

REPORTS OF THE
AD HOC COMMITTEE ON
DEVELOPMENT OF THE
UNIVERSITY OF ALABAMA
IN HUNTSVILLE

#3



UNIVERSITY OF ALABAMA

University, Alabama

July 19, 1967

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THE PROBLEM
REPORTS TO THE PRESIDENT
OF THE UNIVERSITY OF ALABAMA

BY THE
AD HOC COMMITTEE ON
DEVELOPMENT OF THE UNIVERSITY
OF ALABAMA IN HUNTSVILLE

UNIVERSITY OF ALABAMA

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UNIVERSITY OF ALABAMA

University, Alabama 35486

OFFICE OF THE
PRESIDENT

August 15, 1967

Mr. H. Clyde Reeves
Vice-President for Huntsville Affairs
University of Alabama in Huntsville
Box 1247, West Station
Huntsville, Alabama

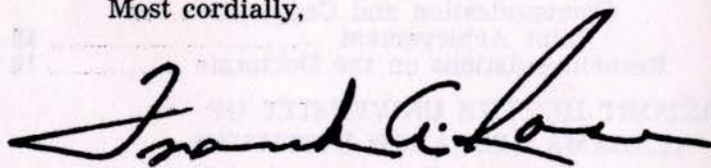
Dear Mr. Reeves:

The development of the University of Alabama in Huntsville as an outstanding institution lies, I believe, in faithfully carrying out the spirit of the reports and in promptly implementing the recommendations of the Ad Hoc Committee on Development of the University of Alabama in Huntsville. I take it from our conversations on August 8 that you agree with me, and I shall look to you to see that this is done. The faculty of the University of Alabama in Huntsville have considerable responsibility in this regard, and I urge you to seek their cooperation to this end.

Dr. Pow is indicating my approval of the Ad Hoc Committee's reports to the Main Campus academic divisions, and I am sure that these divisions will cooperate fully.

Please keep me informed as you progress in the implementation of the Ad Hoc Committee's recommendations, and let me know if I can be helpful.

Most cordially,



Frank A. Rose,
President

FAR:cab

cc: Dr. Alex S. Pow
Professor Willard F. Gray

MEMBERSHIP OF THE
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Vice-President for Huntsville
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University of Alabama

*Retired from the Committee April 12, 1967, in anticipation of becoming a full-time member of the faculty of the University of Alabama in Huntsville effective September 1, 1967.

UNIVERSITY OF ALABAMA

University, Alabama 35486

July 19, 1967

Dr. Frank A. Rose
President
University of Alabama
University, Alabama
Dear Dr. Rose:

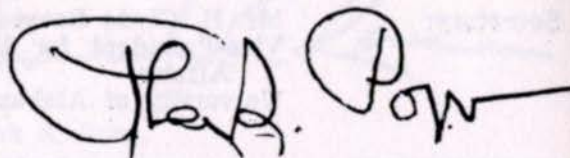
In behalf of the Ad Hoc Committee on Development of the University of Alabama in Huntsville, which you appointed on May 3, 1966, I am submitting herewith three reports: one dealing with the recommended nature and scope of the undergraduate programs; one, with the graduate programs; and one, with the University of Alabama Research Institute.

The Committee as a whole has met five times in Huntsville (last August 5-6, January 14, March 27-28, June 22-23, and July 18-19). In addition, subcommittees of the Committee have met several times, in Tuscaloosa, in Huntsville, and at other locations.

The Committee has found a wonderful spirit of friendliness and cooperation among University of Alabama and University of Alabama in Huntsville faculty and administrative staff members, and among leading citizens of the Huntsville area. There is no doubt in the mind of any Committeeman that the educational needs, opportunities, and response in Huntsville are great indeed—impressively so.

In the opinion of the Committee, the fine University of Alabama in Huntsville faculty and staff members now on hand are entirely capable and want to begin the intensive and systematic further planning and development of appropriate undergraduate, graduate, and research programs. They will, of course, need and desire continued support from the University Main Campus and other sources. It is the hope of the Committee that its reports will facilitate such planning and development.

Sincerely yours,



Alex S. Pow, Chairman
Ad Hoc Committee on
Development of the University
of Alabama in Huntsville

ASP/jdw

REPORT I

THE NATURE AND SCOPE OF
UNDERGRADUATE PROGRAMS AT
THE UNIVERSITY OF ALABAMA
IN HUNTSVILLE

Introduction

With a rapidly expanding population of 150,000, nearly 40 per cent of whom are under 21 years of age, a community in which more than three-fourths of the high school graduates attend college, and with a business and industrial climate demanding above-normal proportions of college-trained people, it is obvious that Huntsville needs and deserves a good program of public higher education. Fortunately, the University of Alabama began developing educational programs at Huntsville in 1950. The full-time faculty of the University of Alabama in Huntsville (U. A. H.) is now 78*, and the well-qualified part-time faculty equally large. The full-time faculty, like the enrollment, is growing fast. The campus (now nearly 350 acres) and the physical plant and facilities are growing fast, too. Nearly 2,000 part-time and full-time undergraduates are now pursuing degree programs in the arts and sciences and in engineering at U. A. H. Another thousand are enrolled in graduate and in non-credit courses.

For the immediate future, the Ad Hoc Committee on Development of the University of Alabama in Huntsville recommends the vigorous development of these programs, with special emphasis in the undergraduate programs on balance and quality rather than variety and large scope. In short, the Committee recommends strong and well-balanced arts and sciences and engineering programs leading to the degrees of Bachelor of Arts and Bachelor of Science and to a bachelor's degree in engineering science, with provision in the arts and sciences curricula for an option in business administration and an opportunity to meet certification requirements for public school teaching in the areas in which majors are offered, and with a strong core of general education common to all of these undergraduate programs.

