THE UNIVERSITY OF CHICAGO RECORD

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REPORT OF THE STUDENT OMBUDSMAN FOR SPRING QUARTER 1970

July 8, 1970

As was stated in my first report, the majority of cases which come to my attention as ombudsman are highly particularistic. This has been true even in this last extraordinary quarter. During Spring Quarter, I handled approximately 65 cases (again for an average of 6 cases a week) involving perhaps 120 complainants. Again there was considerable clustering of cases with regard both to time and subject matter; and again, rather than tire the audience of this report with details of large numbers of these cases, I would prefer to discuss a few which raised what are, to my mind, important issues—issues which questioned accepted rules, policies, or procedures, or which involved a large number of complainants.

One such issue was the much debated nature and content of the College's spring convocation. In order that such confusion be avoided in the future, and for a variety of reasons which will be discussed below, I believe that a senior class council should be elected to plan, in cooperation with the faculty and administration, the College convocation and, separately, any other events or programs which seem appropriate (for example, class donations to worthwhile causes, speakers' programs before or after convocation, other events of a less serious nature, etc.). As with any proposal of this sort, questions are at once raised as to how a representative and hard-working body (and this job will require considerable work) can be elected on a generally apathetic campus. I will leave this question for further debate. I should hope, however, that an attempt will be made to avoid what is apparently becoming a standard format applied without consideration of the merits of the individual case, that is, indirect election (such as election by the already elected student advisory councils). While such indirect processes generally secure responsible, hard-working students, their representativeness remains questionable. This inevitably limits the legitimacy that any such body can have in the eyes of its ultimate constituency; and in this case legitimacy is essential.

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Rightly or wrongly, convocation has long been a function important to the University but unimportant to a large segment of the student body. The dispute this spring arose because students realized that this function could be important to them, that convocation could and should be more to them than a compulsory ritual of passage.

Many students distrust the formalisms and elaborate apparel of convocations and other ceremonies. Yet, most ceremonies, through their symbolic affirmations, serve the ultimate function of reinforcing solidarity, of helping the participants recognize reciprocal bonds and mutual concerns. Certainly this function will not be achieved when the basis for solidarity is questioned. If the ceremony seeks to reinforce a solidarity of educated men and women as against "outsiders," of elitists

in a plebian world, it will and perhaps should be attacked. Hence, students have come to question the garb, the sanctity of the ritual, and the academic exclusiveness of the event's central figures (that is, those giving the convocation addresses, not those receiving honorary degrees). There are other bases for solidarity. For instance, if the ceremony were designed to reinforce the solidarity of the participants as sharing a common desire to improve the conditions and quality of human life through means made available to them through education, then worthwhile debate would continue over those means, but the ceremony might have the potential for generating the kind of centripetal forces it should. Such a ceremony can be developed only through recognition of such common desires and beliefs as now exist, and that recognition will come only when the diversity of participants is adequately considered. This in turn can be accomplished only through sufficient representation of all sectors of the participating body at the planning stages.

While numerous lofty assumptions may be made about the nature of the convocation address and what it should be, it is at bottom nothing more than a topical lecture of an inspirational nature, at best. Can anyone seriously think that after four years at The University of Chicago, the graduating senior is not quite capable of discriminating between exceptional and mediocre lecturers? Those who believe so had best set about dismantling the Quantrell Award and teaching evaluation systems, for they rely on the same capacity. Wouldn't it be preferable to build upon the strengths of these systems, that is, their capacity to draw upon a considerable breadth and depth of informed opinion. I believe, despite all the objections, that the College convocation speaker as well as the ceremony should be selected with significant student participation.

The convocation also seems to me a propitious time for taking stock of what this University is accomplishing in the education of its undergraduates. This index can be provided in part by the students' selection of a student speaker and in part by the problems which he or she addresses. Likewise, there is an important solidarity among students, particularly undergraduates, which deserves recognition and which should be much more deeply understood by faculty and administrators than it is at present. Thus the reciprocity deemed so desirable in the classroom should be paralleled in the last experience we share together.

I believe a senior class council could do much to advance each of these goals.

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A problem which will be increasingly important in the next year will be the continuing decay of Student Government, a decay which is not so much a result of poor leadership as it is a result of poor student participation in its elections and operations, which is in turn the result of widespread belief in its impotence. I believe that a referendum should be held this autumn to determine whether there is sufficient student support for it to continue. I encourage Student Government to coordinate this vote and to push for performance as early as possible in the Autumn Quarter.

In the event that the verdict of such a referendum is to abolish Student Government, several important functions which SG has attempted to perform should be continued. A major function is the appointment of students to important committees such as the Council on Recognized Student Organizations (CORSO), disciplinary committees, and others. It will be necessary to continue and to strengthen the performance of this function. Of the various possible methods of doing this, I propose a direct one: suit the institution to the job. For the job of making committee appointments, this would mean an appointments council of fifteen to thirty members elected generally. For the purpose of expressing student opinion to the President, to the Faculty Senate, or to the general public, this would mean a student forum with resolution-writing powers. For other purposes, other groups of students would be formed.

If the appointments council operated effectively, with application and screening, it might do a good deal in the way of distributing responsibilities beyond the few who seem to be involved in everything (Maroon Key Society, Owl and Serpent, dean's advisory committees). Such distribution might also help substantiate students' desire for positions of responsibility in the University by proving their widespread capacity for work in a meaningful endeavor. It would also free the various existing councils from their current tangle and from the variety of incompatible demands made upon them for both action and appointments. With specific functions, an appointments council could be more carefully scrutinized by its public and kept more responsive in its actions.

This does not mean that direct election to decision-making bodies should be unilaterally abandoned. However, to fill large numbers of important positions by popular election ignores the fact that

students here normally do not know the abilities or the interests of large numbers of other students. There are notorious and infamous students (believe me); there are few or no famous or generally respected students.

If the events and debates of a student forum were widely publicized in advance, I see no reason why it could not become a valid and viable means for the formulation and exposition of student opinion on a wide variety of subjects. Because of the open nature of this institution and its resolution-drafting power, participation in the debate of all crucial issues probably would be heavy and would produce resolutions of high quality both in terms of content and persuasiveness. This could multiply immeasurably the effective influence students could have in the University and its decisions.

As for other functions, once established they are better off left alone (for example, Charter Flights, the Tenant Union, or even the Union of Students —if and when it comes into being). When appropriate, these groups should receive funds directly from CORSO and space directly from Student Activities (when available). Miscellaneous functions should be absorbed by already existing groups. For instance, Revitalization could take on the defunct speakers program, and so on down the line.

If SG is not abolished and continues at its present low level of support and participation, students can look forward to a good deal of resistance to its and CORSOs actions from administrators as a natural and undesirable outcome. More importantly, if competent bodies were established, the possibility that student needs and beliefs would not be taken into account in important University decisions would be much diminished.

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One suggestion I received this past quarter deserves to be put forward just as it was stated to me. Instead of getting involved in purchasing additional apartment buildings and real estate, wouldn't it be simpler for the University to run a housing placement service in much the same way that it now operates the Career Counseling and Placement Service, though perhaps on a much smaller scale? To do so would involve probably only one or two staff members and a suitably equipped office. This is a method employed to advantage at several other schools and would be well worth investigation by a member of the Dean of Student's staff. Besides the visible advantage to students, faculty, and staff, the University might profit by having a viable alternative to geographical expansion. It would also be an important way for the University to promote fair housing policies within its own neighborhood.

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There were a few blunders this past quarter which, while they cannot now be corrected by discussion, may serve to illustrate a class of cases that with care can be avoided.

Disturbingly late in Spring Quarter, dormitory residents were notified by Residence Halls and Commons of a limitation upon the amount of space they would be allotted for summer storage. In fact, the notice arrived in the midst of a trucking strike that precluded normal pickup service and was so late that arrangements for other methods of shipment were made with great difficulty by a large number of students. Even worse, the notification took the form of an authoritarian statement which gave the appearance of total inflexibility and inadaptability to unusual circumstances. Further, the space limits appeared to have been made without consulting the Office of Student Housing or any student groups and showed a lack of awareness of students' actual needs. Rather than trying to secure additional space for storage purposes, RH&C had decided, perhaps appropriately, to limit student storage. However, from there the effort took on the appearance of coerciveness and arbitrariness. Behind the scenes there may have been a good deal of flexibility, but all I could see were alarmed and enraged students by the score. (This was one of the very few cases that have come to my attention where delegations were actually formed to present me with a grievance.) In the end, arrangements were worked out for students, with the approval of resident heads, to secure additional space—but only after considerable (and what should have been unnecessary) pressure from students and the Director of Student Housing.

A second blunder involved about twenty students who thought they had jobs with the Plant Department. Some even arrived on the job for the first day of work only to be told there were no jobs. Some administrators in the Plant Department had thought they had money for these summer employees but apparently were mistaken. It is very difficult for someone with little fiscal experience to understand how these mistakes might be avoided

in the future. I can only say that with the summer job market the way it is, I would be very surprised if all these young people find work, and I would be inclined to press for reconsideration of the financial aid applications of these particular people if need arises as a result of this development. Such abuses of student helplessness must be avoided. There are no sufficient excuses for them.

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When the fall recess was still being considered, I publicly requested those students interested in an alternative of substituting a Summer Quarter's work for a Fall Quarter's work to contact me about the difficulties they might encounter if they attempted to do so. I felt, and still feel, that ten days' work in a political campaign by large numbers of inexperienced students could not but fail to be effective in anything but the frustration of their aspirations. To date I have had no response to this inquiry. Either no one was interested, or the difficulties they anticipated seemed so insurmountable that they soon lost interest. But what if those difficulties had not appeared so insurmountable?

To be honest, I had hoped to use this interest in the Summer Quarter to further my own ideas about what the Summer Quarter should be. Personally, I find Chicago's winters unbearable and the summers generally quite nice. However, besides the advantages for politically interested sutdents, a real Summer Quarter would have values for nearly every group. Faculty might look to the possibility of getting two-quarter research leaves and grants (in different fiscal years). Administrators could look forward to having more company in the summers, and more seriously, to the general advantages associated with continual operation. Staff would find layoffs less common.

I realize, of course, that there are financial and family problems to be dealt with (for example, faculty with school-age children whose vacations are confined primarily to the summer), but it seems to me that resources could be displaced rather than multiplied and that the Laboratory School, at least, could provide more family flexibility. However, since my inquiry went unanswered and thus gives no evidence of demand, I must reluctantly assume that the rest of the University thrives on Chicago winters.

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The issue was raised this year as to whether the University should provide bail money for students who have been "busted." I concur with the decision that such a service would be unwise, but my agreement probably springs from a different set of assumptions. I hope it suffices to say that such a service would work against students if one considers that it directly or indirectly forces the University to take cognizance of off-campus behavior. The present ad hoc system appears to be functioning, with minor exceptions, remarkably well. The only problem, as far as I know, has been in procuring ready cash. At present the list of volunteers consists mainly of students willing to do the "legwork." However, several faculty have expressed to me their willingness to join a similar list for providing the capital.*

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During Spring Quarter another in a long series of committee reports was published. It received far less attention than reports and studies of less important issues, and I fear it will not receive the constructive legislative effort given the Wegener report on disciplinary procedures. It appears to me that the report of the Committee on University Women has so far been treated publicly with a lack of seriousness inappropriate to the magnitude of the issue. This may be a consequence of the timing of its presentation. I hope that a much more positive response will be forthcoming.

Admittedly, the report suffers from incompleteness. There are several other dimensions to be explored by this type of research (for instance, the knowledge men have of discrimination against women and the facts posed by those 6.2 percent of undergraduate men who say they have heard a professor make discriminatory remarks), but they will be refinements of a still young discipline. The response, however, should be to the issue, not to the quality, of the report; and that response has been lacking to the present time.

I am provoked to this conclusion by my own recollections of letting prejudicial words go by without even recognizing the prejudice. Perhaps those who have been denigrating the women's movement are expressing a feeling that the movement is a silly effort on this campus because it attacks a prejudice with which the University has not been contaminated. Perhaps they see the whole movement in terms of what is, to them, its lunatic fringe. Or perhaps they see the inequalities

* I encourage F. M. and his cohorts who organized last year's effort to take advantage of this expression of willingness.

in the status of women in the University simply as a matter of temporary quantitative disequilibrium which will heal itself without a change in the qualitative approach to the problem. Whatever the reason, the very lack of seriousness with which the University is approaching this and associated problems is itself the most serious student grievance I have encountered since taking this position.

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Finally, I suppose I should offer some comments upon the method by which my successor was selected. To be blunt, I think it was fair. The task was significantly more difficult than any of the selection committee members would probably have anticipated. The grilling given the applicants was one I hope I shall never have the misfortune to undergo. The only improvements I could offer would be of a detailed procedural sort. The method of choosing the student members of the committee seemed adequate, but I believe the current ombudsman should be a voting member, rather than an ex officio member who appoints one of the student members. (All student members should be selected by the appointments council if it should get off the ground.)

Beyond these comments, I believe I will save my final remarks about the office and its operation for my final report.

