



From the Stones of Karnak... Page 7

NEWS IN BRIEF

CRAWLEY LECTURE: RALPH NADER

Attorney Ralph Nader will discuss "Social Issues in Management" at Irvine Auditorium on Tuesday, February 8, at 11 a.m.

He appears under the auspices of the Wharton School's Crawley Memorial Committee, in the first of a series of Crawley lectures honoring the 50th Anniversary of Wharton Graduate Division. All faculty, staff and students are invited.

QUESTIONS AND ANSWERS ON BLACK STUDIES

Dr. Nick Aaron Ford, the noted Morgan State College English Professor who is conducting a nationwide study of black studies programs in predominately white institutions, will be at Pennsylvania today for consultation between 2 and 4 p.m. with faculty and students concerned with Afro-American Studies and related projects here.

At 4 p.m. he will appear in an open forum at the University Museum, followed by a reception that is also open to the campus community. Appointments are needed for the 2 to 4 p.m. consulting period, however; contact Mrs. Yvonne Perry at Ext. 6938 or John Wideman at Ext. 8220.

OPEN MEETING ON AFFIRMATIVE ACTION

Women for Equal Opportunity at the University of Pennsylvania (WEOUP) will hold an open meeting at 12 noon Friday, February 4, to discuss the University's Affirmative Action draft. The meeting will be held in the Franklin Room of Houston Hall. All women are invited.

President Meyerson has invited campus comment on the draft, to be sent to Gerald Robinson by February 4.

PRINTING OFFICE: CAMPUS REPRESENTATIVES

Two members of the Printing Office's staff have been re-assigned to be available on-campus for advice and planning of printing, Director Harriet Yeager has announced.

Thomas Bluebello and Anthony Acconciamesa are on call at Ext. 7189 and will come to the main campus from Printing (Continued on Page 8)

IN THIS ISSUE

- CUE Concerts • The China Trade • The NEP
- ENGINEERING: A Long Range Plan and a Response
- MUSEUM: Rereading the Story of Akhenaten
- Annenberg Symposium • WASHINGTON

Almanac

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UNDER DISCUSSION: AN EXPERIMENT IN INCREASED TRANSFER ADMISSIONS

Discussions are being held by the Budget Committee and other campus groups to explore the possibility of increasing transfer admissions to the University this Fall, according to Dr. Robert Zemsky, Assistant to the President.

Among the considerations is whether or not to grant financial aid to transfer students in order to attract a larger pool of qualified applicants. Among the possible advantages outlined by Dr. Zemsky:

1. Some such increase may be necessary in any case to counteract increasing attrition among upperclassmen due to changes in Federal draft law and conditions in the national economy.

2. Hopefully the University could realize a small reduction in the size of the incoming freshman class without any accompanying loss of income, even with financial aid costs attached to an increase in transfers.

3. Given a financial aid package that awarded proportionately more loan than scholarship funds, an increase in our enrollment of upperclassmen could even produce additional income for the University. Any such funds would be earmarked for educational development, i.e., to add new faculty in needed areas, and to create new undergraduate programs.

Generating Quality

"Each person who approves the idea seems to do so for a different reason," Admissions Dean Peter Seely said. "I see it as a way to reduce the size of the freshman class . . . to generate new applications from a highly qualified pool rather than increase the number of freshmen we must choose from a shrinking pool."

President Martin Meyerson emphasized that the subject is in discussion stages only, that what is outlined is a limited one-year experiment, and that the idea will be taken before the Council before any decision is made.

The transfer question is also due for further study by the Budget Committee, Dr. John Hobstetter said. Any final decision will be delayed as long as possible in order to gauge campus opinion and assess the quality of the applicant pool.



CUE CONCERT SERIES

After the Conference on Undergraduate Education last fall, one group that got busy was the Workshop on Intellectual Lifestyle. With Penn Union Council, it formed a chamber music series to bring visiting artists to campus, and is now promoting the four new concerts as well as seven remaining Spring performances of campus musical organizations.

Flutist Jean-Pierre Rampal and harpsichordist Robert Veyron-Lacroix open the new series February 4 in the Museum Auditorium at 8 p.m. Admission is \$1 for students, faculty and staff; \$2.50 for visitors.

To come: Cellist Marcia Peck with pianist Edith Finton Rieber, February 24; the Curtis String Quartet March 24, and the Julliard String Quartet April 8.

THE CHINA TRADE AFTER 200 YEARS

In the 1972 University Hospital Antiques Show, treasures of the China trade tell the story of Philadelphia's romance with the goods of that far eastern nation from the time trade was established with the western hemisphere.

Carefully preserved for nearly two centuries, the finest Chinese porcelains and silks, distinctive furniture, priceless jade and other household ornaments will be gathered for the Loan Exhibit which traditionally highlights the Show.

This year's Show runs Tuesday, April 18, through Saturday, April 22. Show hours Tuesday through Friday are 12 noon until 10 p.m. On Saturday, hours are 10 a.m. to 3 p.m.