The Relationship of U. A. H.
with the University of Alabama in Tuscaloosa

As the Committee understands it, the U. A. H. is intended to continue as a part of the University

* As of June 1, 1967.

of Alabama, under the governance of the President and Board of Trustees of the University of Alabama—not under the curricular and faculty control of the undergraduate departments, divisions, and colleges of the Main Campus of the University of Alabama in Tuscaloosa, but with the active assistance and support of these units. This membership in the University of Alabama system should facilitate the continuing and growing development of many forms of cooperation, curricular and extracurricular, between the U. A. H. and the Main Campus. The Committee urges continual, resourceful, and mutual attention to a growing range of cooperative endeavors between the U. A. H. and the Main Campus.

The Suggested Nature and Scope of U. A. H. Undergraduate Programs for the Near Future

It is the purpose of this report (intended for the University of Alabama and U. A. H. administration and for the U. A. H. faculty) to offer opinions and suggestions on the following topics related to the undergraduate programs of the U. A. H.: (1) three general guidelines related to the undergraduate programs, (2) a program of general education for all undergraduates, (3) a comment on undergraduate majors in the arts and sciences, (4) advanced placement and honors programs, and (5) a program in engineering science. It is assumed that the U. A. H. faculty and administration (possibly with consultative assistance from Tuscaloosa) will need and wish to work out the detailed curricula (with or without further outside consultation) against the background of the suggestions offered here. The details provided herein are not meant to be prescriptive, but only illustrative of the opinions of the Committee, offered for the possible guidance of the U. A. H. administration and faculty as they design the undergraduate programs for the next five or six years. It is impossible to predict the ultimate scope of the U. A. H. or even the pace of development, partly because of some uncertainty concerning the scope and intensity of future industrial development in the Huntsville area and also of Federal investment in the space and missile programs.

Three General Guidelines

In the opinion of the Committee: (1) The curricula of the U. A. H. need not parallel, or closely correlate with, the more elaborately developed and specialized undergraduate programs on the Main Campus of the University in Tuscaloosa. Instead, in

the near future, the U. A. H. on the undergraduate level should provide a balanced program of general education (a common core) plus an opportunity for a major in a limited number of subjects (9 to 12) preparatory for enlightened living, employment, and graduate study. The U. A. H. should guard against over-specialization, fragmentation, or proliferation of courses and administrative units.

(2) The U. A. H. has a good opportunity to be innovative and creative in college calendar, in curricula, and in learning arrangements, including the facilitation of independent study, student progress at varying rates according to ability, and the use of both mechanical and human teaching and learning aids and instruments. Examples are: computer-assisted instruction, experimental methods of using closed-circuit television, and the College-Level Examination Program of the College Entrance Examination Board. In fact, the use of the General Examinations of the College-Level Program for all rising juniors would enable the U. A. H., both students and faculty, to determine how the lower-division graduates of U. A. H. compare with those elsewhere, since these examinations have national norms. A further advantage would be the evaluation of transfer students seeking admission to the U. A. H. junior class from junior colleges.

(3) At least in the initial years, it would probably be best not to establish small departments of instruction, but to organize in larger academic divisions. Keeping to a small number the separate academic units will encourage and facilitate better faculty interchange and interrelations of program and will help to prevent proliferation of specialized courses. As the institution grows, more academic units may become desirable.

The Program of General Education for All Undergraduates

There are two principal ways of providing the general education for all students, regardless of their career intention, and there is no good reason why these two may not be combined, in accordance with the talents and disposition of the faculty.

1. The more familiar is the requirement of single-discipline courses distributed among the broad areas of knowledge, with some choices left to the student: some English, for example; some mathematics or logic; some courses selected from the natural

sciences, the social sciences, and the humanities; etc. The emphasis is upon the particular subject matter, and the student is assumed to be able, gradually, to perceive the interrelationships of the various subjects.

2. A more difficult method of providing general education instruction is through interdisciplinary courses, taught individually or by groups. Where the faculty talent and faculty disposition permit, this is a good method that offers the student more help in the immediate perception of the interrelationships of all knowledge. In order to encourage at least some interdisciplinary work in the general education program, either now or in the near future, the U. A. H. administration in some of its faculty recruitment may wish to consider such characteristics as high sensitivity to the interrelationships of academic disciplines and other qualities appropriate to interdisciplinary studies.

The Committee suggests that the general education requirement might constitute from 35 per cent to 50 per cent of the total credits required for the degree, provided some options within some of the areas of knowledge are left to the choice of the student. (This would leave 40 per cent to 45 per cent of the credits for the areas of concentration and 20 per cent to 25 per cent for electives.) Without wishing to recommend any specific pattern of courses in general education, either interdisciplinary or single-discipline, the Committee suggests representation of the following areas: English, foreign language (those with extensive pre-college study of foreign language might be exempt), mathematics or logic, the natural sciences (both physical and biological), the social sciences, and the humanities. The table at the top of the following page sets out possible differences of a pattern for B. A. candidates from a pattern for B. S. candidates which the U. A. H. faculty and administration might consider.

In determining general education requirements, the total U. A. H. faculty need to be involved in open-minded, patient, and persistent reflection and frequent discussion, without any group's seeking maximum representation of its own academic discipline. This requires academic statesmanship of a high order, of course.

Finally, to permit the optimum flexibility in the undergraduate programs, the Committee suggests that the general education requirement should not be confined to the freshman and sophomore years.

	B. A.	B. S. (Including Engineering)
English Composition	6 sem. hrs.	6 sem. hrs.
Mathematics*	6	12
Natural Sciences	8	16
Foreign Languages	12	0
Humanities	6 to 12	6 to 12
Social Sciences	12	12
	<hr/> 50 to 56 hrs.	<hr/> 52 to 58 hrs.

Undergraduate Majors in Arts and Sciences

As indicated earlier, quality is more important than scope. A few strong majors with good supporting and elective courses would be much better than many mediocre majors. The Committee suggests that it may be possible to increase the number of majors in the relatively near future to a total of 9 to 12 of the arts and sciences.