REPORT OF THE AD HOC COMMITTEE ON THE USE OF UNIVERSITY FACILITIES

July 21, 1970

The first report of the Ad Hoc Committee on the Use of University Facilities, which is in the form of a letter to Mr. Levi, is published below. I have asked the Dean of Students to make known to student and faculty groups whose activities come within the purview of the Committee's charge the guidelines contained in the report.

JOHN T. WILSON
Provost

Dear President Levi:

Although the Ad Hoc Committee on the Use of University Facilities continues to deliberate on a variety of issues within its competence, it has completed its initial examination of the issues raised by the absolute prohibition against University participation in campaigning under the relevant provisions of the Internal Revenue Code.

The Committee's deliberations so far on the issue of "campaigning' can be summarized as follows:

1. The Committee believes it can only outline the gross characteristics which distinguish campaigning from other activities of citizens.

2. Campaigning involves temporal proximity to, and functional connection with, an election. The nearer in time an election is, the broader is the scope of activities which will be considered campaigning.

3. Functionally, the following activities would be considered *examples* of campaigning, regardless of their temporal proximity to an election:

(a) Endorsing a particular candidate;

(b) Soliciting campaign funds for a particular candidate;

(c) Recruiting and assigning workers to aid a particular candidate by canvassing, poll watching, or "getting out the vote."

The Committee has also examined the implications of the prohibition in relation to one campus group, the Movement for a New Congress, which has been most cooperative in informing us of its present activities and future plans.

As we understand it, the present activities of the local Movement for a New Congress involve information and referral rather than assignment and campaigning. A formal distinction should be made immediately between *The University of Chicago Chapter of the Movement for a New Congress,* a registered student organization concerned with information and referral, and the *Illinois Movement for a New Congress,* concerned with coordinating certain campaign activities for selected Illinois candidates.

In the view of the Committee, it would not be improper for *The University of Chicago Chapter of MNC* to maintain on-campus information and referral services for members of the University community. The Chapter must not use its campus location for campaigning. If and when the *Illinois MNC* should become involved in campaigns for particular candidates, it will be imperative to keep those activities off campus and clearly separate from the former. We believe that this physical separation should be accomplished by Labor Day, when congressional campaigning is launched in the rele-

vant districts. MNC has indicated that it intends to meet this deadline.

The Committee has sent a copy of the present letter to The University of Chicago Chapter of MNC for its information.

We hope that you will find our advice helpful and that the Committee can continue to help you meet current problems without sacrificing the traditions of university freedom.

Sincerely,

ARISTIDE R. ZOLBERG, *Chairman*
Ad Hoc Committee on the Use
of University Facilities

HONORARY DEGREES

Five honorary degrees were awarded at the 332nd Convocation on June 12, 1970.

Doctor of Humane Letters

PETER HUGH JEFFERD LLOYD-JONES, *Regius Professor of Greek, University of Oxford, and Fellow, British Academy*

Classical scholar and teacher, a master in the art of establishing classical texts, and an enlightened interpreter of ancient Greek religious and philosophical ideas.

Doctor of Laws

RICHARD MORRIS TITMUSS, *Professor and Chairman, Department of Social Science and Administration, London School of Economics and Political Science*

Creative scholar and educator, humane and uncompromising social critic, whose inquiries have profoundly influenced the theory and practice of social welfare programs in his own country and abroad.

Doctor of Science

JULE GREGORY CHARNEY, *Alfred P. Sloan Professor of Meteorology, Massachusetts Institute of Technology*

Distinguished scientist, his fundamental contributions to dynamical meteorology have opened new vistas on atmospheric circulation processes and weather prediction.

SOL SPIEGELMAN, *Director, Institute of Cancer Research, Columbia University*

Distinguished biologist and teacher, his probing experimental studies have led to a broader understanding of the molecular bases of life.

HENRY M. STOMMEL, *Professor of Oceanography, Massachusetts Institute of Technology*

Distinguished scientist, his incisive studies have illuminated the dynamics of the world's oceans.

1970–71 UNIVERSITY BUDGET

July 31, 1970

TO: Faculty, The University of Chicago
FROM: John T. Wilson, Provost

We have just closed the books on fiscal year 1969–70 (which ended June 30, 1970) and have started the new budget year. Attached for your information is the 1970–71 Consolidated Budget as approved by the Board of Trustees in early April. The financial problems it reflects are serious. I think we all should be aware of them.

At about this time last year, during the closing for fiscal year 1968–69, the 1969–70 budget appeared to be sound; but it was obvious that by 1970–71 the University would be facing serious financial stress. In order to convey to the University community the nature of the University's fiscal limitations, Ben Rothblatt prepared a special report on the budget. The report was published in the *Maroon* of November 25, 1969 and again in the *University Record* of December 1, 1969. This memorandum is a continuation of our effort to keep you informed, particularly about the current budget year. It also is intended to alert you to some of the problems inher-

ent in the budget for fiscal year 1971–72, planning for which has already started and will accelerate during the next two months.

In anticipation of the difficulties that we are now facing, President Levi last July asked that a Deans' Budget Committee be appointed to survey the University's financial position. He asked the Committee to make recommendations for the 1970–71 fiscal year and for the longer run. The Committee, chaired by Dean Sidney Davidson and including Deans A. Adrian Albert, Roald Campbell, Leon Jacobson, and D. Gale Johnson, began a series of discussions with other Deans and staff members culminating in a set of recommendations for the 1970–71 budget year. The recommendations made by the Deans' Budget Committee called for:

a 3 percent increase in the basic academic and business budgets of the University;

a tuition increase of $225 for all students in the 1970–71 academic year and $150 per year in each succeeding year until further notice;

a faculty limited in size to a number equal to or less than the number of faculty in 1969–70;

an increase in room and board charges for dormitories and single student housing of 10 percent on the average; and

deferment of adjustments in married student housing charges until an analysis of costs and revenues by individual properties is made.

Discussion among the Deans led to agreement within all academic areas to make every effort to achieve the projected enrollment figures used in constructing the budget. In addition, in keeping with established practice, the Deans in each area were informed of the general characteristics of the budget for all of the academic areas.

The recommendations were communicated to faculty and students by means of a series of memoranda which were subsequently published in the *University Record* for May 11, 1970. After review of the Committee's recommendations and their acceptance by the President and the Budget Committee of the Board of Trustees, the 1970–71 budget was prepared on the basis of: (1) an increment of approximately 3 percent in the academic budget, applied not uniformly but as equitably as possible across the various academic units; (2) an estimated Quadrangles student enrollment of 8,300; (3) a total number of faculty not to exceed the 1969–70 level. Steps were also taken to improve the fiscal control of various academic activities such as the Computation Center, which in prior years had been handled by year-end deficit funding or through various contingency funds. Firm understandings were reached with academic areas that budgets and budget conditions were to be met and that contingency funds would not be available throughout the academic year.

The University's Consolidated Budget for 1970–71 totals $151,467,000, which represents both projected expenditures and projected revenues required to balance the budget. The attachment is a somewhat condensed form of the material that appears in the "official" budget and includes the General Funds (Unrestricted) budget; the Restricted Funds budget; the budget for Academic Auxiliary Enterprises; and, lastly, the budget for general Auxiliary Enterprises.

The difference in degree of freedom enjoyed by the University with reference to the categories "unrestricted" and "restricted" is somewhat illusory. While "restricted" funds which are available for specific purposes are indeed limited to those purposes, the functions carried out are generally those which the faculty is doing by choice and which would be eligible for general University support if sufficient "unrestricted" funds were available. In turn, "unrestricted" funds are not completely unrestricted in that they are encumbered, for example, by tenure and term contracts.

Revenue and expenditure categories for auxiliary enterprises are self-explanatory, with most of the activities budgeted being essentially "self-balancing." But Auxiliary Enterprises as a whole, particularly student housing and food services, will require from unrestricted revenue a subsidy of over $800,000 in fiscal 1970–71. It is important to note that the Consolidated Budget contains no funds for capital expenditures, i.e., construction of buildings. Another point that should be made is that the indicated revenue from endowment includes only that which is available to the operating budget either from income or, if necessary, from allowed allocations from principal.

There are several comments regarding the General Funds (Unrestricted) portions of the budget that I should like to make. General Funds (Unrestricted) expenditures are estimated to total $53,135,000 for 1970–71 as compared to a total of some $49,783,000 in last year's budget Within the $53,000,000 figure, the strictly academic portion, as defined by accumulated academic area budgets, amounts to $34,450,000 as compared to $33,315,350 last year. The increment for academic functions

thus defined is 3.4 percent The difference between this increment and the 6.7 percent increment for total General Funds (Unrestricted) expenditures is accounted for by several items: student services and student aid budgets together increased about 12 percent; the cost of physical property operations increased 16.7 percent (for example, physical plant operating costs of the Regenstein Library are included for the first time in this budget); and, business operations, because of a reorganization in the Treasurer's Office and improved computation services to the investment unit, increased about 10 percent. Several activities, budgeted for the first time, were not included within the 3 percent limit reommended by the Deans' Budget Committee.

I should like particularly to call your attention to General Funds (Unrestricted) revenue. Total revenue from sources which make up the General Funds (Unrestricted) category is budgeted at $53,935,000. As indicated, the sources of this revenue include students fees, unrestricted endowment income, sundry income (largely from Encyclopaedia Britannica), indirect cost allowances (primarily from federal government grants and contracts), and, finally, gifts required—which means required to balance the total revenue budget against the total expenditure budget. Each of these items reflects the best estimate that could be made as of the time the budget was adopted.

Although student fees were increased by an amount sufficient to maintain tuition income at its previous relative level of contribution to the budget, increased support of student aid reduced the net contribution from this source. The contribution from endowment income toward support of the budget and that from sundry income will probably meet the estimates as indicated. The same is true, at least based on current information, with reference to indirect cost allowances from government grants and contracts. Reductions in income from this source will probably not be felt until next year.

What gives the greatest cause for concern is the unrestricted gift requirement—$10,435,000. This is the portion of the unrestricted general funds revenue total of $53,935,000 that is necessary to balance the budget as a whole. Last year the analagous figure was $9,327,000. However, there is a significant difference in this year's situation as compared to last year and the four years before that. The difference is that there were available last year some $5,700,000 from the Ford Challenge grant to apply against the $9,327,000 unrestricted gift requirement. For 1970–71 funds remaining from the Ford grant will be about $3,000,000. For 1971–72 and for future fiscal years none will remain. The likelihood of a replacement for the Ford grant is negligible.

Obviously it will require strenuous efforts to meet the gift estimate. Gifts are in large measure a function of market and economic conditions. They are also a function of the attitudes of those most eligible for gift-giving. In addition, they are a function of the amount of time available to apply to fund-raising pursuits. Taking into account all of these factors, including the remainder of the Ford grant, it will take something akin to a minor miracle to achieve the required $10.4 million gift estimate.

With reference to restricted and auxiliary enterprise revenue the primary source is government grants and contracts. Funds from federal government agencies have leveled off for the past three years. The federal budget for fiscal year 1971 shows increases for research and development programs in colleges and universities, but many of these increments are directed toward programs and areas of research which are not congruent with faculty interests at this University. Although we have indications that we will not experience a reduction in government grant and contract research funds this year, that will probably not be true for fiscal 1971–72. Compounding the problem is the cutback on fellowships and traineeships, which will put an increasingly heavy burden on research grants as a source of replacement for graduate student support. It will also put an increasingly heavy strain on unrestricted University funds for student aid. Over the past two budget years we have experienced a reduction of about $2 million in revenue from government fellowship and traineeship programs.

The outlook for the immediate future, insofar as the University's budget is concerned, is difficult. It is against this background that the Deans' Budget Committee will initiate its deliberations on the 1971–72 budget. There is little doubt that measures such as were recommended for the 1970–71 budget will be inadequate to meet the conditions of next fiscal year. Closer scrutiny of recommendations and decisions on new appointments, reappointments, and tenure will be required. Closer examination of each expenditure will be necessary. Increased efforts to raise funds will help.

It may well be that there will be a return to an earlier mode of academic life, less well rewarded than we have come to enjoy and expect. If this is so, it may be helpful to remind ourselves that this University has weathered crises, fiscal and otherwise. It has the capacity to do so again.

