courses as part of a sequence in which core material is to be taught, then two separate sequences, each with different faculty, are necessary. Clearly, coverage of core material in a sequence where philosophy replaces sociology. Each course in this mode would be taught by an individual instructor, with coordination among the three course instructors in this sequence to determine how and where core materials are covered.

Finally, to measure the interactive effect of this disciplinary method of presentation and class size, 1.a. and 1.b (see Table IV.1) will be assigned a different number of students. Such a "control" will allow for comparison of the different modes with class size held constant.

ii. Multidisciplinary Faculty Leader Mode. In this mode, courses would be designated as disciplinary, but would draw on the expertise of other faculty members as that expertise impinges on particular core course topics, themes or approaches. Thus, for example, the political science taught under Mode 2 would be directed by a political scientist who might utilize the insights of a philosopher when discussing the philosophy of American constitutional development, an historian when discussing the evolution of American federalism, and a sociologist when discussing American political socialization. A series of well coordinated guest lectures would, in essence, make this a multidisciplinary course. However, within the four-discipline, three course structure, the role of guest lecturer would fall chiefly to a philosopher who would be responsible for lecturing on philosophical themes within the core

material and would, like other visitors to the classroom, play a gadfly role, a role for which there is no little historical precedent.

The first two courses here would be, as in Mode 1, introductory history and political science, with the third in the sequence being sociology. The degree of cooperation required would be considerable, not only to develop the teaching schedule and to assure that all core materials are covered, but also to assure equitable teaching loads for the four involved faculty over the course of a full year.

iii. Interdisciplinary Team Taught Mode. In this mode, four professors would jointly develop a year long sequence in which all core material would be covered but organized and presented as those professors saw fit. Cooperation and interaction among them would be intense. They would be responsible for creating a new sequence and distributing the workload in a coherent and equitable fashion. All four members of the instructional team would participate in all three of the courses on a regular basis. Thus, this mode is more labor intensive than the other two modes, in which each instructor would be regularly involved in only one course during the year long sequence. Because we are attempting to hold the student-faculty ratio constant at 35:1 in all of the experimental conditions, the class size in Mode 3 will be larger than in the other two versions of the course. Our survey of students enrolled in humanities and social sciences courses at Georgia Tech indicated that attitudes toward such courses tended to vary with class size. In order to offset the observed dislike for such large classes, the courses in Mode 3 (and in 1.b.) will include weekly discussions sessions conducted by members of the instructional team.

Thus, the format in Mode 3 will be two lectures followed by one discussion, although any one lecture might be shared by more than one lecturer, depending on the topic and the design of the syllabus for the sequence. Because the sequence in this experimental mode will not contain three distinct disciplinary courses, its organization will necessarily differ from the other conditions; a greater part of its success, admittedly, may depend on the interaction among members of the faculty team. The following table summarizes the mechanics of the proposed experiment, according to the three instructional modes described above.

TABLE IV.1

Plan of Experiment: Introductory Social Science Sequence --**

Key Dimensions and Instructional Modes

	Disciplinary		Multidisciplinary	Interdisciplinary
	1.a.	1.b.	2	3
Courses	Hist. Pol. Sci. Phil.	Hist. Pol. Sci. Soc.	Hist. Pol. Sci Soc.	U.S. Ind. Culture I II III
No. of Students	35	105	48	140
Discussion Sections	no	yes	no	yes
No. Participating faculty	3	3	4	4
E.F.T. Totals*	.25	.75	.33	1.00

A yearly ratio of 35 students/.25 faculty Equivalent Full-Time (E.F.T.) will be maintained in all cases. In the cross disciplinary cases, 2 and 3, each of the participating faculty will be from a different discipline (history, political science, sociology, philosophy).

Total number of students = 328* Total number of faculty = 14*

**Variations in this experimental sequence will depend upon levels of funding.

2. Core Material to be Covered in the Experiment

With the structure of the experiment in mind, we present a tentative list of core topics which would be addressed in each sequence and a set of general propositions which would apply to Modes 2 and 3, and, in most respects, to the "control" mode as well. The set of propositions represents a consensus of opinion among the Exxon core group. It is much more tentative than definitive, and suggests a common core of topics to be discussed rather than an inclusive itemization. We recognize the need, in all modes of the experiment, to have both comparability of content and the opportunity for participating faculty to be creative in the presentation of material in different ways. The list of proposed core topics, like the set of general proposition, grew out of discussions about what might be included in a unified sequence of courses involving all of our disciplines.

It will be the responsibility of all the participating faculty members to proceed from these tentative topics to a set of agreed upon core themes for inclusion in the experiment. It would likewise be the responsibility of the four faculty teams to design syllabi that incorporate each core theme. General discussion of these matters among the school faculty is already underway. Specific operational planning, including the preparation of syllabi and the selection of reading materials, would take place in the summer preceding the academic year of 1981-82, as would the designing of evaluation instruments.

1. Some General Propositions Concerning a Required Freshman Sequence in the Social Sciences.

a. It is highly desirable to present the student early in his or her career with an integrated, holistic view of man, society, and the environmental context of human life. The integration that we propose will require interaction between the various disciplinary perspectives in the department. This process will involve both

the presentation of these various perspectives--each with its own subject matter and methods of operation--and a demonstration of how through joint consideration of common issues, themes, and problems, they may modify and enrich each other, and thus provide the student with a more unified way of analyzing the social world.

b. A required freshman sequence offered by this department should include the professional insights and expertise of philosophers, sociologists, and anthropologists, as well as historians and political scientists. A sequence ought to be designed in such a way that all members of the department can participate as equal partners, with each one free to teach and to "profess" as he or she thinks best. There is obviously a tension between the ordering of a sequence of courses and the freedom of the individual professor. But with a modicum of collegial tolerance and with mutual commitment to a shared task (the education of human beings who are becoming professionals in one field or another), this tension can be creative rather than debilitating.

c. Freshman courses should not be "survey" or "introductory" courses in the sense of a course that is designed to orient a particular professional specialization. They should introduce the educated (or educable) layman to the key issues, problems, and substantive themes of the area in which the course is being offered. That is not to say that the courses should be less rigorous, only different from introductory courses of the kind mentioned. The courses should also, insofar as possible given the constraints of time and class size, give the student a chance to see a professional in that field practicing his or her craft. It is essential that students see the social sciences and humanities as processes of problem solving, with applications to their own personal and professional lives, rather than as a mass of predigested material which is to be regurgitated and then forgotten.