It is important that the U. A. H. establish some deliberative procedure and structure for recommending what undergraduate majors are needed and when conditions are adequate for establishing them. The Committee urges the establishment of a small U. A. H. committee on the development of majors, with or without the occasional use of outside consultants, which (a year or more before a new major is formed) would study rigorously the components and conditions to be met before any new major is authorized, including such matters as a faculty adequate in quality and size, library and laboratory resources, strength of cognate areas, and community need and response.

The U. A. H. committee should guard against a topsy, inadequately planned kind of growth.

Advanced Placement and Honors Programs

Students will come to the U. A. H., of course, as they do to other public institutions, with varying degrees of ability and knowledge. It would be a mistake to require all students to take all the introductory courses in all the subjects they study. The U. A. H. will wish to develop honors programs and, it is hoped and urged, will make extensive use of both the Advanced Placement and College-Level Examinations of the College Entrance Examination Board. The faculty are urged to examine these carefully and to use them, where appropriate, not only for placement but for credit. An institution-wide policy on this matter is better than wide departmental variation.

*Possible substitution in the B. A. Program is Logic.

The Undergraduate Engineering Program

The suggested common core of general education for engineering students, as well as for arts and sciences students, has already been discussed.

The Committee recommends that for the present the U. A. H. offer an engineering-science undergraduate program which will be compatible with the general education program suggested above, and which will allow enough elective option to permit some specialization in selected engineering disciplines.

The present undergraduate program in engineering at the U. A. H. is one which was developed as a curriculum in general engineering for the University of Alabama in Birmingham. The particular curriculum is a collection of courses which are taught in the various designated-degree programs on the Main Campus, and were used in the Birmingham program because of the experience of the College of Engineering in Tuscaloosa with these particular courses and the availability of Tuscaloosa faculty to teach some of them in Birmingham. This general engineering program, although reasonably adequate, is probably not the most appropriate one for the Huntsville campus.

The Committee recognizes that an engineering-science program with a strong base in the sciences and mathematics may not satisfy some of the needs of industry for B. S. graduates with an orientation toward professional practice. It is suggested that the U. A. H. consider developing an engineering technology baccalaureate program after the engineering-science program is well established.

The development of a new curriculum for the undergraduate engineering program will require that faculty time be made available for this task, and that considerably more interest in the undergraduate program be encouraged among the existing staff than is presently apparent. It is suggested that the U. A. H. administration take steps to insure that the existing engineering faculty and faculty recruited in the future view the undergraduate program, along with graduate instruction and research, as a part of the total commitment and responsibility of practically every staff member. It is also suggested that a committee of the faculty should presently be actively engaged in undergraduate curriculum planning, and that this committee should work closely with similar groups involved in engineering undergraduate curriculum development on both the Tuscaloosa and Birmingham campuses.

The present system by which many faculty members spend 50 per cent or more of their time on Research Institute programs appears to work to the disadvantage of the undergraduate program. The Committee recognizes that this problem is partly a function of the use of a semester hour credit base with a quarter system, but would suggest that some consideration be given to means for allowing a smaller percentage of faculty time spent in research so that both undergraduate and graduate teaching can be performed. It is the view of the Committee that there is far too much reliance on part-time staff in the undergraduate teaching program.

Conclusion Regarding the

Undergraduate Programs at the U. A. H.

Although intensive deliberations and planning will need to be done by the U. A. H. faculty over the next two or three years, the Committee is confident that the existing and growing U. A. H. faculty are capable and desirous of developing a strong program (though probably not a greatly diversified one) of which the University of Alabama and the citizens of the area can be proud. Considerable physical, material, and human resources are already available as a base, but substantial further development is required for the expanded programs envisioned herein.

REPORT II

THE NATURE AND EXTENT OF GRADUATE PROGRAMS AT THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

Introduction

The extent of the industrial and Federal agency development at Huntsville is full justification for the present graduate programs at the U. A. H. and for the existing assumption that additional programs will be needed and offered. Rapid growth of student registration has been experienced. To outline the probable nature of future graduate programs and their extent or level has been the purpose of this study by the Ad Hoc Committee. The Committee takes the conservative academic position that the value of graduate work is inherent in its quality. Therefore, numbers of programs or, in fact, numbers of registrants, when inadequately related to standards and selection, are an inadequate measure of achievement at the graduate level. A strong base must be built, and the limited programs offered should be of high quality. The undergraduate curricula recommended in the Committee's report on

undergraduate programs (Report I) would form a base supporting some expansion of the master's degree programs. However, strength based primarily upon the distinction of the full-time faculty is a most important measure of the meaningfulness of master's programs and a sine qua non of the doctorate.

Three- to Five-Year View. After reviewing the rapid changes that may be expected to occur in a recently established institution serving a developing community, the Committee has confined its considerations and recommendations to the next five years. In fact, the point of greatest emphasis is upon the next three years in this report dealing with graduate study, because capabilities at the graduate level change rapidly with recruitment or transfer of key personnel. Also, the Committee was told by local Federal agency administrators that the emphasis in the programs of both the N. A. S. A. and the Army at Huntsville are in a period of change. The N. A. S. A. is moving from an emphasis upon hardware to the support of scientific missions, and the Army foresees much greater emphasis upon soft sciences because of its mission in underdeveloped countries. With change in the emphasis of Federal agency programs, one much anticipate some change in the interests of contractors and of personnel who provide graduate registrations. Hence, the Committee has felt that a three- to five-year view is an optimum, particularly for its report on graduate study.

On the Master's Level

All graduate programs are under the supervision of the University of Alabama Graduate School. Except for such required approval, the master's work at the U. A. H. is independently planned and administered at Huntsville.

At present, the U. A. H. offers at Huntsville two master's-level degrees with options in seven areas: mathematics, physics, and five engineering areas—electrical, mechanical, industrial, and aerospace engineering and engineering mechanics. In addition, the U. A. H. offers master's-level instruction in public administration, chemistry, and professional education in cooperation with the University of Alabama in Tuscaloosa.