CONSOLIDATED BUDGET: REVENUES AND EXPENDITURES, 1970–71

Revenues (Estimated)

A. General Funds (Unrestricted)	1970–71
Student fees	$ 21,500,000
Endowment income	8,800,000
Sundry income	6,600,000
Indirect cost allowance	6,600,000
Gifts required	10,435,000
Total	$ 53,935,000
B. Restricted	
Endowment income	$ 3,157,000
Government contracts & grants	34,941,000
Other	11,721,000
Total	$ 49,819,000
C. Academic Auxiliary Enterprises	
Student fees: precollegiate	$ 3,030,000
Income from patients: Hospitals and Clinics	27,524,000
Gifts & fees: Industrial Relations Center	1,130,000
Total	$ 31,684,000
D. Auxiliary Enterprises	
Bookstore	$ 2,000,000
Housing & food services	3,681,000
International House	760,000
Center for Continuing Education	913,000
University Press	7,145,000
Miscellaneous activities	1,530,000
Total	$ 16,029,000
E. Consolidated Revenues (Total of A, B, C, D)	$151,467,000

Expenditures (Appropriated)

A. General Funds (Unrestricted)	1970–71
Instruction and research	$ 27,439,300
Library	3,300,000
Student services	2,920,000
Physical properties operation	7,789,000
General administration	790,700
Development expense	1,985,000
Business operations	3,481,000
Student aid	6,325,000
Staff benefits	105,000
Estimated year-end savings	(1,000,000)
Total	$ 53,135,000
B. Restricted	
Instruction and research	$ 43,968,000
Library	465,000
Student services	74,000
Physical properties operation	2,000
General administration	225,000
Student aid	5,050,000
Total	$ 49,784,000
*C. Academic Auxiliary Enterprises**	
Precollegiate	$ 3,030,000
Hospitals and Clinics	27,524,000
Industrial Relations Center	1,130,000
Total	$ 31,684,000
*D. Auxiliary Enterprises**	
Bookstore	2,000,000
Housing and food services	4,671,000
International House	795,000
Center for Continuing Education	964,000
University Press	6,953,000
Miscellaneous activities	1,481,000
Total	$ 16,864,000
E. Consolidated Expenditures (Total of A, B, C, D)	$151,467,000

* Expenses of Auxiliary Enterprises do not include charges for depreciation or rent of premises occupied.

NEW FACULTY COMMITTEE

President Levi has appointed a faculty committee to consider criteria of academic appointment in a broad perspective. The members of the committee are:

EDWARD SHILS, *Chairman*
S. CHANDRASEKHAR
DR. RODERICK W. CHILDERS
JOHN HOPE FRANKLIN
ARTHUR FRIEDMAN
JACOB W. GETZELS
HARRY G. JOHNSON
SAUNDERS MAC LANE
JOHN A. SIMPSON
LORNA P. STRAUS
H. G. WILLIAMS-ASHMAN

ROSENBERGER MEDALIST

The Rosenberger Medal was conferred at the 332nd Convocation on June 12, 1970.

EDWARD PENDLETON HERRING, *Director, Foreign Area Fellowship Program, Joint Committee of the Social Science Research Council and the American Council of Learned Societies*

In recognition of your scholarly contributions to the understanding of politics and your leading role in the development of the social sciences during your fifteen years as President of the Social Science Research Council.

DISCIPLINARY PROCEDURES ENACTED BY THE COUNCIL OF THE UNIVERSITY SENATE ON MAY 12, 1970

In April 1969 the Council of the University Senate asked for the appointment of a committee to study possible future changes in disciplinary procedures with particular reference to disruptive activities and to the question of student participation in disciplinary hearings. The Committee of the Council selected six faculty members to serve. The faculty members then selected three students from a panel of nominees supplied by student councils of the collegiate divisions, the graduate divisions, and the professional schools.

Faculty members of the committee were Charles Wegener, chairman, Harold Demsetz, Edward Deutsch, Paul Sally, Ronald Singer, and James Spofford. The three student members were Tim Lovain, Peggy McQuade, and Steven Orman. Counsel to the committee was Allison Dunham.

The report of the Wegener Committee was submitted to the Council of the Senate on November 24, 1969. It was discussed extensively throughout the Winter Quarter of 1970 and numerous changes of style and substance were adopted by the Council, although the disciplinary procedures as finally enacted are substantially the same as those recommended by the Wegener Committee. The amended procedures in their final form were adopted by the Council on May 12, 1970. In keeping with the recommendation of the Wegener Committee, the new disciplinary rules and procedures as finally adopted are being printed in full in this issue of the Record. *The substantive rules will also be separately printed in the 1971 edition of the* Student Handbook.

CHARLES D. O'CONNELL
Dean of Students

Section 1. Provision for Review of Disciplinary Procedures

The Council of the University Senate shall review, through an appropriate committee, the entire disciplinary system of the University with special reference to the innovations herein proposed, such review to be conducted not later than the Spring Quarter 1973.

Section 2. Statutory Provision

The Council of the University Senate shall request the Board of Trustees to include within the Statutes of the University provisions to the following effect:

Conduct of members of the University disruptive of the operations of the University, including interference with instruction, research, administrative operations, freedom of association, and meetings as protected by University regulations, is prohibited and is subject to disciplinary action.

Consistent with the powers reserved to the Board of Trustees, the Office of the President, and other Ruling Bodies, the Council of the University Senate

shall formulate those rules that relate to student conduct prohibited by this statute. The Council of the University Senate shall formulate the procedures that will enforce those regulations and shall provide for hearings where there are charges of violations of those regulations. The Council of the University Senate may also establish mechanisms for the formulation and administration of additional rules and regulations for student conduct prohibited by this statute.[1]

Section 3. Definition of Disruptive Acts

It is misconduct, constituting a disruptive act, for any member of the University community to engage in conduct which substantially obstructs, impairs, or interferes with teaching, study, research, or administration of the University, the authorized use of University facilities, or the rights and privileges of other members of the University community, for example:

(a) by obstructing, impairing, or interfering with University sponsored or authorized activities or facilities in a manner likely to deprive others of the benefit or enjoyment of the activity or facility;

(b) by using force against any member of the University community or his family which substantially and directly bears upon the member's functions within the University, or threatening the use of force against him or his family in circumstances which create a reasonable fear that actual force is likely to follow;

(c) by taking, occupying or using, destroying or damaging the property of the University or of any member of the University in the offices or premises of the University without authorization;

(d) by obstructing the administration of University disciplinary processes by force, violence, physical interference, unreasonable noise, or by other obstacle to its functioning;

(e) by obstructing any officer or employee of the University in the performance of his duties;

(f) by altering, destroying, removing, or concealing without authorization or by falsifying any record or document of the University.

Section 4. Constitution of University Disciplinary Committees

Disciplinary committees, empowered to conduct hearings on charges of violations by students of statutory provisions and Council legislation prohibiting disruptive acts, shall be constituted as follows.

During the Spring Quarter of each academic year:

(1) The President of the University shall appoint, after consultation with the Committee of the Council of the University Senate and the Academic Deans, five faculty members [as defined in Statute 13(a)] to each of five University Disciplinary Committees, and designate one member from each Committee as its Chairman.

(2) A panel of thirty-two students shall be constituted—one to be appointed by each Student Council in the Collegiate Divisions, the Divisions, and the Schools (including The Pritzker School of Medicine), in consultation with the appropriate Dean or Master, and sixteen by Student Government.

At such time as a University Disciplinary Committee is required:

(1) One of the available faculty groups shall be drawn by random selection and to it shall be added two student members drawn by random selection from the student panel.

(2) The Chairman does not vote except in case of ties. The Chairman and four members of the Committee constitute a quorum, and decisions are

[1] On May 18, 1970, the Board of Trustees amended the Statutes of the University as follows.

1. By adding the following provision as Statute 24 and by redesignating the present Statutes 24 (Degrees) and 25 as Statutes 25 and 26 respectively:

Statute 24. Disruptive Conduct.—Conduct of members of the University disruptive of the operations of the University, including interference with instruction, research, administrative operations, freedom of association, and meetings as protected by University regulations, is prohibited and is subject to disciplinary action.

2. By adding the following provision to Section 3 of Article IV of Statute 14 as paragraph (e) of said Section 3 and by redesignating the present paragraphs (e), (f), (g), and (h) of said Section 3 as paragraphs (f), (g), (h), and (i) respectively:

Section 3 of Article IV of Statute 14 (the Organization and Powers of the University Senate and the Ruling Bodies.—(e) Consistent with the powers reserved to the Board of Trustees, the Office of the President, and other Ruling Bodies, the Council of the University Senate shall formulate those rules that relate to student conduct prohibited by Statute 24. The Council of the University Senate shall formulate the procedures that will enforce those regulations and shall provide for hearings where there are charges of violations of those regulations. The Council of the University Senate may also establish mechanisms for the formulation and administration of additional rules and regulations for student conduct prohibited by Statute 24.

Pursuant to the new disciplinary rules enacted by the Council, President Levi has appointed the following groups of faculty whose members will be available for service during 1970–71:

1. Mark Ashin
   Dr. James E. Bowman
   Edwin McClellan
   Schubert Ogden
   Margaret K. Rosenheim
2. Mary Jean Bowman
   James Bruce
   Dr. Jarl Dyrud
   Dr. Wolfgang Epstein
   Owen M. Fiss
3. Philip Foster
   Robert Gordon
   Akira Iriye
   Dr. Ann M. Lawrence
   Michael D. Taylor
4. Dr. Lloyd A. Ferguson
   John E. Jeuck
   William H. Meyer
   Jane Overton
   Manley H. Thompson, Jr.
5. Philip Hoffmann
   Charles H. Long
   Richard A. Posner
   Erica Reiner
   Dr. Francis H. Straus, II

reached by simple majority, except that a decision to expel requires four affirmative votes.

(3) Vacancies on a Disciplinary Committee, whether of faculty or students, created by failure to serve, shall be filled by appointment by the President.

(4) A Committee remains in being until discharged by the President, at which time its members rejoin the appropriate panel or groups.

Section 5. Procedures

The following procedures are to be followed in cases in which the charge against the student is violation of the University Statute and legislation of the Council prohibiting disruption of the operations of the University.

Intent of Procedures

The intent of these procedures is to insure a fair and orderly hearing on the charges. Interpretation and detailed development of this procedural outline require that all parties to the proceeding consider procedural questions in the light of what is required by fundamental fairness and a reasonably prompt and organized movement toward an accurate determination of individual cases in a process not having available all the resources of a proceeding conducted in a court of law. While responsibility for a fair and orderly procedure must be shared by all parties, the Chairman of the University Disciplinary Committee is specially responsible for the conduct of the proceedings, and the Committee as a whole must be the judge of what procedures will best serve these ends in a particular case.

Charging

Information that a student has engaged in acts disruptive of the operations of the University may be brought by any member of the University to the attention of the Dean of Students, a Dean of Students, or the Deans of the Schools, the Divisions, or the College. Charges of such violation may, however, be preferred only by the Dean of Students, a Dean of Students, or any one of the Deans of the Schools, the Divisions, or the College. Charges must be given to the student in writing, and must include a brief statement of the nature of the charge and of places and times at which the student can respond to the charge. Unless there is already in being a University Disciplinary Committee able to handle the case, one is promptly convened. The charging authority transmits to the Chairman of the Committee, who thereafter becomes responsible for processing all aspects of the case under the Committee's direction, a copy of the charge and a statement of the evidence on which it is based. The facilities of the Office of the Dean of Students are at the disposal of the University Disciplinary Committee in whatever ways may, in the judgment of the Committee, facilitate a prompt and fair disposition of the case.

Informal Hearing

Proceedings before the Committee normally begin with an informal private hearing conducted by a representative designated by the Committee. At this hearing the student charged is informed of his rights and of the substance of the procedure to be followed throughout by the Committee as set forth herein or in some other form. He is

advised that he may be represented by someone of his own choosing at every stage of the proceedings, is asked to consider—and to decide, if possible—whether he will request a private or a public hearing of the case, is fully informed of all the evidence available to the Committee on which the charge is based, and is told that the Committee will hear witnesses whom he may bring forward and that it will also accept written statements on his behalf. He is further informed that the Committee will use its own powers of persuasion to induce such witnesses to appear or to offer statements in writing if he is not able to procure their attendance and assistance. This policy of full disclosure is further implemented by informing the student that any additional evidence becoming available to the Committee will be available to him before the hearing, and he is told how he and his representative may have access to such evidence. Finally a date for the hearing before the Committee is set or arrangements are made for determining it and informing the student.

Hearing

The Committee presumes the innocence of the student charged, assumes no facts or conclusions, ignores any previous history of disciplinary action with respect to the student charged, and reaches its decision as to whether the student has engaged in the prohibited act solely on the basis of the evidence actually before it. In a hearing before the Committee the evidence is set forth and its significance discussed. In addition to the content of all evidence the student charged is entitled to be informed of the source of all evidence and of the identity of those on whose credibility any evidence may depend. The Committee makes every effort, within the limits of its powers of investigation and invitation, to resolve all issues of fact appearing in the evidence and invites and encourages the student and his representative not only to comment upon conclusions which might seem reasonably inferable from the evidence but also to offer alternative interpretations of it in whole or part. But the student charged, while required to appear, is not required to testify, and if he chooses to testify he may refuse at any point to answer any question, and no prejudicial inference is drawn from such refusal. All "rules of evidence" will, in similar fashion, be considered by the Committee with respect to their function and effect in an inquiry enjoying neither the advantages nor the limitations inherent in an "adversary" proceeding in a court of law. The student may have a private hearing at which a few observers of his own choosing are present as well as his chosen representative, or with the approval of the Committee a public hearing at which members of the University community and other persons are freely admitted within such limits and under such conditions as the Committee deems consistent with orderly conduct of the hearing. At any time the student charged or his representative may request changes of schedule in the interest of a more adequate presentation of his case or may change his mind as to whether he wishes a public or a private hearing. Such requests will be considered on their merits by the Committee. In deliberating upon the *weight* of the sanction to be imposed the Committee may take into account any facts of previous disciplinary action with respect to the student and, in the case of a student on probation or under a reserved suspension, is required to do so. The deliberations of the Committee will be private.