d. Because of the "legislative mandate" and because our teaching mission includes the responsibility of preparing students for enlightened citizenship, the freshman sequence should concentrate geographically on the United States and include (but not be limited to) a study of American history and government. However, the courses must also be designed to combat strenuously the ethnocentricism which most of our students bring to the classroom by placing the American experience in a comparative framework, socially, economically, intellectually, and politically, and by emphasizing the role of the United States in world affairs.

e. Some organizing themes and principles are essential to make sense of the mass of material to be presented in the freshman sequence. Some degree of uniformity and continuity within and between the courses in the sequence is necessary. Agreement on what the organizing themes and principles should be needs to come out of a discussion among the people who will teach the courses rather than from the edict of any committee. One organizing theme which the Exxon core committee believes is particularly appropriate is the broad theme of "industrial culture". That is, a central task

of the courses and of the sequence as a whole would be to explain how industrialized and urbanized America got to be like it is. To name this one theme is not to exclude others from the sequence or to exclude discussion of the "roads not taken" along the way to our present state of affairs. The intention is rather to suggest that industrial culture is an appropriate central theme which could focus and "discipline" our freshman sequence.

2. Suggested Topics: Introductory Social Science Sequence.

Although the primary emphasis of the core materials is on helping students to understand the present-day American society in which they live, this goal can be achieved in a variety of different ways. The roots of our national development and the thread of continuity in our nation's institutions and beliefs must if necessity be sought in an earlier period, but the political, social, technological, and cultural factors of earlier years must also be continually related to our present concerns in industrial and post-industrial America. Different teams with different backgrounds and skills will necessarily develop somewhat different ways of conveying this material in an intellectually coherent manner. The following are a few of the major themes which our introductory experimental sequence will seek to present to the students:

(1) The political dimension of American development provides an essential framework within which other social, technological, and cultural aspects of American life and relations with the broader world can be understood. Of particular importance in understanding such topics is an appreciation of the historial and philosophical issues which underlay the settlement of the English colonies in North America, the creation of the United States Constitution, the evolution of federalism and the separation of powers, and the development of primary political institutions such as the presidency, the congress, the judiciary, and the evolving government bureaucracy. Students must begin to appreciate the complex ways in which such political structures are related to the growth of other aspects of American society.

(2) Closely related to the evolution of American political institutions in the development of an increasingly complex and highly differentiated society, characterized particularly during the past century by processes of industrialization and associated social and technological changes. These include the rise of professionalism, the dominance of the market place, and the growth of the urban America. Within this context, ethnic and cultural conflicts have played an important role and basic social institutions such as the family, religion, and education have undergone significant changes. Students will be encouraged not simply to understand the development of this complex American society, but also some of the important alternative visions of the future of that society, both at home and in relation to the larger world.

(3) Integrally related to such political and social developments is the overriding importance, especially during the past hundred years, of science and technology as forces shaping American life. The social and intellectual roots of our concerns with science and technology will be closely analyzed and the integral connection of such powerful forces to our present lives will be stressed. Particular attention will be given to the processes of stratification that characterized industrial development and the distribution of political and economic power in government and social structures. More recent impacts of technological change on the form and substance of politics and on social development will be discussed, along with the growth and character of technical rationality and its reflection in bureaucratic organization. The information and methods analysis conveyed to the students should equip them more effectively to deal with possible future trends and developments.

(4) A final important area which this proposed sequence will attempt to present is a comparative and cross-cultural one. Comparative investigation--both temporally and intellectually--is implicit in any serious study of political, social, and technological development, of course. Modern institutions must be compared with those of the past, and alternative approaches to major issues must be presented, and their various strengths and weaknesses analyzed. In addition, however, we feel that the fullest understanding and appreciation of American institutions--past and present--necessitates comparison and contrast with similar institutions elsewhere in the world. In an increasingly interdependent age, our goal is to equip students to reflect on and deal effectively with issues affecting both American life and the world. A sympathetic understanding of social and cultural differences throughout the world is necessarily a part of preparing students to appreciate the distinctive strengths and weaknesses of modern America.

3. Schedule of Activities

The plan of work for this project is straightforward. Background research and initial planning for the proposed experiment has been going on for eighteen months. Departmental endorsement for this experiment has been secured, and discussion of the proposal and related issues is now underway. Before June 1981 the remaining positions in the corps of instruction for this experiment will be filled from among the members of the School who have already volunteered their services for that purpose. In the summer of 1981 final course planning and development of evaluation instruments will take place. Some version of the experimental courses would be offered

during the three quarters of the 1981-82 academic year. Evaluation, curricular recommendations, and final report writing will take place in the summer of 1982.

4. Institutional Commitment to the Experimental Introductory Sequence

Most of the cost of the introductory sequence will be borne by Georgia Tech. We requested, but failed to receive from NEH, funding to the experimental courses. But Georgia Tech has already agreed to pay instructional costs for the experiment itself during the 1981-82 academic year. Additional funds are now being sought from several sources for the final evaluation and report writing phase of the project.

The experiment itself is of such a large scale that Georgia Tech's nominal commitment of funds is quite large; it involves fourteen faculty members and over 300 students, or approximately 15% of the total who would be involved annually if and when the pilot program is fully implemented. However, since these experimental courses are to be alternatives to freshman courses already being offered, the instructional cost is largely a reallocation of teaching resources rather than a commitment of new funds. There is a slight difference in cost because the student faculty ratio in the experimental courses will be somewhat lower than in our existing freshman courses, but the difference is not large enough to strain departmental or institutional resources during the year of experiment. The responsible administrative officers have agreed to the necessary budgetary reallocations. The Director of the School of Social Sciences has not only authorized this budgetary commitment, but has also agreed to participate in the experiment as an instructor. The President of the Institute, as well as the Dean of the College of Sciences and Liberal Studies has been enthusiastically supportive of our study of

the humanities and social sciences in professional education. In addition, the Exxon core group has discussed some or all of the ideas presented here with numerous administrators and faculty members around the campus, and has been gratified by the high degree of support which our colleagues have indicated. The Director of Registration and Records approved in principle the assignment of several hundred freshmen to the experimental courses, and Directors of the large schools on campus have authorized us to enroll their freshmen in them.

Given this "blessing" of the experiment by administrators and faculty, we are optimistic about the long term prospects for implementation. Of course, we cannot say which of the three experimental modes will prove most successful, nor can we say with certainty that a recommendation for major changes in required courses will finally be adopted by the School of Social Sciences and the Institute. However, our study of the role of the humanities and social sciences in professional education has, from its inception, had the twin objectives of (1) developing a comprehensive plan for organizing liberal sutides which reflected the intellectual and professional needs of the students rather than the sedimentary layers of administrative and departmental happenstance, and (2) devising such a program in a way which would recognize and build on past efforts to strengthen liberal studies at Georgia Tech within the boundaries of the thirty-six credit hours presently allocated to the humanities and social sciences, and provide mechanisms for implementation with little or no net increase in instructional cost.