As the U. A. H. gains faculty strength in the undergraduate subjects of the arts and sciences, as is anticipated at an accelerating rate, it might appropriately offer both more of the master of education program and additional master's programs in the

arts and sciences for public school teachers. For instance, the U. A. H. might soon begin offering some or all of the requirements in the teaching subjects of high school teachers (English, history, mathematics, etc.). At present, such faculty strength probably exists in few if any of the areas of the arts and sciences. As resources become available, the U. A. H. may wish to develop complete master's programs not only for secondary school teachers, but also for other school personnel.

The U. A. H. should not undertake other complete master's-level programs in the arts and sciences until strong supportive programs are developed, except perhaps an interdisciplinary program in administrative science, about which a few comments are in order.

Master's Degree in Administrative Science. The master's degree in administrative science that is proposed for the U. A. H. will undertake to unify public and private (business) administration. This combination is unusual in the United States but not unique. Of the existing attempts, some appear to be suffering because of overbalanced financial support and student interest in the business side, with resulting lack of attention to public administration. In Huntsville, however, the presence of numerous Federal agencies would appear to afford a better balance between public and business interests. Moreover, the unified approach which is envisaged will, if successful, give the U. A. H. a chance of some distinction nationally. The approach will be to offer about 20 semester hours, nearly two-thirds of the degree, in combined studies of equal utility to public and private administration, with both kinds of organization viewed on a fairly theoretical level from a behavioral standpoint. Developed in this way, the program will require support from persons trained in political science, economics, sociology, or psychology. Relationships also might be developed with industrial engineering. The program thus affords an opportunity for graduate-level outlets for faculty in several of the social or behavioral sciences. At the same time, it places heavy emphasis on the necessity for a well-chosen and well-balanced faculty whose members enjoy approaching a common interest from disparate disciplinary backgrounds. The U. A. H. is fortunate in having effected the appointment for next year of a professor whose qualifications are excellent for leading this venture. The Committee feels that development of the program should proceed forthwith. However, in recognition of the great difficulty in finding faculty appropriate to the program, it is recommended that no firm com-

mitment to offer the degree be made immediately and that one or two years of careful search in the academic marketplace be made before final commitment to the degree is decided upon. Meanwhile, the existing cooperative program with the Main Campus for the Master in Public Administration degree should be pursued actively.

On the Doctoral Level

The Committee wishes to make certain comments regarding the development at Huntsville of complete doctoral programs, including what the Committee considers to be minimum qualitative standards that should govern the inauguration of doctoral programs anywhere. The Committee would like to emphasize that the substantial investment required for such programs should not be made at the expense of developing strong undergraduate programs or further strengthening of the master's programs reviewed or proposed above.

Current Doctoral Study. All doctoral study presently under way at the U. A. H. is for degrees to be awarded through departments at the Tuscaloosa campus. The requirement imposed upon the U. A. H. by the University of Alabama Graduate School is that an academic year of residence for the doctorate must be completed at the Main Campus, where the student must complete at least 18 semester credits of course work. These requirements are in contrast to the essentially complete autonomy enjoyed by the U. A. H. faculty in planning, operating, and approving master's degrees. When a subcommittee of the Ad Hoc Committee met with a group of representatives of the Graduate School and the departments of science and engineering at the Main Campus, concern was expressed that doctor's degrees should not be approved prematurely for autonomous award by the U. A. H. because departmental reputations at the main University of Alabama campus would be influenced thereby.

Several meetings of the subcommittee with administrators and faculty groups at the U. A. H. brought out a lack of satisfaction and some resistance to operation under the current doctoral regulations. The view was expressed repeatedly that U. A. H. students would choose to go elsewhere rather than Tuscaloosa to complete a doctorate if residence away from Huntsville were required. The usual arguments were presented that award of the doctorate is important for faculty recruitment, that faculty research is limited by lack of advanced students as assistants, that full-time doctoral students are essential to a total education-research atmo-

sphere, and that competent dissertation directors already exist at the U. A. H. The engineering groups were most active in presenting these arguments. The science and mathematics groups seemed more inclined to recognize present weaknesses that would have to be eliminated by recruitment and related or supportive developments.

External Influences. Six meetings with industry and agency representatives in Huntsville emphasized the desire of the non-academic community for local award of the doctorate, first, as an aid to recruitment of scientists and engineers, second, as a means of upgrading present scientific personnel, and, third, as a factor in community prestige. With one important exception, the individuals interviewed showed no concern about the costs involved, library needs, or other factors that will be reviewed later in this report. Their concerns were toward their own organizations, and they expected educational interests to solve educational problems.

The persuasiveness of the arguments presented from both inside and outside of the U. A. H. for immediate or early award of the doctorate (particularly in engineering, which had been proposed by a faculty committee) made it necessary for the Committee to develop criteria for measuring present institutional development and to establish minimum conditions under which courses and residence for award of the doctorate could be completed in Huntsville. The Committee has followed the concepts of quality laid down by a joint committee of The Council of Graduate Schools in the United States and The Association of Graduate Schools in The Association of American Universities in the leaflets, "The Doctor of Philosophy Degree" and "New Doctor of Philosophy Degree Programs,"* but has attempted to quantify such concepts into measurable criteria whenever possible.

Evaluation Based Upon Criteria

The evaluation of an institution for awarding the doctoral degree is simplified by the significant

*The Association of Graduate Schools in The Association of American Universities and The Council of Graduate Schools in the United States, "The Doctor of Philosophy Degree," The Council of Graduate Schools in the United States, Washington, D.C., December, 1964. Also, the Council of Graduate Schools in the United States, "New Doctor of Philosophy Degree Programs." The Council of Graduate Schools in the United States, Washington, D.C., n.d.

gap that exists between the master's degree and the doctorate. The doctorate usually requires three times the period of residence of the master's degree, and it is offered by about one-third as many educational institutions. Therefore, one would expect to find a sharp difference in standards of admission, retention, and percentage of success of students in achievement of the doctor's degree as contrasted to the master's degree. These differences are in fact observed. Taken together, they define the doctoral institution as belonging to one of the strongest groups of graduate institutions. Also, since the doctoral program commonly has developed out of successful master's programs, doctoral universities are usually relatively mature institutions. A variation exists in the concept of branch operation, in which faculty strength and experience or even control may be exercised from a central campus as a means of establishing or assuring standards.