The Chairman of each Committee has a special responsibility for procedural correctness. He may, if he so chooses, delegate this responsibility to another member of the Committee, but it is his responsibility to see that the function is provided for in the working of the Committee. The Chairman or his deputy would (a) make an initial response to any procedural question which arises, (b) be obligated to alert the Committee to procedural implications of any action they may wish to take, (c) call to the attention of the Committee or any of its members any inconsistency between the demands of fair procedure and the actions of the Committee or its individual members at any point in the proceedings, and (d) be responsible, in situations in which he feels it desirable or the Committee instructs him to seek further guidance, for seeking out and presenting to the Committee whatever relevant information may be available in the experience of previous Committees, or in special circumstances from other sources (see below). None of the special responsibilities within the working of the Committee, however, should in any way impair or supersede the ultimate authority of the Committee as a whole in determining, within the framework of this legislation, its own procedures.

In discharging the function of the Committee, its Chairman is authorized and encouraged to consult the precedents and experienced judgment available in the work of previous Committees. For this purpose he may have recourse not only to the records and reports of previous Committees but also to their Chairmen or such other members

of previous Committees as may seem to him appropriate. *With the permission of the Committee* he may, on specific points, consult such other persons as it may determine may have useful advice. In transmitting the results of such inquiries to the Committee for its consideration he shall (a) emphasize that no advice or precedent is binding upon the Committee, (b) indicate clearly what the sources of any opinions or suggestions may be, and (c) express his own judgment as to the value of the suggestions offered.

Failure To Appear

There is but one exception to the rule that no sanction is imposed without fulfillment of the procedural requirements outlined above. A student who fails to appear for a hearing before the Committee may be suspended by action of the Committee when it is satisfied that he has been given notice of the charges as required above and has had sufficient opportunity to respond. A student so suspended is notified of the suspension and offered another opportunity to appear on the original charge or charges. Failure to appear on the part of a student so suspended and so notified for a period of three weeks from the time at which notice of suspension was given to him or by the end of the quarter in which the original notice to appear was given, whichever is longer, is in itself grounds for imposition of sanctions, not excluding expulsion, by action of the Disciplinary Committee. In considering the case of the student who appears after having been suspended as a consequence of failure to appear, the Committee may take into account his original failure to appear in imposing sanctions where, in their judgment, such failure was willful.

Records

A summary written record of each case is kept by the Committee and furnished to the Review Board or the student upon request. This record should show at least (a) the chronology of the case from the receipt of the charges to final disposition by the Committee, (b) a statement of all actions taken by the Committee with respect to the case, (c) a statement of the chief findings of fact which were relevant to the final disposition of the case and the choice of sanction, including especially any findings that bear upon the difference of sanctions imposed in this case as opposed to similar cases, and (d) a notation of any procedural questions peculiar to the case. The student may keep his own record of the hearings.

At least annually the Dean of Students shall make available to the University community a statistical summary of the activities of all University Disciplinary Committees and of the Review Board.

Section 6. Identification

A student is subject to disciplinary action if he fails to identify himself adequately upon proper request of a properly identified University official in the performance of his duty. Charges of such a failure to identify oneself may be heard by a University Disciplinary Committee when the failure to identify is associated with a disruptive act. In no case shall the sanction imposed for such failure exceed one quarter of suspension.

Section 7. Sanctions

Sanctions imposed upon students in any University disciplinary proceedings shall be given the practical meaning assigned in the following list. No others shall be imposed in cases of disruptive conduct except that restitution may be required for theft or damage to property associated with a disruptive act. It is the responsibility of the Dean of Students to inform students by appropriate means of the various sanctions. The notes which follow this list are an integral part of it.

Disciplinary probation means that the person charged has been found to have engaged in the prohibited act but that the sanction of suspension or expulsion has been withheld. For a period of time specified in the decision of the Disciplinary Committee, the student continues to enjoy all the rights and privileges appertaining to the status of a student except as the Disciplinary Committee may specifically provide, but in the event that during the period of probation he is charged with and found by a Disciplinary Committee to have engaged in another prohibited act the Disciplinary Committee, in determining sanctions, is informed of his probationary status and is required to take it into account.

Reserved suspension means that the person charged has been found to have engaged in the prohibited act, that the Disciplinary Committee imposed the sanction of suspension for a specified time but that the suspension is held in abeyance. The unexpired portion of such suspension becomes automatically effective when a student under reserved suspension is charged and found by a Disciplinary Committee to have engaged in another prohibited act. In determining a sanction for such an additional act the Disciplinary Committee is

required to take into account the fact of the previous suspension.

Suspension means that the person charged has been found to have engaged in the prohibited act and that for a period of time specified in the decision of the Disciplinary Committee (but never exceeding nine quarters) the student is denied the exercise of all the rights and privileges appertaining to the status of a student in the University. Unless the Disciplinary Committee specifically provides otherwise in its decision, at the expiration of the period of suspension the student may resume active status as a student without any action on his part other than would be required of any student who has, for a comparable period, interrupted his residence in the University for any other reason, except that a student under suspension charged with another offence may not resume active status as a student until final action has been taken on such charge by an appropriate Disciplinary Committee.

Expulsion means that the person charged has been found to have engaged in the prohibited act, that he ceases to have the rights and privileges appertaining to the status of a student in the University, and that he may not resume such status without reapplication for admission. Normally such reapplications will not be entertained for a period of eleven quarters following the date of explusion.

Note 1. Sanctions may be imposed on anyone who has been admitted to the University whether or not he happens to be in residence at the time of the offense. The sanction imposed in the case of students not currently in residence takes the form of a condition imposed upon resumption of active status as a student.

Note 2. Sanctions on this list are arranged in increasing order of severity. They may be combined in a given decision. The Review Board in mitigating sentences may be expected to make use of all the alternatives.

Note 3. Rights and privileges appertaining to the status of a student include (but are not limited to) registration, participation in classes and other instructional activities of the University, taking of examinations and the satisfaction of any other requirement for a degree, application for and receipt of any degree, participation as a student in student activities and organizations and in University ceremonies or official bodies, and use of University facilities such as libraries, dormitories, and other student housing. While employment by the University is not an exclusive right or privilege of students, in cases in which employment is reserved for students or students are given preference in employment the fact of suspension or expulsion may affect status as an employee. Further, the University as an employer is entitled to take into account in its employment policies the grounds on which sanctions have been imposed, as these may relevantly bear on qualifications for employment.

Note 4. Suspension and expulsion will be recorded on a transcript in such terms as will not distinguish explicitly or by inference between interruptions of registration and residence by disciplinary action and interruptions imposed for any other reason, such as academic performance.

Section 8. Review Board

There shall be established a Review Board with authority to review decisions of University Disciplinary Committees as follows.

Constitution of Review Board

The Review Board consists of:

(a) the Dean of Students in the University or his designated deputy,

(b) one of the Academic Deans selected by the Provost,

(c) a senior member of the faculty appointed as Chairman by the President of the University,

(d) an undergraduate student selected at random from the panel of students nominated for membership on University Disciplinary Committees,

(e) a graduate student selected at random from the panel of students nominated for membership on University Disciplinary Committees.

All members other than the Dean of Students in the University are appointed for one year terms at the beginning of the Winter Quarter of each academic year.

Procedure for Clemency

(1) A student on whom any sanction other than probation has been imposed by a Disciplinary Committee may petition the Review Board at any time (but no more often than once each academic year) for mitigation of the sanction imposed. The petition shall contain a brief history of the case and a statement of the reasons why the decision should be modified. The Review Board shall not in such a case pass upon the correctness of the proceedings in the adjudicatory tribunal but shall confine itself to considerations which properly bear upon the

propriety of extending clemency. In making the determination regarding clemency the Board considers whether the sanction imposed bears unfairly on the petitioner in his individual circumstances, but also should take into account such factors as whether there is undue risk that on reinstatement the petitioner will engage in misconduct again and whether a lesser sanction will depreciate the seriousness of the petitioner's misconduct.

The Board may in its discretion permit the petitioner to make an oral presentation in addition to any written submission he cares to make. If three members of the Board agree on reinstatement or other mitigation of the sanction imposed, a copy of the Board's decision shall be sent to the Dean of Students for appropriate action.

Procedure for Request of New Hearing

(2) Within one academic quarter after a notice of a decision has been delivered to him, a person who has been suspended or expelled may petition the Review Board to request an appropriate Disciplinary Committee to hold a new hearing. The Review Board (by agreement of three of its members) will order a new hearing:

(a) where the petitioner establishes to its satisfaction that he was denied a fair and impartial hearing;

(b) where the petitioner establishes to its satisfaction that since the initial hearing he has discovered new and material evidence which if introduced at the hearing would probably have changed the decision.

Conclusiveness of Disposition

(3) Except as provided in (1) and (2) above, the disposition of the original adjudicatory tribunal is final and conclusive on all parts of the University.

Section 9. Publication

The Council's actions with respect to disciplinary procedures shall be published in such a way as to ensure their general availability to all students.

Section 10. Transitional Provision

Irrespective of the calendar prescribed [in Sections 4 and 8] for the appointment of the student panel, the faculty groups, and the Review Board, the first panel, groups, and Board will be appointed as soon as possible after enactment of these regulations and procedures and will take office upon appointment.

REVISION OF AUTUMN QUARTER CALENDAR

June 10, 1970

TO: Faculty and Students of the University

FROM: Edward H. Levi, President

On May 12, 1970 the Council of the University Senate approved an action recommending to the President that the academic calendar for Autumn 1970 be constructed so as: (1) to provide for a recess from Saturday, October 24, through Tuesday, November 3; and (2) to begin classes on September 28. The feasibility of the proposed calendar has been discussed by the Provost with the Academic Deans and by the Dean of Students with the Deans of Students in the various areas. In addition, the proposed calendar was discussed at a subsequent meeting of the Council.

I realize there are differing views as to the wisdom of the proposed change, and that in deferring to the diverse personal plans of some faculty and students, there is inevitably some inconvenience for others. A calendar, at best, always represents a compromise on such matters consistent with the educational requirements of the institution.

I have concluded that the recommended University calendar is feasible and that it is consistent with the academic objectives of the University. I trust the administration of the calendar will seek to minimize the inconveniences which are bound to arise because of the lateness of the change.

REVISED AUTUMN QUARTER (1970) CALENDAR

	Present Schedule	*Revised Schedule*
Quarter begins; classes meet	October 5 (Monday)	September 28 (Monday)
Registration for undergraduates begins	September 30 (Wednesday)	September 23 (Wednesday)
Registration for graduates begins	October 1 (Thursday)	September 24 (Thursday)
Registration for undergraduates and graduates in divisions ends	October 2 (Friday)	September 25 (Friday)

Registration for professional schools ends	October 6 (Tuesday)	September 29 (Tuesday)
Interim—no classes		October 24 (Saturday) through November 3 (Tuesday)
Thanksgiving Day, a holiday	November 26 (Thursday)	November 26 (Thursday)
Autumn convocation	December 18 (Friday)	December 22 (Tuesday)
Quarter ends	December 19 (Saturday)	December 22 (Tuesday)

REPORT OF THE COMMITTEE ON AFRICAN AND BLACK AMERICAN HUMANITIES

May 15, 1970

The following report on the first two years' work of the Committee on African and Black American Humanities was prepared by its retiring chairman, James C. Bruce, for distribution to the campus community.

I would like to summarize the events of our total or partial sponsorship from October 1968 to the present. I feel that through these events, enumerated below, the Committee has made a positive contribution to the intellectual and cultural life of the University and of the Chicago community at large.

In all, we have presented, or helped to present, eighteen persons and three ensembles for a total of twenty-four lectures, ten informal discussions, four musical or dance performances, and one art exhibit. In six instances we have enjoyed the cooperation of the Committee on African Studies, the Departments of History and Music, the Bergman Gallery, and the Illinois Arts Council.

Apart from the separate, informal discussions, these events have comprised, in terms of the geographical distribution of their content, six lectures and two performances pertaining to Africa; thirteen lectures, two performances, and an art exhibit pertaining to the United States; four lectures pertaining to the Western Hemisphere south of the United States; and two lectures pertaining to Africa and the Western Hemisphere. In terms of topical categories, again apart from informal discussions, the offerings have consisted of three lectures on art and one exhibit, twelve lectures on literature, seven lectures on music and four performances (including the dance), and two lectures concerning the intellectual and cultural tradition in general.

The art exhibit was a month-long show of works by Hughie Lee-Smith, who also delivered a lecture and conducted a separate, informal discussion. Musical or music and dance performances were offered by the classical pianist Natalie Hinderas, the Ghana Dance Ensemble, the Blue Nile Ensemble of Ethiopia, and a jazz ensemble under the direction of William Quinn, who also gave a lecture on jazz.