The Antiques Show is held for the benefit of the Hospital of the University of Pennsylvania by the Hospital's Board of Women Visitors. Fifty-five of the country's leading antiques dealers will display antiques for sale.

Special Events

Visitors to the Show may make advance reservations for several special events. The first is the Preview Dinner Monday evening (April 17) prior to the Show's official opening. Tickets are \$50 per person; \$42.50 is tax deductible.

Reservations are also necessary for the special Gallery Tours during the Show. Trained guides will take small groups through the Show, discussing highlights of the exhibits. The Gallery Tours will begin at 10.30 a.m. (before the Show is open to the public) on Wednesday, Thursday and Friday (April 19, 20 and 21). The charge is \$5 per person, which includes admission to the Show.

For the related House Tours, four outstanding architectural examples in Society Hill have been chosen. Tours leave at 10 a.m. Thursday and Friday (April 20 and 21), and at 12:45 p.m. Thursday. The \$10 charge includes the Show. Reservations are necessary.

There is a buffet, the Bamboo Court Luncheon, April 18 through 21 (Tuesday-Friday) from noon to 2 p.m. at \$4 per person; reservations are advised.

The Show's Eagle Coffee House will also be open for lunch or light refreshment. April 18 through 21 its hours are 12 noon to 9:30 p.m. (except for Thursday, April 20, when it will close at 5 p.m.); and on Saturday, April 22, it is open from 10 a.m. to 2:30 p.m.

—Trudy King

WHARTON MODEL PREDICTS THE NEP

President Nixon's New Economic Policies will need some more "fine tuning" during the next few years if the U. S. economy is to avoid adverse monetary pressures and a return to the inflationary spiral by 1980, according to Wharton Econometric Forecasting Associates at the University.

Applying the group's long term, computerized model of the U. S. economy to measure the effects of President Nixon's NEP through the rest of the decade of the 70's, Dr. Ross Preston finds that NEP will:

- Reduce the rate of inflation to 3% initially, but allow it to climb to 4% annually by the end of the decade,
- Cut back on funds for residential housing in the latter part of the decade,
- Bring the nation to full employment a year earlier,
- Give the U. S. economy higher real growth for the next eight years,
- Increase capital formation (business fixed investment) by \$4 billion annually from 1976 to 1980,
- Create a dramatic increase this year (1972) in the real trade balance and maintain the growth in that balance for the rest of the decade, and
- Unbalance the federal budget by more than \$20 billion annually for the next three years and allow budget to be balanced again only in 1979.

In an article in the Winter issue of the Wharton School's *Wharton Quarterly*, Dr. Preston presents figures developed from the computer on August 11—before the first announcement of NEP—and compares them with a projection made on October 27, which "includes a realistic interpretation of the effect NEP would have on the economy during the decade."

"NEP gives the economy a short-term boost," Dr. Preston says, "but it is not an unmixed blessing. We may have sown the seeds of a capital goods boom that could come back to haunt us. Of course, if we heed this warning, we can do some more 'fine tuning' in the next few years to avoid the troubles that resulted during 1969 to 1971 from a similar boom."

Analyzing the figures for the NEP forecast and the no-NEP forecast, the University of Pennsylvania economist points out:

Without NEP, the U.S. economy would have reached a 4.7% unemployment rate in 1974. With it, a 4.5% unemployment rate could be recorded in 1973.

The real GNP in the decade 1970-1980 will increase, with NEP, by \$388.6 billion, while the increase without NEP would have been \$380.2.

Capital formation (business fixed investment in 1958 dollars) which declined in 1971 will "by the end of the decade . . . be \$4.2 billion higher with NEP than without NEP."

The U. S. net foreign balance would have drifted between zero and \$2.5 billion for most of the decade without NEP; with NEP that net foreign balance shoots up to \$4.6 billion for 1972 and continues in the \$5 billion to \$6 billion range for the rest of the decade.

—William Alrich

CORRECTION

ALMANAC inadvertently promoted Dr. Gerald Meyers in the January 18 issue. The footnote under his article, "Academic Freedom: An Exercise in Rhetoric," should have read, "The author notes that he is an Assistant Professor of English whose current contract is not being renewed."

As the University plans the structures and strategies needed for its development in the '70s, the Chairman of the Long Range Planning Committee of the Schools of Engineering has asked to have his Committee's 1970 Final Report circulated. It appears in slightly condensed form below.

Long Range Planning for the Schools of Engineering

Summary

The members of the Long Range Planning Committee of the Schools of Engineering have agreed unanimously that excellence can be materially enhanced through flexibility of both thought and organization. The principal thrust of all our recommendations is to bring about such flexibility.