Research Orientation. The truly unique characteristic of the doctoral institution is the necessity that it be research oriented. The common objective of the Ph.D. degree is to train researchers, scholars, and university teachers, all of whom carry a future responsibility of a similar nature. A master's degree faculty may offer excellent course work and thesis guidance with only limited research productivity. A doctoral faculty must set an example in research and scholarship for its students to live up to. In published reports on acceptable standards of doctoral work,* one finds agreement that a minimum departmental faculty should include several relatively productive (about which more is said later) research scholars working in interdependent specialties if the Ph.D. degree is to be awarded. Variations are naturally great. One can mention a few specialized areas for which it might be impossible to draw three productive scholars together. On the other hand, doctoral departments covering several subdivisions of chemistry or psychology might be inadequately staffed with fewer than ten productive scholars. The figure of three such faculty members as a minimum, therefore, is projected by the Committee as a rule-of-thumb or guide for internal evaluation by the department itself and the administration.

Interrelationships of Doctoral Programs

The minimum departmental or area faculty for awarding the doctorate has been defined as three faculty members having reasonably extensive experi-

*E.g., *ibid.*

ence in research and publication, supported by several other faculty members who are qualified to offer courses in the area of the major. Just as the minimum library holdings for a single departmental program would, of course, represent inadequate breadth of library for the total support of doctoral study and research, so the faculty of a single department could not function effectively alone at the level of the doctorate. For example, even if one of the more distinguished faculties in, say, electrical engineering could be assembled in a location at a distance from a major institution, one would have to question its effectiveness in offering doctoral degrees. And this weakness would not be fully eliminated by assembling a faculty in engineering mechanics at the same location.

The Critical Mass for Ph. D. Production. There is indeed a critical size or related grouping of departmental or area faculties that jointly represent a minimum assemblage for award of doctoral degrees. The term "a community of scholars" has its greatest significance when applied to doctoral work. It represents the interaction of creative minds upon each other and upon advanced students. It envisions conflicting opinions, debate, and nonpolarized influences upon the doctoral student rather than the more unified viewpoints of faculty members from a single department or area. Faculties tend to condense into polarized groupings and thus protect their students from diverse opinions even in the most extensive institutions. One or two doctoral departments in a less developed institution would offer insufficient opportunity for essential critical interchange.

It is very difficult if not impossible to define a minimum cluster of interrelated departments that would provide unquestionably the scholarly atmosphere and critical interchange essential for award of meaningful doctorates. That the cluster of departments should extend beyond a unified profession is made evident by the strength of science faculties developed in nearly all institutions of technology. We could also wish for strength in humanities but could not list it as critical. Nor would doctoral work in social science be critical to the award of doctorates in engineering except possibly for the related areas of economics and industrial engineering. Likewise, doctoral strength in the biological sciences would not be considered essential to an engineering doctorate if the areas of bioenvironmental and biomedical engineering were not involved.

Possible Focus for Future Doctoral Work at the U. A. H. Considering the present developments and

early projections for the U. A. H. and the interests expressed to Committee members by the industries and governmental agencies in the Huntsville area, it appears that a focus of doctoral programs in physical science and engineering would form a logical beginning. The initial strength in engineering are in electrical engineering and theoretical mechanics. Because of the local aerospace interest, it would appear that a related strength in systems engineering might be expected to develop. However, the Committee was not favorably impressed by the proposal to interrelate electrical and industrial engineering as constituting a satisfactory program in systems engineering. Other areas of doctoral study would doubtless be produced later, but they are not of initial concern.

To sustain, support, and provide balance in basic research for the applied areas mentioned, the need for at least equal strength in mathematics and in physics can hardly be questioned. A third area of science for which additional strength is likely to develop is less clearly defined by local needs. Chemistry might appear to be a probably next choice, primarily because a considerable faculty exists and recruitment of additional research personnel seems easier in this field than several others. Also, graduate students are available in large numbers for advanced study in chemistry. Perhaps the initial advanced program in chemistry should be restricted to one or two of the usual four subdivisions of chemistry, and similar restrictions would also be reasonable for physics.

The suggested group of a half dozen interrelated departments in physical science and engineering, each meeting minimum standards of faculty productivity, would jointly provide the research and scholarly atmosphere, the critical debate, and the lack of polarization that we consider a minimum essential for doctoral study. The Committee feels that doctoral capability should exist in a half dozen interrelated areas, even though the initial authorization for awarding the Ph. D. might be in fewer fields.

The physical needs will now be considered that must be provided so that the faculty may be fully productive at the doctoral level.

Provisions for Faculty and Students

It should be accepted that reasonable facilities for faculty and student research should precede an attempt to award the doctorate. Library need is obvious. Nevertheless, it will be discussed later because of the importance that it be evaluated both qualitatively and quantitatively. Research laborator-

ies have been provided quite effectively on an initial basis by the Research Institute. Undoubtedly some doctoral students, particularly in engineering, would find an excellent opportunity to complete a dissertation with the Research Institute, perhaps supplemented in certain instances by use of industrial and government agency laboratories and equipment. However, a decision to offer doctor's degrees in basic science fields probably will necessitate the development of additional research laboratories; these might be initially in physics, and later perhaps in chemistry, and still later in life sciences. A productive and creative experimenter will expect a well-equipped research laboratory substantially under his control.