The names of the persons and ensembles who appeared and the nature of their contributions follows:

Chinua Achebe (author)—lecture on African literature and separate discussion

T. J. Anderson, Jr. (composer and musicologist)—lecture on music and participation in a joint discussion with David N. Baker and Wendell P. Whalum

David N. Baker (composer, performing musician, and musicologist)—lecture on music and participation in a joint discussion with Messrs. Anderson and Whalum

The Blue Nile Ensemble—performance of Ethiopian music, in cooperation with the Committee on African Studies

Wilfred Cartey (Africanist)—two lectures on African and Caribbean literature and a separate discussion

Mercer Cook (Romanist)—lecture on African, West Indian, and Afro-American literature

Abram Demoz (Ethiopianist)—lecture on Ethiopian literature, in cooperation with the Committee on African Studies

Hoyt W. Fuller (author and editor)—lecture on literature and separate discussion

Ghana Dance Ensemble—performance of African music and dance, in cooperation with the Department of Music and the Illinois Arts Council

Natalie Hinderas (pianist)—lecture on music and a piano recital

C. L. R. James (historian and author)—two lectures on the intellectual and cultural tradition in general (one lecture in cooperation with the Department of History)

Charles Keil (musicologist)—two lectures on music and a separate discussion

George E. Kent (Americanist)—two lectures on literature and a separate discussion

Hughie Lee-Smith (artist)—lecture on art, a separate discussion, and an exhibit of his works (in cooperation with the Bergman Gallery)

Ezekiel Mphahlele (author)—lecture on African literature and a separate discussion

James A. Porter (art historian)—two lectures on art and a separate discussion

William Quinn (musician)—lecture on jazz and a performance with his ensemble

Emile Snyder (Africanist)—lecture on African literature

Wendell P. Whalum (musicologist)—lecture on music and participation in a joint discussion with Messrs. Anderson and Baker

John A. Williams (author)—two lectures on literature and a separate discussion

The recent appointment of George E. Kent as Professor of English and in the College is a direct outgrowth of the activities of the Committee. Following his lectures here in spring 1969, Mr. Kent was invited to the University as a visiting professor for the academic year 1969–70. The visiting appointment has in turn become a permanent one.

I must conclude on a tragic note. Those who were privileged to hear James Porter's splendid lecture on African art, which so auspiciously inaugurated our series on October 14, 1968, will be especially saddened to learn of his recent untimely death from cancer.

JAMES C. BRUCE, *Chairman*

FINAL REPORT OF THE COMPUTER POLICY STUDY COMMITTEE

November 1969

Preface

The Computer Policy Study Committee was appointed by President George W. Beadle in early May of 1968. Its mission was stated as follows: "To engage in the broadest possible inquiry of the University's long- and short-term computation needs and what the University can best do to attempt to meet these needs."

An interim report was issued in August 1968 and was printed in the *University Record* of October 22, 1968. Some background information in the interim report has not been included in the final report; however, in all essential respects this report supersedes the interim report.

We gratefully acknowledge the generous help offered by many people. In particular, Harry Roberts of the Graduate School of Business and Carol Stocking of the National Opinion Research Center (NORC) gave us valuable advice in drawing up the questionnaire, and the directors (past and present), associate directors, and staff of the Computation Center were constantly ready to assist us in everything we requested.

There was initially a distinction between members of the Committee and alternates. This distinction became blurred as time went on, and in this final report we list all Committee members alphabetically.

R. DARRELL BOCK
JAY M. GOLDBERG
ROBERT L. GRAVES
JUERGEN A. M. HINZE
IRVING KAPLANSKY, *Chairman*
RICHARD C. LEWONTIN
STUART A. RICE
DON R. SWANSON
VICTOR H. YNGVE

Conclusions and Recommendations

1. (a) The University needs the continued existence of a good Computation Center.

(b) In the near future this will require a subsidy from the University of approximately one-third of the Computation Center budget. This is in line with the current practice at many comparable universities. The appropriate subsidy in the more distant future is not easy to predict; in part this may depend on the results of studies recommended below.

2. Administration. The administrative structure of the Computation Center has not functioned entirely satisfactorily. (It was partly in response to inadequacies of this structure that the Computer Policy Study Committee was formed.) We feel that it is important to define clear lines of command and that in the case of major decisions the computing community should be informed and consulted effectively. To this end we make the following recommendations.

(a) We endorse the assignment of an administrator (currently William Cannon, Vice-President for

Programs and Projects) to an active concern with computation on campus.

(b) There should be a Director of the Computation Center to guide the day-to-day operations and the implementation of policy. The Director should be responsible to the administrative officer referred to in part (a). We recommend (as is presently the case) that the Director be a full-time professional.

(c) There should be a computer policy committee and an executive subcommittee. The administrative officer and the Director should be members, but neither should be the chairman. Preferably each division, school, or other relevant unit (e.g., the library, the comptroller) substantially concerned with computing should be represented on the whole committee. For the four units that currently do the bulk of computing (physical sciences, biological sciences, social sciences, Graduate School of Business) we suggest that one faculty member be designated as the chief representative on the computer policy committee; faculty and staff in his area could then channel their suggestions through him. (Remark: Some years ago the Computer Policy Committee did have such divisional representatives.)

3. Policy, planning, and review. Policy should be formulated so as to preserve the areas in which the Computation Center has been particularly successful and improve other areas. The Center has had and does have a good staff and a good batch operating system. It has not had good planning and budgeting procedures, there has typically been unused computer time (reflecting either poor allocation procedures or excess capacity), there has been no real progress in time-sharing, the plotting facilities have not worked well in spite of extensive expenditures, and there has been little effort to coordinate the investigation and use of external computing services.

We suggest that the computer policy committee and its executive committee organize with the Director and staff of the Computation Center (perhaps through the use of a subcommittee structure) to provide policy, short-range planning, and long-range planning in the following areas.

(a) Budget. Projections of costs, revenues, and types of use should be prepared and reviewed on a regular basis. Past operations should be analyzed regularly. Recommendations should indicate the marginal services which might be deleted or added. Business operations would be part of this area as would recommendations for rate and priority decisions.

(b) Computation Center operation. This area includes the physical arrangement and operation of the central facility and various remote access facilities which may be installed this year. The issue of space falls in this area.

(c) Computation Center facilities. This area includes hardware, systems programming, and external commercial services. Recommendations for the size of the central facility would come under this heading.

(d) Computation Center programming and analysis services. This area includes services provided for the library and the comptroller, custom and applications programming, as well as future services for other research and administrative groups. It is important to decide which part of analysis and programming should be done at the Computation Center and which by the educational, research, or administrative bodies. Here it will help to have examples of successful operations.

Responsibility for each of these areas ultimately lies with the administration, the chairman of the computer policy committee, and the Director of the Computation Center. The study committee recommends that short-range reports with a one-year horizon and long-range reports with a five-year horizon be prepared by the Director and his staff, reviewed in detail by subcommittees of the policy or executive committees (joined by other experts as each group decides) and presented to the full policy committee at regular (say yearly) intervals. One of the four areas might be reported on each quarter in combination with a general report by the Director on the state of the Center. These reports, when approved, should be made widely available.

4. Meeting computing needs. Our campus-wide survey indicated that there are two different computing needs which are not adequately satisfied by the Computation Center at present. These are: (a) remote batch and time-sharing access to the central computer and (b) truly large-scale computations requiring a large and fast "super" computer.

For (a) we recommend an immediate technical study of the cost and feasibility of establishing remote batch and time-sharing services by the Computation Center. The technical details of such a study (i.e., the costs, types of devices, and their locations) should be distributed widely to the University community. The study should also include an investigation of possible grant support for such facilities; the Director of the Center and/or chairman of the computer policy committee should take the initiative in preparing suitable proposals.

For (b), a financial and technical study is required to ascertain how users with large-scale computations can be served. At present, some of these users have made private arrangements to use large, fast computers off campus; this represents an inconvenience to them and a significant drain on finances. One possibility, which appears financially attractive, is a data link to an off-campus "super" computer via a console in and supported by our Computation Center. The feasibility of such an arrangement should be explored immediately. An alternative, more attractive from the users' point of view, would be the rental or acquisition of such a "super" computer by our own Computation Center. However, this appears (at least to us) to be too expensive, unless a true bargain could be struck or sufficient financial support obtained for paid use of the "super" computer at close to capacity. These points need detailed financial exploration.

We mention finally that it is desirable to be alert to developments which in time may change the pattern of computer use. The falling cost of small computers is one such possibility.

5. We recommend a periodic reconsideration of the rate structure for computer time, in accord with federal auditing policies, so that the computing capacity of the Computation Center can be used more fully. Possibilities for the immediate future are significant volume discounts, significant low priority discounts, or a combination of both.

6. We endorse the recent steps taken to distribute through proper channels the deficit, which was up to now picked up by the University at the end of each fiscal year. We suggest the following priorities for the use of these funds:

(a) classroom computer use by students (this is the only category envisaged in the steps taken thus far);

(b) computer use by students for thesis research or special projects;

(c) administrative computer use; and

(d) computer use for faculty research (e.g., new faculty members until they get grant support, new projects not yet funded).

Several alternatives ordered by priority appear to be appropriate, since the survey showed that no group, except perhaps (d), could consume all the deficit.

7. The Center should aggressively advertise for business via publicity and suitable courses.

Background

Ways of providing large-scale computation facilities on the Chicago campus were first studied during 1956. Warren Johnson, then Dean of the Division of Physical Sciences, appointed a committee chaired by Joseph Mayer. Among other things, the committee examined the possibility of acquiring one of the computers commercially available at that time, the IBM 704 being typical. (For many interesting details on the history of computers in general, see the article "Electronic Computers: A Historic Survey" by Saul Rosen, in the March 1969 *Computing Surveys.*)

The step that was finally taken was to invite Nicholas Metropolis to build an individually designed computer to be called Maniac III. (Maniac stands for "mechanical analyzer, numerical integrator, and calculator." There had been a Maniac I at the Institute for Advanced Study in Princeton and a Maniac II at Los Alamos.) Mr. Metropolis was appointed Professor in the Physics Department and Director of the newly created Institute for Computer Research (ICR). Maniac III was housed on the ground floor of the computer building, erected as a wing of the Research Institutes. The bulk of the funds for the construction of Maniac III came from the Atomic Energy Commission.

The directorship of ICR subsequently passed to Richard H. Miller and then to Victor Yngve. Increasing scholarly work in the general area of computer science led to the formation of the Committee on Information Sciences under the chairmanship of Mr. Miller and subsequently Mr. Yngve. On October 1, 1969 Robert Ashenhurst succeeded Mr. Yngve as Director of ICR and Chairman of the Committee on Information Sciences.

Maniac III continues to be used by the students and faculty of ICR and the Committee on Information Sciences as an integral part of their research and education programs.

In 1958 the Sperry Rand Corporation presented the University with a Univac I computer. It was installed in the Operations Analysis Laboratory, under the direction of Alex Orden. In the four years from 1958 to 1962, the Univac in effect functioned as the University's computation center.

By the fall of 1961, with Maniac III still not completed, advances in computer technology made it timely to reconsider the situation. William Zachariasen, then Dean of the Division of Physical Sciences, took a survey to determine what support faculty members would be able to bring to help finance a large computer. The survey indicated that

a computation center that was self-supporting (or at any rate nearly so) appeared to be feasible. As 1962 got under way, an administrative mechanism was set up and a Computation Center was created. The Director was Clemens Roothaan (now the Louis Block Professor of Chemistry and Physics). He had a vigorous interest in the problems of computation, in part because he needed large-scale computation in his own research and in part out of an altruistic concern for the general question of computing needs on campus. In addition, a Computer Policy Committee was formed, chaired by A. Adrian Albert (who became Dean of the Division of Physical Sciences on January 1, 1962). Dean Albert was succeeded by Sidney Davidson in 1965 and resumed the chairmanship of the Computer Policy Committee on October 1, 1968.

The decision reached in 1962 was to rent an IBM 7090. At the time, the IBM 7090 and the CDC (Control Data Corporation) 1604 were the two computers commercially available that were suitable for a large computation center. The machine was installed in the basement of the computer building and went into operation on October 1, 1962. An IBM 1401 was attached to the 7090, acting as a satellite computer to "drive" the 7090. Since then the Center has expanded to fill the basement and has overflowed to other buildings.

The National Science Foundation had a program of grants to support the establishment of computation centers. A proposal was prepared by Dean Albert, aided by Mr. Ashenhurst, and a grant of $500,000 for three years was obtained. Another grant received at about the same time is worth mentioning, although its effect on the development of computers on campus was peripheral—an IBM five-year $500,000 grant for the support of applied mathematics. This grant has resulted in the development of a significant program in applied mathematics, including numerical analysis.

After about two years the 7090 was upgraded to a 7094 and the 1401 to a 7040. A favorable offer from IBM led to the purchase of the main frame of the 7094 (tapes and peripheral equipment continue to be rented); the offer was contingent on the rental or purchase of some (not necessarily IBM) third generation equipment.

Three substantial IBM grants and contracts were made to the Computation Center. They carried the titles *Mathematical Routines, Advanced Computing Systems,* and *Man-Machine.* The last was especially important in that it supported the development of the CHAOS (CHicago Asynchronous Operating System) for the 7090/7094.

A National Institutes of Health (NIH) grant made to the Biological Sciences resulted in the establishment of a Biological Sciences Computation Center, with an IBM 1401 used mainly as an input machine to the 7090 and later to the 7094.