We recommend that:

- the education of engineers with broad problem solving capability be explicitly recognized as one of our major goals;
- undergraduate engineering education be recognized as one of the possible paths to the liberal education for the future, and therefore, the Engineering School prepare itself for playing such a role;
- the Schools of Engineering be restructured; the quintessential changes set forth are: conversion to a single College of Engineering, elimination of the four present schools with complete integration of the Moore School into the College of Engineering, conversion of Graduate Groups to flexible departments, and formation of an elected faculty council;
- the tenure of the Dean and other administrative leaders be limited;
- the undergraduate degree be designated BS in Engineering with a major;
- maximum effort be expanded to bring to this faculty several more distinguished professors of engineering; and
- an atmosphere which facilitates student-faculty interaction outside the classroom be further encouraged.

Status and Directions in Engineering Education

It is the view of the Committee that the recent Guidelines for Undergraduate Education developed by the Schools of Engineering are adequate for education of engineers of the highest quality. We do not recommend any significant reorientation so far as the undergraduate educational goals are concerned. Some tightening of requirements may become necessary because of experience gained.

The Committee recognized that The Schools of Engineering were early to appreciate that engineers cannot afford to merely answer the questions that are posed to them by other segments of society, but must become part of a process which insures that the questions critical to the well-being of the community are asked as well as answered. In this regard the Committee recognized the need for still further broadening of the engineering educational experience. Engineers should be encouraged to cross over the boundaries between various disciplines. The interdisciplinary experience thus gained will be beneficial to the individual and will help prepare him for a more meaningful role in government and industry.

The Committee recommends that education of this kind be explicitly recognized as one of our major goals, and that we expose all our students to this point of view.

However, we recognize a continuing responsibility to educate "traditional" engineers, and we do not propose to attempt to force all students into this new mold. *It is, rather, that we should provide all of our students with an appreciation of the interdisciplinary approach.*

These expanded goals should not be undertaken as a substitute for a sound foundation in engineering science or mathematics in the traditional engineering disciplines. What is needed is a broadening of vision. This broadened competence should be provided, within a four year framework. If not possible, an expansion to five years, leading to a Master's degree should be considered by the various departments. . . .

It seems to us that in the future, no one can be truly intellectually enlightened if he does not have some notion of how science and technology work and what their strengths and limitations are. The Committee feels strongly that the School of Engineering should be ready to provide non-engineers with courses designed to impart the essence and message of our technological culture. We feel that in the near future some technological background will become a prerequisite for liberal education and professional training in other disciplines. Such a background, with its associated analytical training, will be valuable for physicians, businessmen, lawyers, and even historians. We urge that the School of Engineering prepare itself for such an eventuality. We may start by offering goal-oriented courses for non-engineers. We recommend that all possible avenues be explored to create more interaction between undergraduates in the College and the School of Engineering.

Structure

Implementation of the goals outlined above requires a major change in the administrative structure of the present Schools of Engineering. The existing structure is shown on Page 4. The principal administrative officer in the current organization is the Vice-President for Engineering Affairs. There are two Assistant Vice-Presidents in charge of undergraduate and graduate matters, respectively. These positions constitute the first administrative layer of the Engineering Division. The individual Schools with separate Directors (who have the status of Deans) constitute a second, largely independent, administrative layer. Finally, beneath the Directors, and frequently bridging the School structure, lie the Graduate Group Chairmen. It is the considered opinion of this Committee that effective operation of the Schools has decreased with increasing faculty size because of the present cumbersome administrative arrangements. One obvious liability of the present administrative system is the lack of direct formal communication between the faculty and the Vice-Presidential level. . . .

The restructuring shown on Page 4 is the Committee's suggestion for correction of the problems discussed above. The quintessential changes set forth here are: conversion to a single College of Engineering; elimination of the four present schools with complete integration of the Moore School into the College of Engineering, conversion of the Graduate Groups to departments headed by Department Chairmen and formation of an elected faculty council to advise the Principal Administrative Officer. We recommend that this Officer be called Dean of Engineering in the new organization.

Conversion to a Single College of Engineering

In recent years, undergraduate engineering education has become increasingly dependent on a grouping of common core subjects in the physical sciences and mathematics. This situation has been acknowledged by the formation of the Engineering Science course sequence. Specialization has tended to arise more and more in the last two years rather than in the first two years. In this regard, the trend of our undergraduate program parallels the educational experience in other Colleges of the University. The Schools of Engineering at the University of Pennsylvania have been a leading force in encouraging the undergraduate engineer to broaden his educational horizons. It therefore would be consistent with the present trend to have a single College of Engineering where the undergraduate would earn a *Bachelor of Science in Engineering* degree with a major in an appropriate area so that this broadening be still further encouraged. The major would be tied to the new flexible departmental structure, and would provide more options and greater flexibility in our undergraduate program. We envision that while the implementation of the new degree program itself

should require Trustees' approval, the creation or elimination of the major should be the prerogative of the Engineering faculty.