Many other requirements for meeting the needs of a doctoral faculty and student body could be discussed. However, the job has recently been completed rather effectively in two publications on the Ph. D. degree by a joint committee of The Council of Graduate Schools in the United States and The Association of American Universities.* For comparison of standards between the master's degree and the doctorate, one can contrast the requirements in the publications mentioned with a similar publication on the master's degree prepared by The Council of Graduate Schools.**

Library Needs

It is very difficult to delineate the necessary extent of a doctoral library. The variations are naturally great. Ideally, every doctoral student should have the service of an extensive library close at hand. It is important that browsing privileges be conveniently available, since the ordering of books and articles is a poor substitute for personal library research. A major library at a few miles distant is obviously an asset, but it is not a substitute for immediate access to a reasonably complete collection of more commonly used material.

If one takes the number of volumes in a good but not distinguished university library and divides by the number of areas in which the Ph. D. degree is awarded, the result may vary from 20,000 to 50,000 volumes per area or discipline. Perhaps a figure of 25,000 volumes per discipline or area, such as elec-

*Ibid.

**The Council of Graduate Schools in the United States, "The Master's Degree," The Council of Graduate Schools in the United States, Washington, D. C., March, 1966.

trical engineering or physics, if properly selected, would represent a thoroughly acceptable research library. A smaller 10,000-volume library would seem to be borderline and might represent a minimum collection to justify initiation of a particular Ph.D. degree program.

If a half dozen disciplines, or interrelated and mutually supporting areas, are to be developed for initial award of the doctorate, it would be reasonable to expect that the immediately available library should contain at least 60,000 well-selected titles in the doctoral areas represented. In addition, the library should have holdings in non-doctoral areas. Also, a definite plan should exist for further acquisition of research library materials to follow immediately.

Analysis of Research Publications

Research and scholarly publications are a normal measure of the competency of every doctoral faculty. The best measure of this competency is generally accepted to be the publication of articles or papers in national journals that have rigorous review procedures. For some fields such as English and history, the more common scholarly publication is that of a book or monograph which may properly be given a value equivalent to a number of scientific papers. Industrial or government reports, experiment station publications, etc., are very difficult to evaluate. For the purpose of this evaluation, which will be compared with a minimum standard, they have been omitted from consideration.

In the list of 161 publications of the U. A. H. engineering faculty, dating back about six years, some sixty papers, not including the extensive publications of the Director of the Research Institute, appear to have been published in national or international journals or established series where it may be assumed that an editorial review was involved. Fourteen faculty members have published one or more such articles and six professors, not including the Director of the Research Institute, have published five or more of these papers. These six faculty members are divided equally between electrical engineering and engineering mechanics if both areas are defined very broadly. These individuals may, therefore, be looked upon as potential doctoral dissertation directors, supplemented by the Director of the Research Institute, whose research interests appear to overlap both fields.

If three doctoral faculty members are accepted to represent a minimum disciplinary or area group, we may say that this minimum faculty exists for the

broad fields of electrical engineering and mechanics. Other faculty members are available to provide course offerings and otherwise contribute to possible Ph. D. programs. One existing weakness is that these two acceptably developed engineering areas are not supported as yet by equally developed faculties of basic science and mathematics to achieve the "critical mass" needed for initial award of the Ph. D. degree.

Interim Joint Operation of Doctoral Programs

The Committee finds no reason to suggest a basic change in the requirements of the University of Alabama Graduate School for award of cooperative doctorates between the Main Campus and the U. A. H. In fact, the requirement of one academic year of residence and completion of 18 semester hours of course work at Tuscaloosa may be classed as reasonably liberal. This arrangement can be made to function effectively and actively if it is accompanied by enthusiastic cooperation at both ends. For example, the U. A. H. should not encourage its advanced students to take excessive course work at Huntsville on the assumption that the residence requirement will then be reduced or eliminated. Also, departments at the main University of Alabama campus should not make unstated demands for residence beyond the formal requirements by not cooperating in early agreement upon dissertation topics for which the main part of the research can be completed in Huntsville.

A Suggested Plan for Cooperation. It is suggested that a definitely stated plan should be adopted to give students clear guidelines for individual planning. Such a plan might encompass steps similar to the following:

1. The student should complete his master's degree or equivalent course hours with a graduate grade point average to be determined. His Graduate Record Examination average aptitude score should not be less than an established minimum, which might vary from discipline to discipline.

2. Based upon criterion 1 and upon completion of not more than 12 semester hours above the master's, the student should meet with his U. A. H. adviser and an appropriate Main Campus adviser to work out a plan for the completion of his course requirements, including work at both campuses.

3. After the student completes the course work set out in step 2, agreement will be reached on the research topic for a dissertation that can be completed with the facilities and supervision available at the U. A. H., including aid that may be provided by supporting agencies.

4. After completing a year of residence on the Main Campus and his qualifying examination satisfactorily, the student may complete his dissertation research in Huntsville. A supervisory committee will have been appointed of which the chairman will be from the Main Campus, the co-chairman from the U. A. H., and with other members as approved by the Graduate School. It is assumed that the co-chairman will be in weekly contact with the student but that a meeting not less than once each semester will be held of the entire committee. The final committee meeting will be an examination for the doctorate after submission of the dissertation. The chairman and co-chairman will be considered to be co-directors of the dissertation, which requires willingness on their part to cooperate and exchange information frequently.

Communication and Cooperation for Joint Achievement. Based upon a definite set of planned steps, the U. A. H. student will find his residence problem much simplified at the University of Alabama over possible completion of requirements at another institution at a greater distance from Huntsville. If the cooperative scheme outlined is approached with enthusiasm by the U. A. H. faculty and with an open mind by departmental faculties at the University Main Campus, a significant flow of excellent students between the two campuses should develop to the advantage of all parties. Excellent communication between corresponding groups at the two locations is critical to success of such a cooperative venture. The relative position of the two groups inevitably presses the initiative for the development of excellent communication with its inherent travel upon the U. A. H. faculty and administration. However, no statement should be made to students at the U. A. H. encouraging study in a given doctoral area until a specific plan satisfactory to the faculty of the related departments in Tuscaloosa has been approved in all of its details, which may be expected to vary somewhat from other departmental plans.