Anticipation of increased needs and new types of needs led to a thorough study of what should be the next acquisition. The verdict (an interim decision pending a step toward major third generation equipment) was in favor of an IBM 360/50. (The 360 line is IBM's version of the third generation of computers. Available are computers ranging all the way up to the very large 360/91. It is relatively easy to upgrade from one computer in the 360 line to a higher one. There had been on campus a 360/30, subsequently upgraded to a 360/40. It was funded jointly by the library, the Institute for Computer Research, and the Laboratory of Molecular Structure and Spectra.) The 360/50 was installed during the summer of 1968.

Installation of a 360/65 is expected in December 1969 or Januray 1970. It will replace both the 360/50 and the 7040. As this is being written, extensive reprogramming of the system is under way in order to accomplish the changeover. Installation of the 360/65 is expected to be followed by consolidation which will result in hardware costs not rising significantly.

From the beginning it was hoped that income from outside sources (largely federal research grants) would make the Center self-supporting. At times the goal seemed nearly within reach. However, in 1968-69 a combination of various factors (discussed in the next section) raised the deficit sharply.

In early 1968 sharp differences of opinion showed up in the University's computing community. Various factors contributed to this. The leveling off of federal funds was beginning to be felt, and termination of an IBM grant supporting systems programming led to a debate over the role of this kind of work in the Center. The occasion triggered a decision to have a full-scale policy study. The present Computer Policy Study Committee was appointed by President Beadle in May 1968. (It is not a subcommittee of the Computer Policy Committee, although the two bodies overlap.) A preliminary statement was issued on May 29, 1968; it is incorporated in the interim report. After a series of weekly meetings, an interim report was issued in August 1968. It first received a limited circulation. After slight editing, the interim report appeared in the *University Record* of October 22, 1968.

The Computer Policy Study Committee devoted the fall of 1968 to the preparation and testing of a questionnaire. The questionnaire was sent out to the entire faculty in early February 1969. The final steps were taken during the sit-in. (There was an unusual episode when it was necessary to enter the Administration Building to rescue a document; the Chairman of the Committee ventured to do this, with a student escort.) The spring and summer of 1969 were spent analyzing the questionnaire (with the aid of NORC) and conducting interviews. The present and final report was prepared in the fall of 1969.

During the discussions of early 1968, Mr. Roothaan indicated that he wished to have his name withdrawn from consideration for continuation as Director of the Computation Center. A directorship search committee was formed, chaired first by Mark Inghram and then by Jim Douglas. Mr. Douglas agreed to serve as Acting Director during the academic year 1968-69. On September 1, 1969 the Center acquired a new full-time Director, Fred Harris, who had most recently been Assistant Director of the Computation Center at Rice University.

Finances of the University Computation Center

Past History

The Computation Center began operations in October 1962. For the first full year (1963–64) the budget of the Center was $1,013,000. This figure has grown in subsequent years (see Table 1) so that the budget was $1,397,000 in 1967–68 and reached $1,559,000 in 1968–69.

The income to the Center has come from many sources, the most important being direct charges for computing services. These charges grew more or less consistently until 1968–69 when they leveled off. In Table 2 there is a breakdown of these direct charges for the years 1963–64, 1967–68, and 1968–69. (Note: The minor discrepancies between Tables 1 and 2 are due to small changes in accounting procedures.) This breakdown indicates a changing pattern of computer usage. When the Center started, it was largely used by the natural sciences, particularly by the Division of Physical Sciences. The subsequent increase in income from nongovernmental and University funds reflects the increased use made by the other academic units in both their research and educational programs.

A most important point is that income from direct charges, though large, has never been sufficient to meet expenses. The discrepancy between direct charges and income ranged from $224,000 in 1967–68 to $394,000 in 1964–65. Particularly disturbing was the discrepancy of $495,000 in 1968–69. The income to the Center has been supplemented from three sources, the first two being the grants and contracts mentioned in the previous section. In 1962 the National Science Foundation made a grant of $500,000 to help establish the Center. The tenure of the grant was three years, ending in March 1965. Starting in 1964, the Center has had three grants and contracts with IBM, which have helped to support the programming staff. The total income from these contracts reached $251,000 in 1965–66 and has been declining ever since, amounting to only $23,500 in 1968–69. The last source of income has been the deficit picked up by the University at the end of each fiscal year (see Table 1).

University support of the Center comes from two sources. First there is the aforementioned deficit. The other involves direct charges to University budgets. A precise breakdown of these charges is hard to obtain. Estimates for 1968–69 indicate that 45 percent of these charges were for classroom use and 7.5 percent for administrative data processing. The remaining portion (47.5 percent) is difficult to specify but may include unsponsored research both by graduate students and by faculty.

Table 3 indicates that the total University contribution amounted to 3.2 percent in 1963–64, rose to 24 percent in 1967–68, and to 45 percent in 1968–69. The latter percentage is not out of line with the experience of other universities. In the past year there was a deficit of $471,000. This large drain on University finances has led, and properly so, to a reexamination of the future course of the Center. In such a reexamination it is necessary to decide if such a deficit reflects a set of circumstances peculiar to 1968–69 or is, rather, a state of affairs which may be expected to recur. We have, for that reason, done a detailed analysis of the budget for that year and have attempted to identify the reasons for the deficit.

There was in 1968–69, as compared to 1967–68, both an increase in expenses and a decrease in income (see Table 4). The increase in expenses is easily interpreted. Three things contributed to it. There was an increase in operations salaries and in equipment costs, which may be attributed to the installation of the IBM 360/50. In addition there was an increase in programming salaries, most readily explained by a decrease of $60,000

in income from IBM contracts. The latter, as has been mentioned above, have been used largely to support the programming staff.

The decrease in income (see Table 5) is more difficult to interpret. There was a decrease of $195,000 in income generated by the IBM 7094/7040 system—representing a decrease in usage of 494 hours—and this was only partially compensated by new income from the 360/50. Several factors may have contributed to the fact that income did not keep pace with expenses. First, there was a tightening of support from federal agencies, so that income from government accounts remained more or less constant. Second, there was a large decrease in nongovernmental restricted accounts. A preliminary investigation failed to identify the reason for this decrease. Third, some large users—as we learned from our questionnaire and interviews—have found the Center's facilities inadequate for their current needs and have taken their work elsewhere. Fourth, there was a decrease in 7094 rates of some $60 per hour. On simple arithmetic grounds one might be tempted to attribute a large fraction of the loss of income to the rate decrease. Such reasoning obviously assumes that there is a fixed demand for computing time. While this may be true for many users, it is clearly not the case for others. Moreover, there was no immediate drop in income when the rates were lowered in previous years. It may be suggested,

TABLE 1

COMPUTATION CENTER BUDGET: SOURCES OF INCOME, BY YEAR

Sources of Income	1962–63	1963–64	1964–65	1965–66	1966–67	1967–68	1968–69
Direct charges	$414,157	$ 786,422	$ 796,181	$ 963,631	$1,049,951	$1,172,301	$1,063,166
Contracts and grants to Center	150,000	200,000	200,000	251,300	143,800	83,700	23,564
Deficit	71,200	26,340	194,467	105,804	86,493	140,796	471,886
Total	$635,357	$1,012,762	$1,190,648	$1,320,735	$1,280,244	$1,396,797	$1,558,616

TABLE 2

SOURCES OF DIRECT CHARGES, BY YEAR

Sources of Direct Charges	1963–64	1967–68	1968–69
Restricted accounts (government)	$732,316 (92.0%)	$ 580,224 (50.0%)	$ 567,441 (53.7%)
Restricted accounts (nongovernmental)	22,889 (2.9%)	207,724 (17.9%)	128,923 (12.2%)
University budget	6,300 (0.8%)	194,128 (16.8%)	229,545 (21.7%)
Intra-Center transfers	...	46,615 (4.0%)	23,036 (2.2%)
Outside academic	34,048 (4.3%)	91,510 (7.9%)	65,810 (6.2%)
Outside commercial	...*	41,429 (3.6%)	42,100 (4.0%)
Total	$795,593 (100%)	$1,161,630 (100%)	$1,056,855 (100%)

* Not available, but modest.

TABLE 3

UNIVERSITY SUPPORT OF COMPUTATION CENTER, BY YEAR*

Support	1963–64	1967–68	1968–69
Direct charges to University budget	$ 6,300	$194,128	$229,545
Deficit	26,340	140,796	471,886
Total	$32,640 (3.2%)	$334,924 (24.0%)	$701,431 (45.0%)

* Percentages refer to total Center budget (see Table 1).

TABLE 4

BUDGET FOR 1967–68 AND 1968–69

Budget	1967–68	1968–69	Difference
Salaries:			
Administration	$ 83,857	$ 80,184	$− 3,673
Operations	222,016	317,007	+ 94,991
Programming (excluding custom programming)	108,693	175,509	+ 66,816
Custom programming	134,777	115,834	− 18,943
Keypunching	27,980	26,558	− 1,422
Subtotal	577,323	715,092	+137,769
Expenses:			
Equipment	492,030	588,671	+ 96,641
Supplies	226,483	212,002	− 14,481
Travel	8,709	9,032	+ 323
Communications	8,551	10,254	+ 1,703
Subtotal	735,773	819,959	+ 84,186
Total expenses	$1,313,096	$1,535,051	$+221,955
Income:			
7094/7040	$ 802,262	$ 504,020	$−298,242*
360/50	...	130,843	+130,843
Peripherals, etc.	177,013	280,478	+103,465
Applications support	30,540	17,907	− 12,633
Custom programming	131,843	97,901	− 33,942
Keypunching	30,643	32,017	+ 1,374
Total income	$1,172,301	$1,063,166	$−109,135
Deficit	$ 140,795	$ 471,885	$−331,090

* Part of difference is based on new accounting scheme; true difference is approximately $195,000. Compare with Table 5.

TABLE 5

SOURCES OF INCOME (ACCOUNT GROUP NAME), BY YEAR

Sources	1967–68	1968–69	Difference
Restricted accounts (government)	$ 580,000	$ 567,000	$− 13,000
Restricted accounts (nongovernment)	208,000	129,000	− 79,000
University budgets	194,000	230,000	+ 36,000
Computation Center transfers	47,000	23,000	− 24,000
Outside commercial	92,000	65,000	− 27,000
Outside academic	41,000	42,000	+ 1,000
	$1,162,000	$1,056,000	$−106,000
Computer income figures:			
7094/7040	$ 979,200	$ 784,500	$−195,700
360/50	...	130,800	+130,800
	$ 979,200	$ 915,300	$− 64,900
7094/7040 usage figures, in hours:			
Physical sciences	1,529	1,295	
Other	2,074	1,814	
Total	3,603	3,109	

then, that had the rates not been lowered, income might have been higher. But this would have been offset to an extent difficult to gauge by a further reduction in usage.

Future Projections

Many of the factors which contributed to last year's deficit will continue to be felt. For one thing, it is reasonable to suppose that federal support of research will, at best, remain constant over the next several years. Given the increasing costs of doing research—including increases in equipment, supplies, and personnel costs—there may be less federal money available for computer time. If large

users increase their use of non-University computation facilities, this will also serve to decrease income.

It seems clear that the Computation Center, if it is to thrive, must develop and attract new sources of income. The consolidation of administrative data processing within the Center is a step in this direction. Once the consolidation is accomplished, the University should save on the order of $100,000 per year. With the acquisition of the IBM 360/65, the Center should be in a position to provide new kinds of services, such as remote-batch processing and time-sharing, and these may encourage increased computer usage. In addition, the Center is exploring the possibility of submitting a grant proposal to the National Science Foundation (NSF) similar in nature to the one which facilitated the Center's getting started. Such a grant, were it to be approved and funded, would do much to alleviate the current financial difficulties.

There is a further need to keep expenditures within reasonable limits. One possible source of savings would be to get rid of the 7094; although the machine is owned by the University, operations and maintenance costs are not negligible. There was a pronounced decrease in the use of the 7094 in 1968–69, most of which occurred after the installation of the 360/50. This trend should be accentuated as service on the 360/65 improves and it becomes capable of taking over many of the 7094's functions as well as providing some of the services mentioned above. At a certain point the utilization of the 7094 will probably fall to a level where its retention will no longer be justified.

Even under the best of circumstances, however, it is unlikely that the Center can operate without a University subsidy. Here some perspective is helpful. The large size of the deficit in 1968–69 has been considered an almost unique occurrence in the Center's history. This is not really correct if one remembers that, over the seven years of the Center's operations, income from direct charges has never matched expenses and that the discrepancy between the two approached $400,000 in at least two previous years (1964–65 and 1965–66). What helped to decrease the deficit on those occasions was the existence of an NSF grant in 1964–65 and large IBM contracts in 1965–66. What is suggested —both by past history and by current economic pressures—is the continued need for a University subsidy of something like $500,000.

One further point can be made. In the past, the University subsidy has been treated as a deficit to be made up at the end of each fiscal year. This approach is wasteful in that it does not result in a greater use of available facilities. A sensible alternative would be to estimate the amount of the deficit at the beginning of the year and to disburse the funds to the various academic and adminstrative units so that computer time can be purchased. The aim of the disbursement should be to maximize computer use without compromising traditional sources of extramural support. A possible benefit of such a policy would be that by encouraging a wider use of computers, additional sources of income would eventually be developed.

Summary of the Analysis of the Questionnaires

Of about 1,200 questionnaires sent out to the faculty, 504 were completed and returned; a detailed analysis, prepared with the help of NORC, is given in Appendix I.