Unlike the undergraduate program, the graduate program has long recognized the inadequacies of the school structure. The formation of Graduate Groups was a direct response to the growth of interdisciplinary programs which could not fit into the "classical" molds. Membership in the Graduate Groups is determined by interest rather than by school membership. Yet there is a dichotomy which is counter-productive in the present system. Graduate Group Chairmen and Directors of the Schools are not always in one-to-one correspondence. This situation has in some cases led to inadequate authority for the Graduate Group Chairmen in areas of planning, faculty acquisition, and program implementation, in addition to poor communication between the Directors and the Graduate Group members. Conversion to a single College of Engineering would provide a simple and natural solution to the administrative problems of structure.

In connection with the creation of a single College of Engineering, it is recommended that there be limited tenure for the Dean of Engineering and that he be appointed on a limited-term basis of ten years. The rapid changes affecting the academic community make it desirable to have a more rapid turnover in the chief administrative position. This has been recognized at the departmental level in the University and by the Law School. We feel that such a policy in Engineering would be highly desirable.

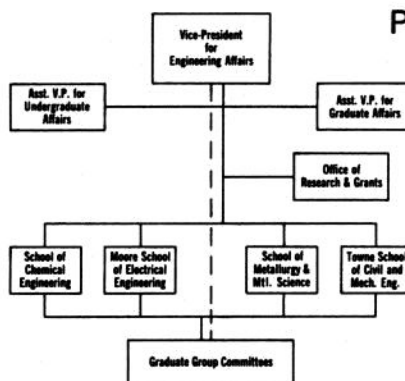
Departmental Structure

It is our judgment that the development of new disciplines is the normal state for an Engineering School responsive to technological change. Consequently, the College of Engineering should have a simple mechanism for quick response to future needs. We believe this can be achieved through eliminating the four Schools of Engineering and forming new Departments responsible for both undergraduate and graduate education. These new Departments, while maintaining the flexibility of the Group structure at the graduate level will organize and administer undergraduate majors. The Departments, therefore, would have dual status.

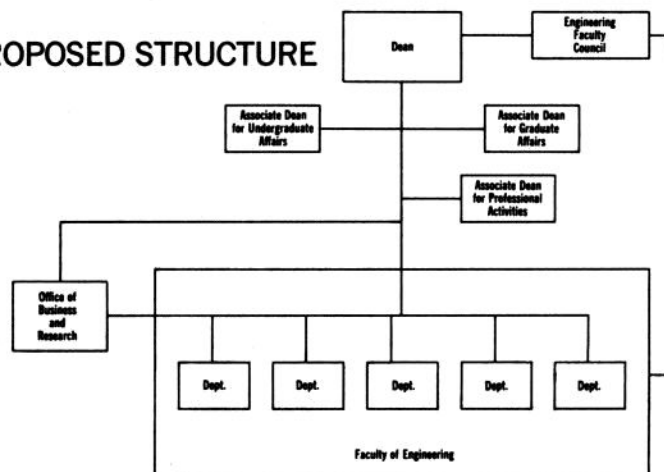
The Departments would, for example, design and supervise undergraduate and graduate curricula, manage major contract activities and be active in seeking support for new research. For their staffs they would draw upon the resources and talents available in the College of Engineering, and for their budgets they would rely partly upon funds from the University and partly upon outside sponsorship. It is expected that, because they would be responsible for practically all ongoing tasks in the College of Engineering, they would have a major role in the disposition of a large share of the funds of the College of Engineering through budgets allocated directly to them. It is through the mechanism of these Departments that the Committee hopes to gain the virtue of flexibility. While it is not supposed that these Departments will appear and disappear overnight, it is nevertheless thought that they will not necessarily have the same degree of permanence as the present schools. Because they would be created in response to needs recognized by interested faculty members, but are not committed (as are the present schools) to the maintenance of a more or less permanent staff (because all engineering faculty will belong to the College of Engineering), they would be much freer to form and dissolve in response to changing demands. The committee envisions that the Faculty Council (below) would be a powerful mechanism for assisting in gracefully dissolving the Departments which have lost their viability and cause.

It is recommended that Chairmen be appointed with limited tenure. The faculty, in conjunction with administration, has a vital concern in the evolution of the engineering disciplines. By retaining a Graduate Group structure for graduate education, the Departments will retain a great deal of flexibility, and most important, sensitivity to future technologies. As envisaged here, the Departments would have full responsibility for their own affairs. As is the case in the present Engineering Schools, new disciplines would grow within each Department. The choice may come between converting departmental program or allowing "fission" or even "fusion" between Departments to occur. In either case, the ultimate decision would rest on mutual agreement between the faculty and the College of Engineering administration. The goal would always be orderly and reasoned evolution to face the educational needs at all levels.

PRESENT STRUCTURE



PROPOSED STRUCTURE



The classical areas of engineering (Chemical, Civil, Electrical, Mechanical, and Metallurgical or Materials Science) do not adequately describe the activities of some members of the present engineering faculty. Many members feel their teaching and research largely lie in interdisciplinary fields. In addition, some students could more readily identify with some of the new departments to be created rather than with the traditional ones which exist. This is not a trivial point since it might then be possible to attract excellent students to engineering who would normally think of other fields.