Recommendations on the Doctorate

1. The Committee believes that the greatest need of the Huntsville community lies at the bachelor's and master's degree levels. It, therefore, recommends that the substantial extra investment needed to develop faculties and facilities for the future award of doctorates not be made at the expense of first- and second-level degrees.

2. When a decision is made that resources may be in sight to develop conditions justifying the award of doctor's degrees, it is recommended that

a half-dozen interrelated areas of engineering, science, and mathematics be selected for parallel development, so that this cluster of related faculties, facilities, and library holdings may form the necessary "critical mass."

3. The Committee recommends for an interim period of unknown duration active development of the existing cooperative agreement involving limited residence for doctoral candidates at the University of Alabama in Tuscaloosa. If approached enthusiastically by the U. A. H. and cooperatively by the Main Campus, a significant flow of excellent students between the two campuses should develop to the advantage of all parties.

4. In the establishment of U. A. H. doctoral programs, the University should make an effort to encourage the development of complementary rather than unnecessarily duplicative programs on the two campuses.

REPORT III

THE UNIVERSITY OF ALABAMA RESEARCH INSTITUTE

Concepts of the University of Alabama Research Institute

Since there was reason to believe that a single basic concept of the purpose and place of the University of Alabama Research Institute in the overall structure of the University had not been arrived at, a subcommittee of the Ad Hoc Committee, at the outset of its study, sought and received statements from administrators, faculty groups, and industry and agency representatives covering this point.

The Statements received by the subcommittee regarding the intended scope of the Research Institute ranged from an expression of the original operating plan, which was for research in the fields of aerospace and missile-related physical science, mathematics, and engineering, to a proposal of the much broader concept that the Research Institute should serve the U. A. H. effectively in all fields requiring experimental facilities. There also were differences of viewpoint as to the necessary or appropriate administrative relationships between the Research Institute and the U. A. H.; but, significantly, all statements agreed that the Research Institute has a strong supportive function with relation to the graduate program.

In order to check other viewpoints regarding the differing concepts of the Research Institute and also the administrative operation of the Research Institute as a part of the U. A. H., the subcommittee conducted a half dozen group conferences within and outside the U. A. H. and also met with representatives of the University of Alabama Graduate School and with department heads in mathematics, science, and engineering for the central University campus at Tuscaloosa. The most significant views expressed are summarized below.

Viewpoints of Industrial and Educational Groups

It became clear to the subcommittee that Huntsville industry and the agencies of the George C. Marshall Space Flight Center and the Army Missile Command have always regarded the Research Institute primarily as a means for attracting the faculty necessary to provide a high-quality graduate educational program for their employees. It is generally their feeling that the Research Institute has been successful in this regard. Considering the views obtained from faculty members, Research Institute section heads, and representatives of the N. A. S. A., the Army Missile Command, the NIKE-X Project Office, and industry in Huntsville, the Committee feels that there has been an excessive concern regarding the present administration of the Research Institute. The Research Institute has had a healthy development and is morally supported by every industrial or government agency contacted. This is quite an accomplishment for an academically-oriented director whose original experience in administration was in another country. Also, each major agency expressed its intention to increase present contract research volume with the Research Institute, provided that better communication and greater understanding of its mission could be developed within the Institute. The industries contacted were not so optimistic, since they have a commitment to expand their in-house research and development activities. Their support of the U. A. H. is more likely to be made in response to a drive for funds to achieve a specific purpose, such as strengthening faculty, building an adequate library, or providing space and equipment.

The faculty group interviewed in Tuscaloosa, who have had previous responsibility for Huntsville operations, showed an extremely cooperative attitude but were somewhat detached from current U. A. H. problems. Their interest centered more in the educational than the research program. The main relationship to the Research Institute that was expressed was that it would reflect favorably upon

the Tuscaloosa campus if it should develop a distinguished reputation in the future. It is clear that the electrical engineering and mechanics department heads on the Main Campus have made a major contribution to the U. A. H.-Research Institute through excellent recruitment of faculty.

The faculty groups interviewed in Huntsville included both teaching faculty and the section heads of the Research Institute. With the exception of one individual, who had had no contact with the Research Institute, reasonable satisfaction was expressed with regard to the working relationships between the U. A. H. and the Institute. The statement was made by two groups that the faculty paid little attention to administrative separation but functioned to achieve results in its own way. However, the view was made very clear that the faculty considered all administrators to be academically somewhat inexperienced and to be unduly sensitive to lines of authority. With more administrative give-and-take, the faculty interviewed seemed to feel that progress could be made without major reorganization. Two points of latent conflict exist: (1) the question of whether or not all research should be performed under the aegis of the Research Institute, and (2) the matter of where a staff member's major commitment lies (in the Research Institute or in an academic division), under the present system of appointments.

Attitudes Toward the Research Institute

It can be said that every group interviewed approved the academic character of the Research Institute and valued its contribution to graduate education and to recruitment both of faculty and of employees for industry and government agencies. No group suggested that its character be changed to an industrial-type research and development agency. The N. A. S. A., the Army, and the NIKE-X Project Office did emphasize the need for the research faculty and the Director to become better acquainted with Federal missions, so that proposals for support of basic or fundamental research would still be sufficiently aligned with long-term mission objectives to achieve support. Proposals have not been supported when the basic research proposed seemed to bear little relationship to the mission of the sponsoring agency.

Appreciation was expressed for the Research Institute's contributions through symposia and other exchanges with Huntsville personnel. There was clearly a desire for a more developed cultural atmosphere and exchange with the U. A. H. and the Research Institute. The major agencies believe their

missions are due to become more scientifically and perhaps socially oriented and thus more closely related to Research Institute and to faculty interests. A detrimental factor was some concern expressed by the government agencies that there had been administrative confusion at the U. A. H.-Research Institute which made relationships less easy and probably less productive than otherwise could be the case.