C. Advanced Undergraduate Instruction in the Social Sciences and Humanities: Beyond the Smorgasbord

In our survey of engineering education literature and in our discussions with members of the Georgia Tech community, we encountered

repeated statements of concern about the use of a free elective or distribution system for the humanities/social sciences component of professional education. Such concerns, of course, are not restricted to persons involved in engineering education, but are by now a major focal point of curricular reform in higher education in the 1980's. The student's freedom to choose from among a bewildering smorgasbord of specialized courses without necessarily constructing a coherent sequence has diluted as well as fractured the educational experience of many American college students. In many instances as academic Gresham's law has driven stimulating but demanding courses from the "marketplace." And when courses may be taken at random with few prerequisites or none at all, then each course must of necessity be reduced to an introductory level, whatever the nominal designation.

As noted above, Georgia Tech's present requirements in the humanities and social sciences are primarily of the smorgasbord variety. With the exception of stipulated courses in history, government, and literature, students are free to choose from among a very large number (102) of courses in satisfying an 18 hour distribution requirement in social sciences and an equal requirement in humanities. When the 36 hour requirement was instituted a decade ago, the Institute's catalogue announced that students would be assisted in fashioning integrated sequences of courses, but no lasting mechanism for accomplishing this laudable objective was instituted. Hypothetically, and in some cases actually, students may fulfill all of their 36 hour requirement by taking an eclectic mixture of survey courses. Courses need not even be taken at an advanced level.

The present distribution requirement is part of a "Core Curriculum" which the state university system has mandated for all of its academic

units. This core curriculum created, for the first time on the Tech campus, a rigid distinction between "humanities" and "social sciences" by requiring that a certain number of hours be completed in each. A previous distribution requirement in effect had a composite requirement in liberal studies. This rigid distinction is in some cases arbitrary as in labeling history and philosophy as social sciences, but not as humanities, and in some cases stifling when it prevents cross disciplinary or cross departmental offerings of courses with a natural topical affinity. We believe that with regard to courses beyond the introductory level, the distinction between the humanities and social sciences ought to be eliminated. Our recommendation is based, in part, on the conviction that most of the coursework offered under both rubrics at Georgia Tech is essentially "humanistic" in that it is concerned with broadening professional student sense of the world around them, with expanding their critical self consciousness, and with helping them to see connections between society and their professional world.

In sum, we perceive two sets of problems associated with the present distribution system. First, it allows students to complete the humanities/social science component of their professional education without a sustained, coherent concentration of coursework and without necessarily progressing to advanced level work on a par with the advanced requirements in their major fields. And second, the system creates an artificial barrier between fields of study which share common aims and which could profitably collaborate in the preparation of Tech students for living and working in the twenty-first century.

Our recommendations for change in this area are rather modest, but if implemented they could, we believe, substantially improve the quality of our student's liberal education without altering the number of hours

devoted to it. We do not propose a return to the lock-step curriculum against which the elective system was offered as a reform. Rather, we propose that all students be required to complete an introductory year long sequence of courses in the social sciences and a similar sequence in the humanities. Beyond these introductory requirements, we propose that all students use at least part of their remaining 18 required hours to complete one or more "tracks" or sequences of courses from a single field of study or relating to a single major theme in the humanities and/or social sciences. Each student's sequence would consist of at least three advanced level (3000-4000) courses selected from approved tracks. This tracking system could be modeled on the sequences presently offered under the certificate programs in the School of Social Sciences and the Department of Modern Languages and proposed in the Department of English. This proposed tracking system differs from the present certificate program in two crucial respects. First, <u>every</u> student would select a track and complete a sequence of courses in it. Second, the barrier between humanities and social sciences would be breached to allow for tracks of topically related courses which cut across present departmental lines and to allow students, if they chose, to expand their tracks beyond nine hours in either humanities or social sciences.

These track sequences would form the heart of our students' advanced level work in the social sciences and humanities. In addition to tracks such as those presently offered in the humanities/social sciences certificate programs, we might also offer (1) tracks specifically designed to complement the professional training offered in the various major fields, e.g., a track in economics/economic history for management majors, (2) tracks which bring to bear the competences found in various departments

on a single topic, e.g., American studies, and (3) tracks, perhaps more extensive than others, which would serve the needs of students whose career plans called for some combination of foreign language proficiency and social sciences/humanities expertise. The tracks need not be restricted to courses from the three departments primarily responsible for humanities/social sciences instruction (English, Modern Languages, Social Sciences), but would also include courses presently carrying social sciences/humanities credit from economics, psychology, management, architecture, and the engineering schools.

The tracking system would provide a coherent, integrated, advanced level educational experience in liberal studies for each of our students, and would still be flexible enough so that students could pursue a particular sequence in which they had an interest. If the free elective system was the "antithesis" which warred against the old fixed curriculum of collegiate education, then we suggest that this tracking system can become the "synthesis" which builds upon the strengths of both.

We offer here only the most skeletal of outlines for such a system and illustrations of potential tracks. This plan will need to be discussed openly and fully within and among the departments most directly affected, and if a formal proposal for such a system were to be forthcoming, it would best come as a joint recommendation from them to the Tech faculty as a whole.

This recommended tracking sequence program will require a system of formal academic advising in the humanities and social sciences, a benefit to our students which has been lacking in the past and which would be desirable in any sound and integrated program. Although some students might make little use of an advisor outside of their major field, a system

of advising would be crucial both for those students who are uncertain of their educational goals and for more mature students who would need information and advice on courses and tracks appropriate to their career plans and about the range of courses that might be available in a particular track. Where a student had an established relation with a faculty member in the humanities or social sciences in his chosen area of concentration, the selection of an advisor might be a simple matter. Since, however, no formal advising system exists in the liberal studies area, a formulation of policies and procedures for the appointment of advisors will be needed. It should be noted that conscientious and successful advising requires time, skill, and understanding, and is an activity that is appropriately related to academic advancement. Further, it is likely that such advising will require additional personnel.

The necessity for specific and careful advising the interdisciplinary character of many of the possible tracks, and the fact that the tracks are to fulfill both humanities and social science credit hours are aspects of this recommendation which will require new modes of cooperation among various academic units of the Institute. The successful implementation of the tracking sequences will necessitate the creation of representative faculty mechanisms for their coordination.