The proposed plan need cause little dislocation among those faculty who wish to remain in departments with names identical to the present schools. They and like-minded faculty will remain in a coordinated unit. *The proposed reorganization is enabling only.*

The changes proposed here would eliminate the position of Directors in the Engineering School. No verbal niceties can avoid the problem that this change will entail. The problem of transition will require the most careful consideration by both faculty and administration. The outcome, however, is anticipated to be a more vigorous and forward look for the Engineering program.

Continuity and Professional Societies

The Committee recommends that a senior member of the faculty be appointed as Associate Dean whose responsibility would be to maintain liaison and cooperation with professional societies associated with the disciplines and advise the Dean of the policies which deal with the future of disciplines in the College of Engineering and in regard to accreditation problems.

The Faculty Council

With the elimination of the four schools, the Engineering faculty will total a body of 100 individuals (or better put, individualists). It will be virtually impossible to have effective communication between the Dean and the faculty under these circumstances. To provide adequate faculty input, the committee strongly recommends the formation of an elected Faculty Council. The

duties of the Council will be to advise the Dean on matters of concern to the faculty and students, provide long-term planning for the College of Engineering and assist where needed in administrative matters. For purposes of discussion, we suggest the following:

- A. Members of the Council will be elected for three years with staggered elections each year.
- B. Department Chairmen would not be eligible for the Faculty Council.
- C. One representative will be elected for each ten faculty members or each Department, whichever is smaller.
- D. Student representative from each department, or prorated in some other equitable fashion, be included.

Concluding Remarks

(1) The Committee has been asserting with confidence that flexibility to recognize and respond to future trends is essential to continued excellence. Thus, the thrust of our recommendations with respect to administrative changes will, we hope, be recognized as aiming toward greater adaptability to change.

(2) Examining the recent history of our graduate activities we were pleased to find that, in a rather short time, progress has been achieved both quantitatively and qualitatively. We were indeed happy to learn that within 5 years, the number of Ph.D. degrees awarded increased from 18 in 1963 to 90 in 1968. However, the Committee feels that despite this rapid and admirable growth we have not, in general, gained as good a national and international reputation as we could have. We were unhappy to find that not very many of our faculty are elected members of the National Academy of Engineering or National Academy of Sciences. There is a great need to attract first rate faculty and the best of graduate students, which in turn are needed to maintain our good name. The Committee feels that there is an absence of an adequate number of established chairs at the full professor level. The Committee does not fully understand the reasons for this situation. We understand the financial dilemma in a private university, but we do not feel that this situation can be allowed to continue. We do

not wish to blame the Schools of Engineering, but rather the University, and its administration for this deficiency. We feel that the University, for one reason or another, has failed to support engineering activities. We earnestly recommend that all efforts should be made to bring this problem to the attention of the President and solicit his support. We recommend maximum effort be expended to attract to this faculty a few most distinguished professors of engineering. Further, we recommend that a subcommittee of the Engineering Faculty Council be created to examine all possible sources of funds to create new Chairs.

In view of the changes proposed for the Moore School, the Committee would like to support a proposal, which already has been made by some members of the faculty, to use the Moore Fund proceeds to establish a number of chairs, perhaps entitled *The Moore Distinguished Professorships in Electrical Engineering*. We can think of no better way of promoting the education of students in this field.

(3) The committee at this time does not recommend the separation of Ph.D. degrees in engineering from the Graduate School of Arts and Sciences. We see many advantages in being part of University wide organizations.

However, we feel that the recommendation of a Doctorate degree in engineering which is now in the process of being decided should be resolved by its approval.

(4) There is no doubt that classrooms and formal meetings provide only one aspect of educational growth. Much can be learned from informal relationships. The committee strongly feels that we should consciously attempt to broaden faculty-student interaction. We should recognize this aspect of education and provide the atmosphere to facilitate this. We should be ready to allocate some space and other resources to achieve this goal.

I. Zandi, Towne School, Chairman

S. C. Batterman, Towne School; M. Beran, Towne School; K. A. Krieger, Chemistry Department; M. Heft, Student; D. D. Perlmutter, Chemical Engineering; H. M. Yamada, Moore School; J. N. Zemel, Moore School.

The Vice President for Engineering Affairs Responds:

Our Engineering Education at Pennsylvania

November 24, 1971

Several years ago I appointed a committee for Long Range Planning in the Schools of Engineering to report to me. The members of this committee are rotated over the years. Early reports dealt with philosophical questions which I deem to be inconclusive in character. As a consequence, I asked the more recent committees, which have been continuously under the chairmanship of Dr. I. Zandi, to identify themselves with specific actions which might be taken by the Faculties of the Schools of Engineering to develop an educational program.