About 200 faculty members of this University make use of computers. Most of these are in one of the following four: biological sciences (60), physical sciences (42), social sciences (33), and Graduate School of Business (26). Only a few of the members of other divisions or schools make use of computers. It can be anticipated that the number of computer users will grow by 10 to 20 percent within the next year.

Most of the computer time used in 1968 by the respondents to the questionnaire was on the IBM 7094 of the University's Computation Center (2,316 hours). The physical sciences account for two-fifths of this computer time, with the biological sciences, the social sciences, and the Graduate School of Business accounting for one-fifth each. The computer time used by all the other divisions is slight. In the biological sciences a significant amount of computer time was used on their PDP/8. A large amount of computer time (1,000 hours) was used by the faculty of the physical sciences on computers not on this campus. This is about equal to the on-campus computer usage by the physical sciences faculty. In view of the underused capacity of the computers of the Computation Center, it appears desirable to attract these off-campus computer users back into the Computation Center. The Maniac III in the Institute for Computer Research appears to be used very little by the respondents to the questionnaire.

A large number of computer users (160) using little computer time each (less than 25 hours a year) account for about one-quarter of the total

computer time used, while a small number of computer users (40) using more than 25 hours a year account for about three-quarters of the total computer time used. In particular, the small group of heavy computer users, mainly in the physical sciences, would use significantly more computer time if their computation budgets were higher. The computation budgets in this group, more so than in the other, are derived predominantly from research funds, while in the larger group of light computer users a significant part of the computer time is paid for out of general University funds.

In the projections of computer time usage for the next few years no changes in this type of picture can be observed; only an overall increase of 10 to 15 percent in the total computer time usage can be noted.

Overall, it appears that the users of the University Computation Center are quite satisfied with the facilities and services available, except that the working room available in the Computation Center was judged by most to be inadequate. The custom programming service and the plotting facilities appear to be used by only a few users.

A large number of the respondents to the questionnaire either require or desire remote access consoles to the main computer for various tasks, ranging from sophisticated direct experiment monitoring and control to simple entering and retrieval of data.

APPENDIX I

Analysis of the Computer Policy Study Committee Questionnaire

Of about 1,200 questionnaires sent out to the faculty of The University of Chicago, 504 were completed and returned. The analysis of these 504 questionnaires is presented here, with the questions in the order in which they appeared in the questionnaire.

1. Have you used any computer time in the past few years?

(by division or school)

Division or School	Total	Yes	No
Library and Library School	4	2	2
Biological Sciences	166	60	106
Humanities	89	4	85
Physical Sciences	80	42	38
Social Sciences	73	33	40
Graduate School of Business	30	26	4
Divinity School	10	0	10
Graduate School of Education	8	5	3
Law School	12	1	11
Pritzker School of Medicine	2	1	1
School of Social Service Administration	13	4	9
Others and no information	17	1	16
Total	504	179	325

If (1) is no:

1a. Do you anticipate using any computer time in the next few years?

(by division or school)

Division or School	Yes	Maybe	No
Library and Library School	0	0	2
Biological Sciences	14	34	58
Humanities	3	13	69
Physical Sciences	5	10	23
Social Sciences	8	11	21
Graduate School of Business	1	0	3
Divinity School	0	0	10
Graduate School of Education	0	2	1
Law School	0	1	10
Pritzker School of Medicine	0	0	1
School of Social Service Administration	2	2	5
Others and no information	2	3	11
Total	35	76	214

If (1a) is no or maybe:

1b. Would you be interested in exploring with a member of the Computation Center staff possible computer use in your area of interest?

(by division or school)

Division or School	Yes	Maybe	No
Library and Library School	0	0	2
Biological Sciences	17	30	38
Humanities	14	17	45
Physical Sciences	2	2	26
Social Sciences	5	5	18
Graduate School of Business	0	0	2
Divinity School	1	3	5
Graduate School of Education	0	2	1
Law School	0	1	9
Pritzker School of Medicine	0	0	1
School of Social Service Administration	0	1	5
Others and no information	3	2	6
Total	42	63	158

If (1a) is no or maybe:

1c. Do you use an electronic desk calculator or other desk calculator regularly for your research?

(by division or school)

Division or School	Yes, Electronic	Yes, Other	No
Library and Library School	0	0	2
Biological Sciences	24	19	43
Humanities	1	2	73
Physical Sciences	2	3	24
Social Sciences	2	6	20
Graduate School of Business	1	0	1
Divinity School	0	0	9
Graduate School of Education	1	0	2
Law School	0	0	10
Pritzker School of Medicine	0	0	1
School of Social Service Administration	0	0	6
Others and no information	1	2	8
Total	32	32	199

2. How much computer time did you use during the past academic year?

(by division or school and machine type in hours)

Division or School	7094/40	1401	360/50	PDP/8	SDS 930	360	CDC	Other
Library and Library School	3	...	...	...	...	...	...	...
Biological Sciences	460	321	55	1,484	...	6	...	101
Humanities	9	...	...	...	...	...	...	...
Physical Sciences	922	42	...	...	2	21	400	605
Social Sciences	456	5	15	...	...	...	...	11
Graduate School of Business	422	120	109	...	3	...	...	2
Divinity School	...	...	...	...	...	...	...	...
Graduate School of Education	22	...	3	...	...	...	...	1
Law School	12	...	...	...	...	...	...	...
Pritzker School of Medicine	6	...	...	...	...	...	...	...
School of Social Service Administration	3	...	...	...	...	...	...	...
Others and no information	1	...	...	...	...	...	...	...
Total	2,316	488	182	1,484	5	27	400	720

(by number of hours of computer use [any one machine])

Hours	Number of Users
0 to less than 1	35
1–5	64
6–10	19
11–25	31
26–50	18
51–100	9
101 and over	15

3. Would you have used more time if your computer budget had been higher?

No	Yes
126	40

(by division or school and machine type in hours of extra time required)

Division or School	7094/40	1401	360/50	CDC
Library and Library School	...	...	...	...
Biological Sciences	97	160	184	...
Humanities	4	...	...	...
Physical Sciences	1,010	...	2	30
Social Sciences	77	...	...	...
Graduate School of Business	55	...	10	...
Divinity School	...	...	...	..
Graduate School of Education	11	...	...	...
Law School	...	...	...	...
Pritzker School of Medicine	...	...	...	...
School of Social Service Administration	...	...	...	...
Other and no information	...	...	...	...
Total	1,254	160	196	30

Question 3 analyzed by response on Question 2. Mean additional time (in hours) required against the amount of time (in hours) used on 7094/40 or 360/50.

Hours	7094/40		360/50	
	n*	⟨t⟩†	n*	⟨t⟩†
0–1	31	8.1	6	243.0
2–10	62	5.2	3	.0
11–100	38	8.3	2	92.0
101 and over	4	187.5	1	.0

* Number of 7094/40 or 360/50 users for the given amount of time per annum.

† Mean of additional computer time required by those users.

(by additional computer time required)

Hours	Number of Users
0–5	14
6–10	8
11–100	14
101 and over	4

4. Indicate below what percentage of computer time equivalent you used was at each of these facilities.

Percent	7094/40 360/50	Other Campus Computer	Off-campus Computer
0–25	12	10	5
26–50	9	12	2
51–75	7	3	1
76–100	106	19	13

Entered are the number of replies in a given category.

(percentage means by division or school)

Division or School	7094/40 360/50	Other Campus Computer	Off-campus Computer	Number of Replies
Library and Library School	100	...	...	2
Biological Sciences	53.2	40.7	6.1	50
Humanities	100	...	...	3
Physical Sciences	75.4	5.3	19.3	41
Social Sciences	85.1	8.1	6.8	30
Graduate School of Business	87.5	3.5	9	23
Divinity School	...	...	...	...
Graduate School of Education	77.6	22.4	...	3
Law School	100	...	...	1
Pritzker School of Medicine	100	...	...	1
School of Social Service Administration	90.4	9.6	...	4
Others and no information	100	...	...	1

5. Approximately what percentage of computer expenditure you used was paid for by each of the following sources of funds?

Percent	Research Funds	General University Funds	Other
0–25	6	17	6
26–50	4	3	2
51–75	4	1	2
76–100	127	17	13

Entries are number of replies in each category.

(Mean percentages for source of funds by time used on 7094/40 and 360/50 [from Question 2])

Hours	Research Funds		General University Funds		Other	
	7094/40	360/50	7094/40	360/50	7094/40	360/50
0–1	75	78	12	12	12	9
2–10	79	70	13	30	3	0
11–100	81	...	10	...	9	50
101 and over	96	85	2	10	1	5

(mean percentages by division or school)

Division or School	Research Funds	General University Funds	Other	Number of Replies
Library and Library School	...	50	50	2
Biological Sciences	81.2	11.2	7.5	53
Humanities	24	76	...	4
Physical Sciences	84.6	0.6	14.8	43
Social Sciences	87.3	10.8	1.9	31
Graduate School of Business	64	27.2	8.8	24
Divinity School	...	...	...	...
Graduate School of Education	67.6	32.4	...	4
Law School	100	...	...	1
Pritzker School of Medicine	100	...	...	1
School of Social Service Administration	66.7	...	33.3	3
Others and no information	25.4	...	74.6	1

6a. If you use the 7094, of the computer time used approximately what percentage was for short, medium, and long jobs?

Percent	Under 3 Minutes	3–30 Minutes	More than 30 Minutes
0–25	21	31	13
26–50	32	28	7
51–75	11	20	3
76–100	79	7	4

Entries are numbers of replies in each category.

(mean percentages by division or school)

Division or School	Under 3 Minutes	3–30 Minutes	More than 30 Minutes	Number of Replies
Library and Library School	100	...	...	1
Biological Sciences	80.8	18.3	0.9	38
Humanities	70.4	27.3	2.3	4
Physical Sciences	63	24.7	12.3	36
Social Sciences	61.1	32.5	6.4	30
Graduate School of Business	59.5	32.1	8.4	24
Divinity School	...	...	...	...
Graduate School of Education	97.6	1.2	1.2	4
Law School	95.2	4.8	...	1
Pritzker School of Medicine	5	25	70	1
School of Social Service Administration	100	...	...	4
Others and no information	100	...	...	1

6b. If you used another computer, what was the average length of time for one of your computer jobs?

Minutes	Number of Replies
Under 3	15
3–30	32
More than 30	18

7. Please record by circling appropriate codes whether or not you use the facilities and services of the Computation Center listed below and what your opinion is.

Facilities and Services	Adequate	Inadequate	No Opinion	Do you use? Yes	No
Central computer speed	99	13	21	...	...
Central computer memory	84	25	23	...	...
Auxiliary storage (tape, disk)	62	15	34	45	48
Card drawer space	46	12	45	29	62
Working room	36	54	27	56	34
Plotting facilities	30	16	51	19	70
Turnaround time	92	18	21	...	...
Documentation describing the use of the Center	70	27	27	...	...
Custom program service	21	15	68	12	76
Keypunching service	54	8	53	33	50
Program debugging assistance	39	24	48	30	55
Program library:					
Documentation	57	16	50	...	...
Availability	57	11	49	...	...
Keypunch machines	73	34	22	56	20
Reproducers, sorter, etc.	61	34	29	55	22

7a. Comments to (7):

User room too small	17
User room too noisy	3
Inadequate tab equipment	4
Not enough keypunchers	11
Need help in use of Computation Center	5
Need better debugging help	9
Improve program library	8
More auxiliary storage	11
Various complaints	53

8. For your purposes, what additional equipment is needed?

Larger, faster computer	7
Time-share consoles/service	10
Small, general utility computer	9
More keypunches	7
Better plotter	6
More work room	9
Better debugging aid	5
Various others	44

9. For your purposes, what equipment could be omitted?

Nothing	26
360/50	3
Plotter	2
Various others	16

10. Please comment on the charging system used, the priority and reserve time policy, or anything else not covered by previous questions.

Computer charges too high	10
Computer charges okay	20
Reserve time complaints	5
Restricted access to output	4
Request volume discount	2
Various others	18

11. Compare The University of Chicago Computation Center to any other computer facility you know.

Forty-three different institutions were mentioned in this comparison. Twenty-five found hardware and services at The University of Chicago better and 17 found them worse; 9 found our hardware better but the service worse; and 4 found our hardware worse but the service better.