To illustrate further what a tracking system might look like, we have appended (see Appendix B) a list of the options presently available in the humanities/social sciences certificate programs, a proposal for a cross departmental track in American civilization, and some thoughts on tracks combining language training and career specific work in the social sciences.

IV. The Senior Honors Thesis

One of the results of our student survey was a strong preference of the students for courses which link the humanities and social sciences to their major subjects at the end of their undergraduate studies. In addition, some students desire the opportunity to pursue advanced studies in the humanities or social sciences. To meet these expressed needs, an optional senior honors thesis is recommended. It would provide a capstone for student work in the humanities and social sciences. Although the honors thesis would be optional, its successful completion in conjunction with the remaining elements of the undergraduate humanities and social sciences program will result in appropriate recognition and an honors certificate. The certificate requirements will supplement those current in the humanities and social sciences.

The honors thesis itself is an optional project representing six quarter hours of effort in the humanities and social sciences during the student's senior year. Students wishing to write a thesis need the consent of the relevant humanities or social sciences school or department. Ideally, it would be possible for up to three hours of credit to count as a technical elective in the student's major field if it were involved. The output of the project will typically be a paper, but other forms of presentation should not be ruled out in suitable circumstances. In the cross field case, the thesis will be jointly directed by a professor of humanities or social sciences and by a faculty member in the student's major field. An honors thesis in the humanities and social sciences will be directed by a single faculty member in the relevant field.

While the honors thesis will probably be elected by a minority of students, it presents an opportunity for a significant piece of work either

bridging the humanities and social sciences with professional activity or within the humanities and social sciences.

Appendix A

Roster of Contributors*

Core Group

Daryl E. Chubin
Jon J. Johnston
Paul Mayer
Robert McMath
Daniel S. Papp
David H. Ray
Frederick A. Rossini
Ward O. Winer

External Support Group

James Gough, Jr.
L. Hugh Moore
Dale C. Ray
John Templer
Gerrit Wolf

Internal Support Group

Stanley R. Carpenter
August Giebelhaus
Morris Mitzner
Diana Velez
Jay A. Weinstein

Support Group from the Department of English

Sara M. Putzell
Robert P. Reno
J. Steven Russell
James D. Young

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*In addition to the various individuals and groups who contributed directly to this report, the Faculty of the School of Social Sciences met on several occasions to formally consider various drafts of the report from the Exxon core group. The final report reflects this Faculty's contribution in many ways. Difficulties were foreseen which had been overlooked, substantive emphases were clarified and altered, and valuable advice was received concerning the impact of the report on the campus as a whole. A variety of suggestions were incorporated in various sections of the report, and the Faculty's assistance in further development of the experimental course sequence was crucial. Over half of the Faculty volunteered to participate in this experiment, and it was also unanimously agreed that participation or non-participation in the experiment should not affect faculty advancement, renumeration, or staffing. At a meeting called for a final discussion of the Report on February 11, 1981, the Faculty unanimously accepted the Recommendations of the report.

Appendix B -- Sample of Tracks

a. TOPICAL TRACKS FOR SOCIAL SCIENCE COURSES

1. INTERNATIONAL STUDIES

HIST 3001 Western Civ. 1500-1789
HIST 3003 19th Century Europe
HIST 3004 World Problems Since 1914
HIST 3020 American Diplomatic History
HIST 3040 Recent Latin American History
HIST 3786 Immigrant Experience
PST 3102 History of Ancient Philosophy
PST 3103 History of Modern Philosophy
PST 3104 Contemporary Philosophy
POL 1253 Comparative Political Systems
POL 3203 National Defense Policy
POL 3204 US Military Policy
POL 3205 US Foreign Policy
POL 3265 Latin American Governments and Politics
POL 3266 Developing Nations
POL 3270 Western European Governments and Politics
POL 3275 Foundations of National Power and International Relations
POL 3276 International Organizations
POL 3280 Communist Political Systems
POL 3281 Soviet Foreign Policy
POL 4211 Science, Technology, and World Policy
POL 3310 Demographic Analysis
POL 4308 Seminar in Contemporary Urban Society

2. URBAN STUDIES

HIST 4075 The City in American History
POL 3217 State and Local Government
POL 3220 Urban Government and Political Problems
POL 3221 Urban Political Problems
POL 3222 Urban Public Policy
SOC 3306 Urbanization
SOC 3339 Urban Sociology
SOC 3340 Urban Ecology and Demography
SOC 4308 Seminar in Contemporary Urban Sociology
SOC 4312 Seminar in Comparative Urban Development

3. SCIENCE, TECHNOLOGY, AND SOCIETY

HIST 1028 Intro to the History of Science and Technology
HIST 3015 Survey of Sciences in the 16th and 17th Centuries
HIST 3016 Survey of Sciences in the 18th and 19th Centuries
HIST 3030 Technology and Economic Change
HIST 3037-8-9 History of Technology
HIST 4008 History of Technology in the US
HIST 4016 History of Electrical Science and Technology
PST 1127 Science, Technology and Human Values
PST 3102 History of Ancient Philosophy
PST 3103 History of Modern Philosophy

PST 3104 History of Contemporary Philosophy
PST 3120-1-2 Philosophy of Science
PST 4106 Philosophy of Behavioral and Social Sciences
PST 4107 Philosophy of Technology
PST 4110 Theories of Knowledge
PST 4115 Philosophy of Science
POL 4210 Science, Technology and Public Policy
POL 4211 Science, Technology and World Politics
POL 3335 Social Problems of Industry
POL 4306 Technology and Society
SOC 3501 Sociology of Science

4. AMERICAN STUDIES

HIST 3102 History of Georgia
HIST 3013 US Colonial History
HIST 3017 American South to 1865
HIST 3018 American South since 1965
HIST 3020 American Diplomatic History
HIST 3022 Afro-American History
HIST 3024 American Civil War
HIST 3025 American Economic History
HIST 3028 US Social/Intellectual History
HIST 3786 The Immigrant Experience
HIST 4008 History of Technology in the US
HIST 4025 US since 1917
HIST 4050 20th Century Black History
HIST 4075 The City in American History
POL 2271 American Political Thought
POL 3203 National Defense Policy
POL 3204 US Military Policy
POL 3205 American Foreign Policy
POL 3210 National Legislative Policy
POL 3211 American Presidency
POL 3216 American Political Parties
POL 3220 Urban Government and Political Problems
POL 3221 Urban Political Problems
POL 3222 Urban Public Policy
POL 3250 Public Administration and Public Policy

5. MANAGEMENT/BUSINESS/ORGANIZATIONAL BEHAVIOR

HIST 3025 American Economic History
HIST 3030 Technology and Economic Change
HIST 49XX Business History (proposed)
POL 3250 Public Administration and Public Policy
POL 4150 Policy Analysis and Evaluation
SOC 3335 Social Problems of Industry