This most recent report disturbs me most because it deals primarily with organizational matters in contrast to educational questions.

An Educational Challenge to the Engineering Faculty

Our new President, Martin Meyerson, has emphasized the concept that a wide variety of modes of study should be available to the individuals coming to the University to undertake their education. The variety of modes of education would range from tutorial study, study by experience in external environments, and studies involving a wide range of themes. While recognizing that many students will continue in the traditional course by course studies which we have been conducting in the past, this proposed variety of educational opportunities at the University, and the importance to education of continual experimentation is a program in which I heartily

concur and would encourage Engineering to participate intensively. I would therefore like to recommend that the Engineering Faculty promptly move to endorse this idea and undertake to incorporate it into its educational program.

It is very easy for any of us to find difficulties which would ensue in a move toward an education program other than course by course in the traditional sense. This is particularly true in engineering education where long prerequisite sequences are typical. In the development of an experimental or changed atmosphere all such thinking can be characterized by being dubbed "reactionary." We must think in terms of ways in which we can do something rather than devising ways which prevent us from doing something.

In considering this topic, the most persuasive argument against educational experimentation of the nature described by President Meyerson is the inextricable relationship between our concept of course credits and our degree. A course is recognized as being the process by which a faculty member teaches a group of students a predetermined amount of knowledge and the award of a grade for the record. I suggest therefore that we try to develop a generic method by which a faculty member can evaluate the quality and performance of his student to the end purpose of certifying him for a degree. Thus, I recommend that the faculty set itself to this task and suggest as a point of departure for discussion that it might specify a set of examinations, including perhaps oral examin-

ations, covering the areas of knowledge and capability which we generally characterize as basic to all studies in engineering. These would include the necessary topics in mathematics, physics, chemistry, basic engineering sciences and a reasonable distribution of studies in social sciences and humanities. I would then recommend that a second set of examinations be required which include the specific accomplishments demonstrating the problem-solving requirements of engineering in a particular professional area. Each of these examinations might be a protracted period of examination including both written and oral examinations.

With such a basic evaluation program establishing the conditions for a degree in engineering, a very wide range of procedures by which an individual student might study engineering would be open to him and innovative ideas in the area of education would be available to our faculty. Their attention would be directed primarily toward the learning process and the education of the students, rather than toward the specific detailed fulfillment of course requirements.

I recommend very strongly that the first issue be the determination of these examination procedures without the attention being given to the possible methods by which the individual student might prepare himself for the examinations.

In many ways one might view these proposals as efforts to extend the techniques of preliminary and final examinations which we have long practiced in our Ph.D. programs, to be utilized in the undergraduate program for engineering students. I re-emphasize the importance of facing this challenge, not with the attitude of why it can't be done, but rather what will be required to do it.

A College of Useful Arts and Sciences

As educators, it is our responsibility to provide the best education for those students who choose to study under our tutelage. Certainly we should encourage those who are determined to become engineering practitioners to study under us. Once they have arrived on our campus, it is our responsibility to teach them in such wise that individually their lives will be most satisfactory.

Although it might be a happy thought that all of these students will become engineering practitioners, as educators we know this is quite unrealistic. While it is obvious that organized societies of practicing engineers will endeavor to influence the particular programs of engineering education which will perpetuate their own specialties, and which view engineering education for the production of engineers exclusively, we must plan our programs not only for the future engineer, but also for those who will change interests and objectives.

I would like to emphasize that engineering education is an attractive and appropriate general education for a way of life in contrast to the sole practice of engineering. Its broadening has been remarkably successful. By conscious design and otherwise the typical four-year engineering program has developed from a group of occupationally-oriented specialties into a liberal program of rather general nature; in some respects, the counterpart in the area of science and technology of the broadly-based general education that is traditionally offered in the liberal arts.

In general, I would characterize engineering education as education from a materialistic standpoint, in contrast to liberal arts education as one from a knowledge standpoint. This does not mean that the liberal arts ignores the materialistic point of view, nor that engineering education restricts itself solely to the materialistic point of view. However, liberal arts does place the highest value on the scholar's approach to knowledge for knowledge's sake, while engineering education

places highest value on knowledge for utilitarian purposes. This is not only a difference between disciplines, but the difference is observed within individual disciplines.

David Hilbert, the pure mathematician, in discussing this subject made the following extreme statement: "We are often told that pure and applied mathematics are hostile to each other. Pure and applied mathematics are not hostile to each other. Pure and applied mathematics have never been hostile to each other. Pure and applied mathematics will never be hostile to each other because, in fact, there is absolutely nothing common between them." This value argument between liberal and useful education has been going on for a long time. Our earliest institutions in this country were highly knowledge-oriented in purpose. Students studied the classics and theology. In 1749 Benjamin Franklin wrote a document entitled *Proposals relating to the education of youth in Pennsylvania*, intended to guide the fortunes of the fledgling institution which later became the University of Pennsylvania. I quote: "As to their studies, it would be well if they could be taught everything that is useful and everything that is ornamental, but art is long and their time is short. It is therefore proposed that they learn those things that are likely to be most useful and most ornamental, regard being had to the several professions for which they are intended."