Administrative Relationships Involved

All discussions placed more or less emphasis upon administrative strains that have existed among the various administrative offices or their present incumbents. These include the Vice-President for Huntsville Affairs, the Director of the Research Institute, the Director of Academic Affairs and Assistant Graduate Dean, the Director of the Division of Natural Sciences and Mathematics, and the Chairman of the Department of Engineering. The Committee studied the personalities involved and found them to be individually pleasant and apparently cooperative but noted an underlying thread of disagreement that often exists where clear-cut lines of authority and responsibility are missing. This leads administrators to become overly competitive for position or authority. The realization seems lacking that a small organization demands extraordinary cooperation or give-and-take among administrators who are all dependent for production upon the same faculty group rather than specialized groups assigned largely to different functions. Nevertheless, there are elements of the administrative structure that might be changed to reduce overlap and provide more outlets for faculty initiative, which will be needed as the total organization grows.

The administrative chart provided the Committee shows separation of the inherently related functions of teaching and research by use of different directors for teaching and research and different groups of departmental or division chairmen for education and of section heads in the Research Institute. The only joint officer is the Vice-President for Huntsville Affairs. In most agricultural institutes, for example, the administrative function of teaching reports to a dean and the research function reports to an experiment station director; but coordination is achieved through use of the same department head for teaching and research in each area, such as agronomy or soils. Alternately, a single dean or director might have one group of educational department heads and another group of research sections reporting to him and thus personally achieve coordination. The latter organization would be most logical if certain research functions were of a secret

or patentable nature that did not relate to the educational function, or if a very large lower-division teaching program existed which had little relation to research.

At the U. A. H. and the Research Institute, neither reason for administrative separation has been overriding. Instead, one faculty has largely handled the joint functions of teaching and research. With the type of organization in current use, extraordinary administrative cooperation would be needed to avoid internal strains. As the organization grows, it will be desirable to make some changes in administration that should produce smoother operation. Two plans for a somewhat revised organizational structure are suggested for consideration. The objective is greater cooperation between instructional and research interests. PLAN I requires no physical changes and could, therefore, be an initial step.

Alternative Organizational Plans

PLAN I. Appoint the same unit heads or chairmen for education in the U. A. H. and for research in the Research Institute so that recruitment, promotions, and combined teaching and research assignments for a single area requiring experimental facilities are the responsibility of the same individual. This assumes no basic change in the type of Research Institute but change in its functional subdivisions, which would have to match the teaching department or division structure. Budgets might come through two channels, but expenditures would be coordinated by unit chairmen.

PLAN II. Seek to define a clearer and perhaps more limited mission for the Research Institute that would relate it even more closely with the character of the Huntsville area. This change appears likely to orient it more definitely toward engineering. Then permit non-engineering departments either to function through the Research Institute, because of its excellent services and specialized equipment, or to develop independent research laboratories as may be justified by their interests and obtainable sponsorship.

Suggestions for Improvements

1. The Committee finds that the undergraduate program may be handicapped somewhat by the Research Institute objective of having faculty give at least 50 per cent time to research. Many professors can direct a sponsored research project with more than a half-time teaching load and should be encouraged to do so if the three functions of undergraduate education, graduate education, and research are each to flourish.

2. It appears that formal faculty appointments to the staff of the Research Institute are an unnecessary and divisive step. If essentially a unit faculty is visualized, professors should under PLAN I or II, above, be directly associated with the Research Institute upon a basis of interest and productivity without concern about appointment thereto, but primarily by assignment of space or use of equipment. Under PLAN I, unit chairmen would solve such problems automatically. Under PLAN II, this would be true for a more limited group of departments, primarily engineering, while for other research areas use of space or facilities in the Research Institute would be negotiated with the Director.

3. The present volume of research in the Research Institute is about as large as it should be in relation to the size and available research time of the faculty. These should grow together, and each gives promise of such growth. Under PLAN I, the Director should expand his interests to relate to all areas of faculty interest in experimental research. An initial problem of the Research Institute, which has not been wholly overcome, is the Director's tendency to become excessively interested in the details of project research and thus to restrict projects through equipment development and use of funds to areas in which he has a degree of expertness. This was, no doubt, initially necessary. The Director now recognizes this as an administrative weakness which he desires to overcome and has overcome to a considerable degree. Under PLAN II, the Director could serve more nearly as a senior scientist-engineer, but even so he should not let his interests become a dominant factor in the total program.

4. As long as the Research Institute remains academically rather than industrially oriented, it will need a Director who has an outstanding scientific reputation. Strong capacity for administration would not suffice in the director of a research institute where every project is related to professors, most of whom also have teaching responsibilities and who consider publications to be far more important than well-organized reports. The alternative of turning the Research Institute into a proposal and report agency without a research activity would not be possible or desirable at this time. An overriding reason is that the Research Institute now provides about the only research laboratories and equipment. Until the research volume and the number of full-time graduate students increases considerably, duplication of such facilities in departmental or divisional space would be impractical. However, under PLAN II, this development is visualized in the

longer term for departments or divisions that are not inherently related to the specialized mission of the Research Institute.

5. As the Research Institute grows, the problem of maintaining a flow of grants to sustain such growth will increase. The Committee concluded that the Director of the Research Institute will need assistance from an associate director whose interests should be promotional, in the best meaning of this term, in order to improve communication with the Huntsville agencies through his own contacts and those arranged for key faculty members.

6. The Committee did not find that the original concept of a single Research Institute to serve more than one campus of the University of Alabama had proved useful. It is believed that the name "Research Institute of the University of Alabama in Huntsville" would communicate its objective and eliminate confusion by clarifying administrative organization.

Recommendation

In the opinion of the Committee, adoption of PLAN I at this time would clarify administrative channels, reduce friction between personalities, and provide for growth during the period immediately ahead, while divisions or teaching areas are developing stature and the Research Institute continues to provide most research opportunities for faculty and students. Thereafter, PLAN II would encourage a more normal institutional development from current small registration and research volume through medium-size and eventually to large-scale operation.