6. ARCHITECTURE/PLANNING

HIST 4075 The City in American History
PST 4106 Philosophy of the Behavioral and Social Sciences
PST 4107 Philosophy of Technology
POL 3217 Local and State Government
POL 3220 Urban Government and Political Problems
POL 3221 Urban Political Problems
POL 3222 Urban Public Policy
SOC 3306 Urbanization
SOC 3335 Social Problems of Industry
SOC 3339 Urban Sociology
SOC 3340 Urban Ecology and Demography
SOC 4308 Seminar in Contemporary Urban Sociology
SOC 4312 Seminar in Comparative Urban Development
SOC 3338 Individual and Society

7. PUBLIC POLICY

POL 3203 National Defense Policy
POL 3204 US Military Policies
POL 3210 National Legislative Processes
POL 3211 The American Presidency
POL 3217 State and Local Government
POL 3222 Urban Public Policy
POL 3250 Public Administration and Public Policy
POL 4250 Policy Analysis and Evaluation

8. HISTORY OF SOCIAL THOUGHT

HIST 3028 US Social and Intellectual History
PST 3102 History of Ancient Philosophy
PST 3103 History of Modern Philosophy
PST 3104 History of Contemporary Philosophy
PST 3105 Types of Ethical Theory
PST 3107 Comparative Religions
POL 2271 American Political Thought
POL 3200 American Constitutional Problems
POL 3280 Communist Political Systems
POL 4200-1-2 Political Theory
SOC Many Sociology courses would be appropriate here.

9. INDIVIDUALLY DESIGNED TRACKS

An integrated sequence of courses organized around some topical theme proposed by an individual student and approved by a responsible faculty.

b. TRACKS FOR STUDENTS WITH A STRONG INTEREST IN MODERN LANGUAGES. IN ADDITION TO GERMAN, TRACKS CAN BE DESIGNED IN FRENCH, SPANISH, AND RUSSIAN, AS WELL AS LINGUISTICS.

German Civilization - (18 Hours Total - 9 in Soc. Sci. and 9 in Hum.)

Prerequisites: 2 years of German in High School or German 1001-2-3

Social Science Options

German	2001	German	4092
	2002		4093
	2003	History	3001
	3011		3003
	3012		3004
	3013	Pol	3270

Humanities Options

German	3001	German	4001
	3002		4002
	3003		4003
German	3031	German	4023
	3032	German	4091
	3033	Ling.	4076
German	3041		
	3042		
	3043		
German	3004		
German	3051		

c. PRELIMINARY THOUGHTS ON "MEGATRACKS" IN SOCIAL SCIENCE/MODERN LANGUAGE

These tracks would be designed for students who contemplate careers overseas or in the United States for which bilingual proficiency and cross cultural expertise are essential. These tracks would combine course work in the social sciences which is linked to the person's professional education (such as in international economics or Latin American government and politics) with course work in a particular language which the person will have need of. These tracks would go beyond the envisioned 18 hour track which we may propose as a requirement of all students and would consist of 24 to 30 hours. The additional 6 to 12 hours would be an overload rather than a replacement for any of the 18 hours in the humanities - social science requirement which are not to be dedicated to the tracking position.

The megatracks would consist of two parts, and maybe three:

1. A series of thematically related courses, international and cross cultural in their focus, from the social sciences (12 hours).

2. Language proficiency and cultural awareness in either Spanish, French, German, or Russian (12 hours).

3. (optional) An honor's thesis related to the course work in parts 1 and 2 and the student's major field (6 hours).

Such cross cultural and language-intensive tracks might be developed relating to the following topics:

1. International business
2. Architecture and city planning
3. Science, technology, and society
4. Comparative cultures
5. International relations

Taking the first of these possible tracks as an example, a student might put together a package consisting of 12 hours in a particular language and 12 hours of social science coursework from the following list:

HIST 3004 World Problems Since 1914
3020 American Diplomatic History
3040 Recent Latin American History
3030 Technology & Economic Change
49XX Business History
POL 3205 US Foreign Policy
3265 Latin American Governments & Politics
3266 Developing Nations
3270 W. European Government & Politics
3280 Communist Political System
3281 Soviet Foreign Policy
4211 Science, Technology & World Politics
SOC 3310 Demographic Analysis
4308 Seminar in Comparative Urban Development
ECON 3401 European Economic History
3410 Economic Development
4300 International Economics
4330 Regional Economics
4410 Industrial Development in Latin American
4160 Management Concepts and Issues in World Business
4335 International Marketing

d. AMERICAN STUDIES

Track 1. American Civilization

Required Courses:

Hist. 3028, U.S. Social and Intellectual History
Eng. 2007, Survey of American Literature

Optional Courses (must take a minimum of 2 from each group);

ENG 3076, Faulkner
ENG 3786, The Immigrant Experience (Hist. 3786)
ENG 4042, Studies in Drama: O'Neill, Williams, Miller
ENG 4041, Studies in Novel: Twain, Dreiser, Hemingway
ENG 4043, Studies in Poetry: 19th & 20th Century U.S.
ENG 4081, Themes & Problems: The City in American Fiction
ENG 4803, Special Topics: Afro-American Literature
ENG 4804, Special Topics: Contemporary American Literature

HIST 3010, History of the United States to 1865
HIST 3011, History of the United States from 1865 to the present
HIST 3013, United States Colonial History
HIST 3020, American Diplomatic History
HIST 3025, American Economic History

HIST 3022, Afro-American History
HIST 3024, The American Civil War
HIST 4008, History of Technology in the U.S.
HIST 4025, The United States Since 1917
HIST 4075, The City in American History
POL 2271, American Political Thought
POL 3205, American Foreign Policy

Correlate courses that may become options:

ARCH 4206, History of Architecture in the United States
SPAN 3001, Spanish-American Literature before 1895
SPAN 3002, Spanish-American Literature since 1895

Track 2. Southern American Studies

Required courses:

HIST 3028, U.S. Social and Intellectual History
ENG 2007, Survey of American Literature

Optional courses (minimum of 2 from each group):

ENG 3076, Faulkner
ENG 3081, Seminar on Eighteenth and Nineteenth-Century Southern American Literature
ENG 3082, Seminar on Twentieth-Century Southern American Literature
ENG 4801, Special Topics: The South in Film

HIST 3012, History of Georgia
HIST 3017, History of the Old South to 1865
HIST 3018, History of the New South since 1865
HIST 3024, The American Civil War
SOC 4999, Special Problems: Contemporary Southern Sociology