In spite of our tendency to view and advertise engineering education as uniquely and almost exclusively designed to produce practicing engineers, we have been attracting students who ultimately in large numbers enter other occupations. I suggest strongly that we look forward to offering our educational program as a preparation for all of those individuals who attach a high value to useful knowledge, whether they become professional practitioners of engineering or take up other activities. Above all, we must recognize that our responsibility is to all of the students who come to us for tutelage; not only to those who will ultimately practice the engineering profession.

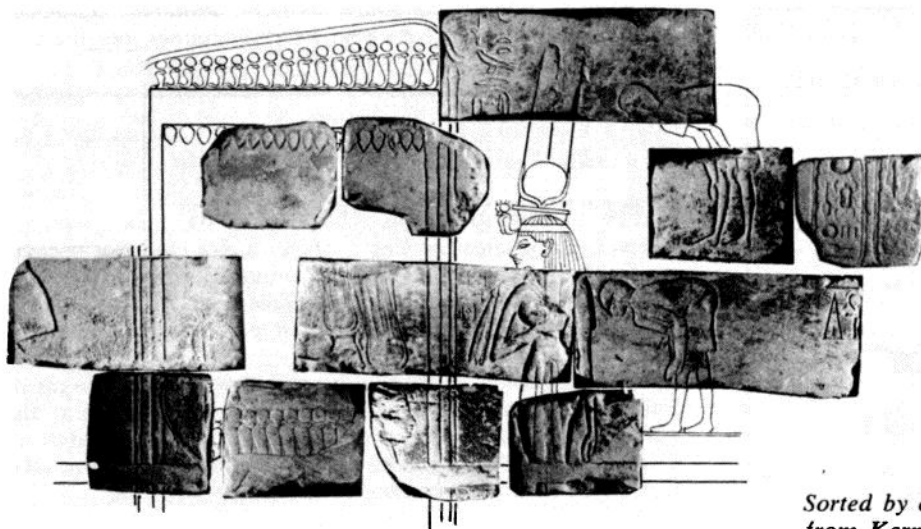
Organization of Engineering at Pennsylvania

Insofar as organization is concerned, I recommend strongly that the engineering effort at the University be organized under a 'College of Engineering' encompassing both the undergraduate work, and graduate work through to the doctorate. Within the College of Engineering, sub-organizations could be schools, departments, and group committees. This would not be unique with Engineering at Penn; Cornell is heterogeneously organized in their College of Engineering. Not only is there no strong reason for a unique organizational structure with parallel titles of the several units, but variety may contribute to our essential need, i.e., the inter-play of different people in different types of organizational groupings. Very few of the problems in the real engineering area are neatly circumscribed by the organizational titles conventional in our universities. They generally require not only participation of the several specialties within engineering but, also, participation by people whose specialties lie in the social science areas. Above all, the organization must not be rigid; it must be flexible enough to accommodate this wide range of cooperation among the specialties from the areas required for engineering undertakings.

In the last two decades we have made great strides in reducing the parochialism of our several groups, but my observation is that we have a long way to go to establish a co-operative organization throughout the engineering division.

In the years to come, I am confident that Pennsylvania will become more and more recognized as one of the outstanding leaders in engineering education in the United States.

—Carl C. Chambers



Sorted by computer, a dozen stones from Karnak suggest a scene which archaeologists complete by hand. Above, Queen Nefertiti emerges with the trappings of power as well as beauty.

REREADING THE STORY OF AKHENATEN IN THE SCATTERED STONES OF HIS TEMPLES

Archaeologists at the University of Pennsylvania Museum must now reshuffle Egyptian history during the reign of King Akhenaten and his Queen Nefertiti (1367-1350 B.C.) as a result of the computer reconstruction of the gigantic temple complex the royal couple built at Karnak to their god Aten.

Ray W. Smith, project director of the Akhenaten Temple project, recently described new findings at the end of the first phase of the international project.

A building complex that rivalled the pyramids in scope and grandeur;

a new role for Nefertiti, who, it seems, was not only a beautiful, deified queen, but perhaps the major political power at the time the Temple was built;

serious doubts as to whether King Akhenaten was the father of Nefertiti's children; and

new information on Aten worship, which was probably the first single-god religion in the world.

Over 35,000 decorated stone blocks scattered in museums and storehouses throughout the world became the raw material from which the University Museum team visually recreated a complex of buildings, including at least two temples, at Karnak over 33 centuries after its destruction.

A Gigantic Puzzle

Jointly participating in the project with the University Museum are the Department of Antiquities of the United Arab Republic, the International Business Machines Corporation and the Smithsonian Institution.