Track 3. Urban Studies

Required courses:

HIST 4075, The City in American History
POL 3220, Urban Government and Political Problems
SOC 3339, Urban Sociology

Optional courses:

POL 3221, Urban Political Problems
POL 3222, Urban Policy
SOC 1378, Social Problems in a Changing Society
SOC 3306, Urbanization
SOC 3340, Urban Ecology and Demography
SOC 4308, Seminar in Contemporary Urban Sociology
SOC 4312, Seminar in Comparative Urban Development

Correlate courses:

ENG 4081, Themes & Problems: The City in American Fiction
ENG 4082, Themes & Problems: The Changing Image of Urban Man in American Fiction
ARCH 3402-21-41, Urban Planning, Facilities Planning, Building Economics
ARCH 3780, Introduction to Urban Engineering
ARCH 4771-2, Urban Systems Design

Track 4. Minority Studies

Required courses:

SOC 3330, Ethnic Minorities in American Society

Optional courses:

POL 4755, Sex Roles: Their Development and Cultural Influence
HIST 3022, Afro-American History
HIST 3786, The Immigrant Experience (Eng. 3786)
HIST 4050, Twentieth-Century Black History
HIST 4925, Special Problems: Women in American History
HIST 4803, Special Topics: Afro-American Literature
HIST 4805, Special Topics: American Women Writers
HIST 4806, Special Topics: Jewish American Literature
HIST 4807, Special Topics: Contemporary Ethnic Literature

Track 5. Studies in American Political Life

Required courses:

POL 1251, Government of the United States
POL 2270, Introduction to Analysis of Political Behavior
POL 2271, American Political Thought

Optional Courses (minimum of 2 from each group)

POL 3210, National Legislative Processes
POL 3211, The American Presidency
POL 3215, Public Opinion
POL 3216, American Political Parties
POL 3217, State and Local Government
POL 3220, Urban Government and Political Problems
POL 3221, Urban Political Problems

HIST 3010, History of the United States to 1865
HIST 3011, History of the United States since 1865
HIST 3028, U.S. Social and Intellectual History
HIST 4025, The United States since 1917
ENG 4808, Special Topics: The American Political Novel
ENG 4809, Special Topics: Politics and Film

Appendix C

Evaluation Strategies for the Experimental Introductory Course Sequence

A. Objectives

The instructional experiment is designed to achieve the following:

1. The establishment of an intellectually satisfactory and organizationally feasible set of themes for a year long introductory course in the social sciences for scientific and professional students.

2. The determination of the most appropriate mode--disciplinary multidisciplinary, or interdisciplinary--for imparing such instruction considering the following equally weighted criteria:

   a. Retention of specific knowledge and familiarity with methods of inquiry which are the province of the humanities and social sciences.

   b. Ability to relate this knowledge to professional curricula and other aspects of experience.

   c. Appreciation of the humanities and social sciences as significant and useful intellectual endeavors.

   d. Equipment for continued learning in the humanities and social sciences.

B. Personnel

In addition to the instructors themselves, who will meet regularly during the experiment to assess its progress, evaluations will be conducted by the following:

1. A panel of four or five external senior scholars in fields related to the content and objectives of humanistic study as a part of science based professional education. They are yet to be named, but will be selected prior to the planning phase of the project. We shall seek to assemble a distinguished panel from among such persons as Peter Berger, Rutgers University; Robert Dahl, Yale University; Edward E. David, Jr., President, Exxon Research and Engineering Company; Henry Knepler, Illinois Institute of Technology; Leo Marx, MIT; and Michael Scriven, University of San Francisco.

2. An internal panel of members of the School of Social Sciences including those with special interests and expertise in program evaluation. One member of this panel will be Melvin Kranzberg, Callaway Professor of History at Georgia Tech. The

evaluation process will include a major contribution from John Havick, who attended the Program Evaluation Institute of the University of Massachusetts.

3. The Exxon core group. This group will be responsible, under the leadership of the project director, for coordinating the work of the various groups and individuals involved in the evaluation process. This group will also be responsible for preparing a final report and for making specific recommendations for implementation to the School of Social Sciences.

4. Departmental Faculty. In the final analysis the collective professional judgment of the faculty of the School of Social Sciences will determine what course of action will be pursued concerning curricular innovations.

C. Data to be Collected and Activities to be Carried Out

In addition to information generated through the self-evaluation of the instructional staff, the evaluation process will include the following:

1. Participating students will be surveyed prior to the beginning of the experiment, after each of the three courses, and annually thereafter for three years. The surveys will measure attitudes and preferences, factual knowledge, and skills. Acquisition of specific knowledge may be measured through the use of widely used standardized tests. Evaluation instruments will be prepared during the final planning stage of the project (Summer 1981). Survey and test results will be analyzed both by the senior review panel and by members of the departmental faculty.

2. The senior panel will comment on proposed evaluation instruments, review curricular material, and visit the Tech campus twice during the course of the project. The first visit will occur during the second quarter of the experiment. The panel will visit with participating faculty and students and examine curricular materials and student work. The second visit will occur shortly after the third course is completed. They will then interview the participating faculty and examine the student surveys and any other evaluative materials which have been produced.

3. The Exxon group, along with the faculty of the School will assemble and assess all evaluation material, including reports of the external panel. As noted, the core group will then prepare a final report and make recommendations to the faculty. Our findings will be disseminated beyond the Tech campus to educators involved in the teaching of humanities and social sciences to undergraduate science, engineering, and other professional students, and to other educators in the disciplines

of the humanities and social sciences. To reach that large audience we shall publish findings in pedagogical journals and newsletters both in the humanities and social sciences and in engineering, the sciences, and other professions.

D. Implementation of Recommendations at Georgia Tech

Implementation at Georgia Tech depends on the presentation of this report to the faculty and administration for their consideration and discussion. The recommendations will be discussed before each formal arena of judgment within the Institute and these, no doubt, will be followed by fruitful informal discussions. Implementation is a matter of communication and compromise, and many voices remain to be heard.

One immediate step to be taken by the School of Social Sciences is to offer three alternative modes of the social sciences sequence described above. The School has applied to NEH for funding for this experiment. Its results will be evaluated by the School for recommendation to the Academic Senate. Because there is no single administrative home for the humanities in the Institute, the recommendation of a parallel humanities sequence presents greater difficulties of experiment and implementation. Its consideration should depend on an ad hoc body created for that purpose.