In 1965, Mr. Smith gathered a team of experts including photographers, computer specialists and archaeologists in Cairo, Egypt, to rebuild an image of the complex that originally stood among existing public buildings at Thebes, the ancient capital of the Egyptian empire.

During the seven-year project photographs were taken of 35,000 of the stones that originally constituted the temples. Every significant detail from the photos of these stones was made computer readable. The computer then reorganized this information into manageable lists so that archaeologists could arrange the gigantic puzzle of photos to form a picture of the complex from the mid-14th century B.C.

At this juncture scholars have a rough sketch of the temples

and some of the colorful wall decorations. They are beginning now to re-evaluate Egypt at the time the complex was built from the architecture, wall decoration and inscriptions that they have pieced together from the stone blocks.

The building program was undertaken during the early part of the reign of Akhenaten (1367-1350 B.C.), a few years after he married the famous Queen Nefertiti. During this period of Egyptian history, the old god Amun was replaced by the world's first single god, Aten, god of the sun's disc. The capital of the empire was moved from Thebes (the site of the Aten Temple) to Tel el Amarna, a new city dedicated to Aten. A new naturalism in art and new building styles also appeared during Akhenaten's reign.

Death of an Empire

While Akhenaten was creating a new religious and cultural order, his empire was crumbling. Within fifteen years after he assumed power, the empire collapsed, and he died shortly thereafter. The Egyptian court returned to the worship of Amun and the other gods of the Egyptian pantheon and moved the capital back to Thebes.

About 15 years after Akhenaten's death during the reign of Horemheb, one of Akhenaten's military officers, the complex was destroyed, probably to eradicate Akhenaten and Nefertiti from history. Many of the temples' small, portable stones, which measured only 2 feet long by 10 inches high and wide, were concealed as foundations and fill in the Second Pylon, a huge monument built by Horemheb in the Thebes complex. Other blocks from Aten's Temple were used in subsequent monuments.

The small, painted, relief-cut stones, which came to light as the Second Pylon and other monuments at Karnak began to crumble, are now being put together to form a picture. The team can estimate the size of some structures, one of them an unprecedented courtyard dedicated to Queen Nefertiti. The reconstructed blocks form images of a sumptuous ceremony held in the fourth year of Akhenaten's reign, of the god Aten portrayed as a sun disc stretching his rays to touch his people on earth, and of the religion, history and folklore of Egyptians in the 14th century B.C.

—Michele Steege

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For further information and registration application write to:

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3620 Walnut Street, Philadelphia, Pennsylvania 19104.

NEWS IN BRIEF CONTINUED FROM PAGE 1

Office's Lippincott Building headquarters to discuss any University office's printing needs, Mrs. Yeager said.

PENNSYLVANIA SINGERS: 'TRIAL BY JURY'

The Pennsylvania Singers, a women's glee club that became an equal opportunity chorus by admitting men to its ranks, will stage a full production of Gilbert & Sullivan's "Trial by Jury" February 11 and 12 at 8 p.m. in the Annenberg Auditorium.

The short comic opera will be paired with "Three Ages of Faith," exploring variations on the theme of the Mass: the 17th Century Missa Brevis of Buxtehude; Schubert's Mass in G as an 18th Century sample; and selections from this century's folk-rock contribution, Jesus Christ Superstar.

Bruce Montgomery directs the varied elements. Tickets are \$3 (\$1.50 for students with cards) at Annenberg Box Office 11 a.m. to 4 p.m. weekdays.

UPCOMING IN SPORTS

Feb. 4	8:00	Basketball	Harvard	Away
		Track	New York K of C	New York
Feb. 5	1:00	Wrestling	Cornell	Home
	2:00	Swimming	Villanova	Home
	3:00	Squash	Yale	Home
	3:00	Fencing	Navy	Away
	8:30	Hockey	Brown	Home
	9:00	Basketball	Dartmouth	Away
		Track	Cleveland K of C	Cleveland
Feb. 9	4:00	Squash	Navy	Away
	7:30	Wrestling	Gettysburg	Away
	7:30	Hockey	Cornell	Home
Feb. 10	8:00	Basketball	Columbia	Away

WASHINGTON

GRANTS FOR SCIENTISTS AND ENGINEERS

The Agency for International Development (AID) has announced that a special program for support of individual American scientists and engineers to apply their experience to the problems of developing countries will be supported through grants from the National Science Foundation.

Research/Teaching Grants and International Travel Grants will be provided under this program to (1) enable scientists and engineers of developing countries to share experiences with U. S. scientists and engineers in the formulation and conduct of research and education programs, (2) establish long-term collaborative relationships between the United States and foreign institutions, and (3) increase the capability of scientific and technical institutions in foreign countries.

Additional information may be obtained from:

Office of International Programs
National Science Foundation
Washington, D. C. 20550
(202) 632-5792

The deadline for submission of proposals is *March 15, 1972*. Awards will be announced on April 17, 1972.

—Donald S. Murray

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