The implementation of a series of upper division tracks will require, quite apart from an agreement as to its desirability, close cooperation between the School of Social Sciences and the Departments of English and Modern Languages, and between these units and others on the campus that offer related upper division courses. The creation of intellectually and pedagogically sound programs and the maintenance of appropriate advising will require formal means of making recommendations to the various responsible academic departments. Similar considerations apply to the senior thesis for it represents a joint project between the humanities and social sciences and the undergraduate degree granting schools and colleges.

Appendix D

Case Study Instruments

Items: Appendix D

An Institute-wide faculty team is conducting a study of humanities and social science education at Georgia Tech. It is our belief that students have a unique understanding of what is really going on at any educational institution. Therefore, we ask you to take a few minutes and give us some perspective on your classroom experiences at Tech. Your responses will be taken very seriously, and could play an important role in improving Tech's course offerings in the humanities and social sciences.

Please do not put your name on this paper.

Do not write in this space

1. What is your major?

2. What is your year in school? (Circle one:) 1 2 3 4 Grad

3. Please list the humanities courses you have taken at Tech. (English, music, modern languages. List by number or course subject.)

4. Please list the social science courses you have taken at Tech. (History, philosophy, political science, sociology, psychology, economics, and some modern language courses. List by department and number or course subject.)

5. On the following scale, how would you evaluate the educational experience in the humanities courses you have taken at Tech?

Consistently Satisfactory						Consistently Unsatisfactory
	5	4	3	2	1	

6. On the following scale, how would you evaluate the educational experience in the social science courses you have taken at Tech?

Consistently Satisfactory						Consistently Unsatisfactory
	5	4	3	2	1	

7. Which of the following terms would you consider applicable to the humanities courses you have taken? (Check as many as necessary.)

____	Stimulating	____	Refreshing Change
____	Impersonal	____	Useful
____	Irrelevant	____	Boring

8. Which of the following terms would you consider applicable to the social science courses you have taken? (Check as many as necessary.)

____	Stimulating	____	Refreshing Change
____	Impersonal	____	Useful
____	Irrelevant	____	Boring

9. When you have registered for elective humanities and social science courses, what was the relative importance of the following factors? (Please rank the factors: "1" for the most important, "4" for the least important. If a factor did not enter your considerations, enter an "X".)

____ The time the course is scheduled
____ Your interest in the subject of the course
____ Something you knew about the instructor's ability
____ Its reputation as an easy course

10. For upperclassmen only: When you have chosen upper-level courses (3000 or above) in humanities and social sciences, how many of them did you choose solely on the grounds that they fit into your schedule?

11. In the average week, approximately how much reading for pleasure (that is, reading which is not an assignment) do you do?

____ Less than two hours ____ 2-5 hours ____ More than 5 hours

12. Roughly what proportion of this reading falls into these categories:

____ Newspapers/Magazines ____ Literature ____ Other

13. At the introductory level, which of the following kinds of courses would you prefer? (Check as many as necessary.)

____ Focused on a single discipline (e.g. history, philosophy, sociology, or political science)
____ Focused on a particular topic cutting across disciplines within the social sciences (e.g. history and sociology of cities)
____ Focused on a particular topic involving social sciences and your major field (e.g. social implications of energy policy)

14. At the advanced level, which of the following kinds of courses would you prefer? (Check as many as necessary)

____ Focused on a particular topic within a single discipline
____ Focused on a particular topic cutting across disciplines within the social sciences
____ Focused on a particular topic involving social sciences and your major field

15. What sort of humanities and social science courses would you like to see offered at Tech?

____ Courses which are explicitly related to scientific and technical concerns of your profession
____ More broadly based courses on a variety of subjects
____ Both of the above
____ No preference

16. For freshmen only: It is normal at any university for new students to receive advice from upperclassmen. As a freshman at Tech, what have you heard from upperclassmen about humanities and social science courses?

17. What kinds of information or skills would you like to acquire in humanities and social science courses at Tech?

18. What things have you liked most about your humanities and social science courses at Tech? What things have you liked least? Please be frank.

(If you need additional space, please write on the back of this page.)

Would you be willing to discuss with us -- in a completely informal setting -- your experiences and opinions on these matters? If so, please write your name, address, and campus/local phone number on the following page. Then detach that page from this survey, and hand it in separately, according to instructions given in class.

Alumni Survey

Instructions. Please answer the following questions as candidly and accurately as possible. Most require no more than a check ( ) or a number, though space is provided for you to elaborate on your answers or comment on the questions we should have asked but did not. For your information, social science credit at Tech may presently be received for courses in history, philosophy, political science, sociology, psychology, and economics, while humanities credit can be received for English, modern languages, and art history.

1. Your major at Tech: _____; year graduated: 19_____

2. Your first job/initial post-Tech experience: (please check one)

   _____ science

   _____ technical/engineering

   _____ management/administration

   _____ architecture

   _____ graduate/professional education in _____ at _____

   _____ military service as _____

   _____ other (please explain): _____

   _____

   _____

3. Length of time spent in first job:

   _____ less than one year

   _____ 1-2 years

   _____ 3-5 years

   _____ more than 5 years

4. Your current job title: _____

5. Present type of work:

   _____ science

   _____ technical/engineering

_____ management/administration

_____ architecture

_____ professional practice (e.g., professional engineer, lawyer, dentist) in _____

_____ military service as _____

_____ other _____

_____

6. Present sector of employment:

_____ government agency

_____ private firm

_____ other (please specify): _____

7. Size of present firm or agency (i.e., number of professional employees):

_____ less than 50

_____ 50-250

_____ more than 250

_____ self-employed/partnership

_____ other _____

8. How satisfied are you with your present job (please circle)?

not at all				very satisfied
1	2	3	4	5

9. How well did your education at Tech prepare you for (check appropriate category):

	not applicable	not at all	little	moderately	very much
a. your first job	_____	____	____	_____	_____
b. subsequent executive or managerial positions	_____	____	____	_____	_____
c. citizenship/civic participation	_____	____	____	_____	_____
d. personal growth (other than professional pursuits)	_____	____	____	_____	_____

10. How would you rate the academic advising you received at Tech:

not available	inadequate	adequate	excellent
1	2	3	4

11. Overall, how satisfied are you with the education you received at Tech?

not at all satisfied				very satisfied
1	2	3	4	5

12. How well did your social sciences and humanities courses prepare you for:

	not applicable	not at all	little	moderately	very much
a. your first job	_____	____	____	_____	_____
b. subsequent executive or managerial position	_____	____	____	_____	_____
c. citizenship/civic participation	_____	____	____	_____	_____
d. personal growth (other than professional pursuits)	_____	____	____	_____	_____

13. How satisfied are you with the social sciences and humanities courses you took at Tech?

not at all satisfied				very satisfied
1	2	3	4	5

14. What, if anything, do you recall about the social sciences and humanities courses you had?

_____

_____

_____

_____

_____

15. Since you have been out of school, how has your perception changed of the potential usefulness to your job, citizenship, etc., of social sciences and humanities courses?

_____ perception has not changed

_____ perception has changed as follows:

_____

_____

_____

16. In general, which courses should be emphasized to prepare better the Tech graduate for:

	the work world	his/her role as a citizen	(check all that are appropriate)
a. business/management/economics	_____	_____	
b. technical writing/public speaking	_____	_____	
c. fine arts & literature	_____	_____	
d. foreign languages	_____	_____	
e. international affairs/ comparative cultures	_____	_____	
f. societal aspects of science/ technology/professions	_____	_____	
g. history	_____	_____	
h. philosophy	_____	_____	
i. politics & government	_____	_____	
j. sociology	_____	_____	
k. other (specify _____):	_____	_____	

17. Some firms encourage their employees to participate in "short courses" on some aspect of the social sciences or humanities. Would you be interested in participating in such a short course?

_____ no

_____ yes; suggested topic (s): _____

_____ _____

18. Would you be interested in attending a 1-2 week institute that would combine intensive instruction with recreation?

_____ no

_____ yes; in Atlanta _____; elsewhere (perhaps a resort area) _____;

comments: _____

_____

19. Please enter in the space below any additional comments.

20. If you reside in the metro Atlanta area, would you be interested in participating in a panel discussion on the role of the social sciences and humanities at Tech (such discussions with current students have proved valuable to us and them)?

_____ no

_____ yes; name _____

address _____

phone _____

If yes, please detach this page and return to the address below. A self-addressed envelope is enclosed for your convenience.

Exxon Project Alumni Panels
Department of Social Sciences
Georgia Tech
Atlanta, GA 30332

EXXON PROTOCOL

For Small Group Discussions with Students

Instructions:

This protocol, or what is technically called an "interview schedule" or "guide for a structured interview," is designed to elicit needed information from informal conversation. The purpose of the protocol or guide is to allow the interviewer to steer the conversation in certain directions; it is therefore a flexible tool. The actual wording and sequence of questions are subject to your interpretation and perception of the conversational flow. There should, of course, be some comparability in the asking of questions. But the interviewer's best tack is a non-threatening I-value-your-opinion-and-am interested-in-what-you-have-to-say approach. This is particularly important to establish at the beginning of the conversation. After introducing all present and completing the Data Sheet, something should be said about the project, its purpose, and the role of student experiences and perceptions. Only then should an approximation of the following questions be asked (the interviewers may want to confer about this prior to the conversation--remember, this is a data-gathering task). Note: If the students appear nervous or uncomfortable, back off and let them talk for a few minutes about anything remotely related to the issues at hand. At some appropriate point of transition, re-introduce a question from the protocol. Ice-breaking and candor often take time to develop.

EXXON QUESTIONS

For Small Group Discussions with Students

1. What have you liked and disliked about the Soc Sci courses you have had at Tech? What have you gained from these courses--either immediately or sometime later--that proved to be important, useful, or enjoyable?

2. In judging whether or not a particular course was a "success," how important was the content of the course as opposed to the workload or the performance of the instructor?

3. In addition to the mechanics of scheduling and the reputation of the instructor, what have you considered when scheduling Soc Sci courses? Specifically, what contributes to your expectations about Soc Sci courses? How does faculty advising affect your course selections and expectations? How important are peer recommendations?

4. In your scientific and technical (major) courses, do you learn anything that you consider "social science" information? In other words, are impressions or opinions about such things as social problems, human values, politics, or world affairs conveyed?

6. Finally, how satisfied are you with your overall experience at Tech--both in the classroom and out? What would you do differently if you had the chance? And what advice concerning Hum/Soc Sci courses would you offer to incoming Tech students?

GUIDE FOR INTERVIEWS

Exxon Foundation Program

The objective of the Exxon Foundation Grant to Georgia Tech is the development of a model program for the Humanities and Social Sciences component of professional education. A first step in this process is to study the historical development of the humanities and social sciences components of professional education in the United States in general, and at Georgia Tech in particular. In addition to the historical aspects, the study group wishes to learn the present attitudes toward the humanities/social sciences component and the desires for future developments of it held by the various constituents within professional education (administration, faculty, students and professional alumni). To this end the study group is conducting interviews with selected leaders within those groups.

As one of those leaders you have been selected for an interview. For guidance during the interview, and preliminary thoughts on your part, the committee suggests the following outline of topics. The outline is not to be considered restrictive but as suggestive of discussion. We are interested in your thoughts on these points as well as others that you feel are relevant. The group has read the literature on the subject (ASEE, ECPD) and therefore is more interested in your perceptions and attitudes than in factual historical background.

A. What is your view of the role of the humanities and social sciences in professional education? i.e., should it be primarily contextual

and utilitarian, broadly cultural, or some blend of the two?

1. What fraction of the total professional education should this component be? Should it be increased or decreased from the present amount?
2. What are the limitations on this component of formal education?

B. In your experience, what is, or was, the nature of the typical humanities and social sciences component in the education programs at leading professional schools? What is unique and what have been the notable successes or failures?

C. What has been ECPD's attitude toward the ASEE liberal studies programs, and recommendations? What have been ECPD's concrete steps toward implementing liberal studies components in engineering education?

D. With respect to the humanities and social studies component of education at Georgia Tech, what is unique and notable about the historical development of the program? What kinds of schools do you think Georgia Tech should emulate in this regard? What directions do you think Georgia Tech should take in developing these programs in the future?

E. The role of universities has been traditionally to transmit cultural values. Generally, these values are presented in the context of SS and Hum. courses. To what extent should the instructors in professional courses (architecture, engineering, management, science) reinforce and reemphasize these values?

Appendix E

Selected Contributed Papers

SELECTED CONTRIBUTED PAPERS ARE UNDER A SEPARATE COVER

SELECT BIBLIOGRAPHY

The listed items are those which the various contributors to this Report found most useful in their thought about the problems which faced us through the life of the project. It does not include a host of brief and often topical items which are to be found in the pedagogical journals of professional societies and the popular press, nor does it attempt to relist the thorough work of the Cooper Union in its classified bibliography on The Humanistic-Social Stem of Engineering Education published in 1956. Except for the classic reports of the ASEE, publications prior to that date are not listed here. In recent years the Liberal Studies Educator, the newsletter of the liberal studies division of the ASEE, has been very helpful. We hope that this publication will continue and prosper, for there are few formal channels of communication concerned with the primary subject matter of these pages.

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