12. Please make a projection of the amount of computer time you expect to use in an average year for the next few years. (151 replies)

(hours by division or school and machine)

Division or School	7094/40	1401	360/50	PDP/8	360	CDC	Other
Library and Library School	10	...	...	...	...	...	...
Biological Sciences	313	165	200	600	208	>1,000	636
Humanities	...	4	...	...	...	...	2
Physical Sciences	1,163	...	25	...	58	...	199
Social Sciences	408	...	4	...	19	...	438
Graduate School of Business	297	...	44	...	2	...	14
Divinity School	...	...	...	...	...	...	...
Graduate School of Education	30	...	2	...	...	...	...
Law School	20	...	...	...	...	...	...
Pritzker School of Medicine	10	...	...	...	...	...	...
School of Social Service Administration	15	...	...	...	...	...	...
Other and no information	11	...	...	...	...	...	...
Total	2,277	169	287	600	287	>1,000	1,279

13. In this projection, would you use more time if you had a higher computer budget?

Yes	39
No	112

(hours by division or school and machine)

Division or School	7094/40	1401	360/50	SDS 930	360	Other
Biological Sciences	132	160	20	...	...	560
Physical Sciences	1,129	...	30	...	...	...
Social Sciences	48	...	...	400	5	20
Graduate School of Business	60	...	...	...	3	99
Other	...	...	8	...	...	...
Total	1,369	160	58	400	8	679

14. Will the time referred to in Question 12 be used primarily for computing or data handling?

Primarily computing	122
Primarily data handling	28
Both, about equally	41
Other	8
Not certain	11

15. Will you require or desire remote access consoles in your work?

Require	22
Desire	67
Neither	62
Don't know	68

If (15) is require or desire:

15a. What type of remote console would you use?

Console for entry and retrieval of information by computer	52
Console for direct experiment monitoring without immediate feedback by the computer	9
Console for direct experiment control with immediate data reduction and feedback by the computer	32
Console for entering batch programs	48
Console for real-time programming interaction with the computer for debugging or editing programs	46
Console to be used as sophisticated desk computer	44
Other	8

16. Will you need Computation Center personnel as advisers in large teaching or research projects making use of the computer (e.g., setting up of large programs, data file and retrieval systems, or on-line experiment control)?

Yes	38
No	110
Don't know	65

17. Do you have programs available to you of sufficiently broad utility that they might usefully be implemented and maintained at the central facility?

Yes	38
No	136
Don't know	44

18. Will you require or desire direct data links between the Computation Center and other computer centers off campus?

Require	4
Desire	19
Neither	115
Don't know	80

19. Do you feel that instruction in the use of the Computation Center is desirable?

Yes	185
No	26

Kind of Instruction:

Basic programming	44
Algol	2
Use of program library	15
Use of University of Chicago Computation Center	4
Systems programming	8
Other	82

20. Please describe any ways not covered by this questionnaire in which you think the Computation Center might be of help to you.

Give a simple primer for users	3
General access (free of charge) to students	4
Instructions in sophisticated computer use	5
Make consultants available	3
Instructions for program library	4
On-line equipment	2
Other	39

APPENDIX II

Interviews with Major Users

The Committee's interim report identified twelve major users of computing on campus. During April and May 1969, Messrs. Graves and Kaplansky conducted a series of interviews. These are assembled in this appendix; they are recorded informally in two different styles. Some suggestions made in the interviews have since been acted on; and some blunt criticisms, perhaps justified at the time, have since been acted on and the conditions alleviated.

The interviews assembled are those conducted with ten of the twelve major users. For the Graduate School of Education, a statement describing the computing operations and needs was furnished by Darrell Bock, a Committee member; this appears as the final "interview." In the case of the Comptroller, there were in fact two interviews. However, because of rapidly changing circumstances, we thought it would not be useful to include a summary of either interview. We are grateful to Riccardo Levi Setti for providing a supplement to the interview with Norman Gelfand; this supplement gives a more complete, updated account of the

needs of High Energy Physics. Thanks are also due to Herman Fussler and John Simpson for editing and updating their interviews.

Laboratory for Astrophysics and Space Research (LASR)

(Gordon Lentz, Peter Meyer, John Simpson)

April 11, 1969

Faculty and professional staff.—There are approximately fifteen doctoral students and ten to fifteen graduate students and undergraduates who make extensive use of the facilities. In the future it is hoped that theoretical astrophysicists in the field of nucleosynthesis would use a central computer facility with very large memory. In addition, there are usually about five research associates who actively use computational facilities.

Technical staff.—Seven people work full time as programmer analysts in production work.

Equipment.—LASR rents an SDS 930 plus associated equipment which includes printer, disk, tapes, and Calcomp plotter. The original installation was made in 1964. The facility runs about 3,000 hours a year. Operating costs including supplies are about $123,000 a year.

Computing budget.—In the year 1970, due to severe funding constraints, the projection is about $30,000.

Kinds of jobs.—There are two main job types at present. The first is processing and cleaning up raw data tapes containing data from various satellites. Most of this work is now done in machine code on the SDS 930. Only the full-time analysts work on this kind of job. The tape library contains about ten thousand tapes at present. The number of bits of raw information is likely to increase drastically. The second kind of program analyzes the data. Much of this work is done by doctoral students using Fortran on the 7094 or 360/50. Both job types are largely I/O and memory limited; the pure computing load is not large.

Comments on the Computation Center.—There is strong support for professional management of the Computation Center and use of rental programmers from the outside to support Computation Center activities.

Future needs and suggestions.—It would be desirable to phase out the SDS 930 by 1971 and do all such work at the Computation Center. Four tapes and a reader/printer would have to be at LASR. There now seems little prospect of this. Data rates of 50 K.C. (50,000 bytes per second) would be required. It would be very desirable to have on-line access to large blocks of data which could be manipulated and displayed by a CRT (cathode ray tube) with light pen. It would also be desirable to have a real-time facility for data reduction and on-line control. The required data rates would be 2 to 5 K.C. There would be no objection to such facilities being located off campus provided LASR could get high priority. It was remarked that the National Aeronautics and Space Administration (NASA) may set up regional computer centers to provide service to various projects. It was suggested that the Committee might consult with Mr. Goddard or other large government users to get useful opinions on current hardware and software. In general, the laboratory looks toward having a high-speed terminal feeding to the Computation Center and through the Computation Center to a super computer facility somewhere in the Midwest.

National Opinion Research Center (NORC)

(Norman Bradburn, Norman Nie, Ed Noll, Jarvis Rich)

April 9, 1969

Faculty and professional staff.—There are six to eight study directors who use the facilities at NORC, the Computation Center, and equipment at Argonne National Laboratory.

Technical staff.—Three or four people are involved full time in production work which may include analysis and programming as well as using existing programs.

Equipment.—NORC has a tape 1401 which rents for about $5,000 a month. There is extra capacity, and conversations with the comptroller are taking place to see if a sharing arrangement is possible.

Computing budget.—Expenditures for its own equipment are about $60,000 a year. About $30,000 to $40,000 a year is spent at the Computation Center or elsewhere.

Kinds of jobs.—Most jobs have large amounts of input—up to five reels of tape. There are about seven hundred reels in its tape library. Some jobs have large amounts of calculation (e.g., factor analysis), others are principally input/output. There is a fair amount of effort in developing statistical and data handling programming systems. An overall requirement is that jobs be handled quickly, accurately, and economically.

Comments on Computation Center.—The applications programming staff has been very helpful. Most other computation centers do not have such groups; our group rates an A. The performance of

the operations staff rates an F. Parts of jobs are lost, tapes are misplaced, and it is the exception when a job runs properly the first time. Most, though by no means all, of these comments seem to be directed toward jobs run on the 360/50. The main criticisms of the 360/50 are the cost and the difficulty in getting information and resolving questions about OS 360. It seems to be true that there is no way of guaranteeing that some given amount of scratch disk space will be available for a job on the 360/50. There are also questions about the management of 360 tape storage. At current rates it costs five to ten times as much to use the 360/50 as it does to use the 360/75 at Argonne.

Future needs and suggestions.—It is strongly urged that there be a full-time professional director who can make policy decisions. The University should consider subsidization of remote access to the main computer via, say, a 360/20. There is no objection to using an off-campus computer in this manner. It will be important to have conversational terminals and fast, reliable turnaround via batch processing. Prices must be comparable to those available elsewhere.

Center for Mathematical Studies in Business and Economics

(Ronald Brooks)

April 1969

This report also deals with the computing needs of the Graduate School of Business as a whole.

Faculty and professional staff.—Two faculty members and one supervisor are directly involved with the administration of the Center. About thirty faculty use its services or participate in its program.

Technical staff.—One person works full time as a programmer analyst. Eight to ten students work part time.

Equipment.—The Center has two keypunches and two teletypes which are used by faculty and students. The Graduate School of Business has six additional keypunches.

Computing budget.—The Center's computing budget is about $15,000 a year; about two-thirds of this is for COMSHARE. The Graduate School of Business spends about $100,000 a year for class and thesis work. These expenditures are part of the regular budget of the Graduate School of Business.

Kinds of jobs.—There is a broad spectrum of jobs. Some involve moderately extensive computing. Many involve data tapes. In the Graduate School of Business there is extensive use of files of the Center for Research in Security Prices and files of survey data. The Center's work is largely in developing, adapting, and maintaining programs.

Comments on Computation Center.—The relationship with the Computation Center has been generally good. There has been trouble with lost jobs on the 360. An unusual amount of effort has seemed to be necessary to get the SIMSCRIPT program to run again; the systems and applications staff, however, have been most helpful. There is a need for better information on manuals; frequently information on revisions is not distributed as soon as it should be.

Future needs and suggestions.—Both the Center for Mathematical Studies in Business and Economics and the Graduate School of Business will strongly urge a remote batch facility and more extensive console facilities within a year or so. The Computation Center is simply too crowded. Disk space for users is more important than additional computing power. Some faculty members believe that they should not be required to use a facility which is less convenient or more expensive than an outside facility.

Biological Sciences Computation Center

(Ralph Brunke, Dr. Robert D. Moseley, Jr.)

April 14, 1969

Faculty and professional staff.—There are eight to twelve faculty members who are fairly deeply involved in the administration and use of the Center.

Technical staff.—Three full-time people and several part-time people work in programming and production work.

Equipment.—The equipment consists of a four-tape 1401 connected to the 7040, a PDP/8 with some extra equipment which can communicate with the 1401, and keypunches and teletypes. The equipment rental is about $67,000 a year. The PDP/8 was purchased. Its most important role is in analog-to-digital work. There are now about 2,500 square feet of space and the Center is very cramped. The facilities for the Medical Information System which is being discussed may require 8,000 to 10,000 square feet.

Computing budget.—The Center was initially supported completely by NIH. Recently the Division of Biological Sciences has supported the operation to about the amount of $30,000 a year. About $12,000 a year is spent at the Computation Center. Currently NIH requires that biological

science projects originating outside the Biological Sciences Computation Center pay for computer time. The current NIH support has been renewed in its present form.

Kinds of jobs.—There is nothing striking about the job mix. The 1401 operates about one hundred hours per month as a stand-alone machine and about the same amount as an input/output device for the 7094/40. There is great interest in developing statistical programs and packages. Some of the work involves programs to process data files of moderate size.

Comments on Computation Center.—There has not been sufficient emphasis on providing file processing service for the general user. Both the direct wire connection and messenger service are used to communicate with the Computation Center. Things are now running smoothly although there were problems when the new CHAOS was installed on the 7040. There has been no use of the 360/50.

Future needs and suggestions.—In general the Computation Center must be super-responsive to the needs of users or the users will acquire small computers or purchase time-sharing service.

Center for Research in Security Prices
(Lawrence Fisher)

April 1969

Faculty and professional staff.—Two faculty members are directly associated with the Center. Other faculty and students in the Graduate School of Business and elsewhere use the resources of the Center and participate in its activities.

Technical staff.—Two technical people are involved full time in production work and programming.

Equipment.—The Center has a keypunch and a teletype used with COMSHARE, a commercial service.

Computing budget.—Expenditures amount to about $24,000 a year at the Computation Center, plus a small amount for COMSHARE. The latter is used almost exclusively for debugging small programs. The Center is supported by a grant from Merrill Lynch and fees charged for a seminar held semiannually.

Kinds of jobs.—A basic function of the Center has been to define, develop, maintain, extend, and use large data files containing information about financial markets—principally the New York Stock Exchange (NYSE). The Center owns or uses several hundred reels of tape. Several of the files consist of about five reels or 15,000,000 words. Faculty and doctoral students may use the large files. Students at a less advanced level generally use smaller files containing selected data. Some 150 students use the files each year.

Comments on Computation Center.—The general level of service at the Computation Center, including systems maintenance, seems to have deteriorated since the summer of 1968. There is no reliable high priority messenger service, and the regular messenger service sometimes fails without notification. The operators tend to be lax at off hours. On one occasion a backup tape was lost; $5,000 effort was required to recreate it. The users' room is small and badly lighted. The quality of printing has gone down. The constant improvement in the quality of service which one should expect has not taken place. The accounting programs are not well designed.

Future needs and suggestions.—Th 360/50 is not a desirable computer for the Center's needs—for several reasons. An important factor is the short word length. The master file will require four 2314 disk packs on the 360. The 360 operating systems don't seem to be very good. It may require four to five man years of reprogramming to move from the 7094 to the 360.

Registrar's Office
(Albert M. Hayes, William Van Der Laan)

May 7, 1969

1. Mr. Van Der Laan was associated with the Comptroller's office starting in 1961. In February 1965 he became Assistant Registrar. In the summer of 1968 he resumed his connection with the Comptroller, while maintaining responsibility in the Registrar's Office.

2. In the basement of the Administration Building the Comptroller maintains two 1401's with associated cards and tape. A survey about two years ago showed that 30 percent of the time was used by the Registrar. It is probably about the same now. The Comptroller charges $41 an hour, this being met by the Registrar's budget. A very large part of the time is spent on printing.

3. If suitable hardware and manpower were available, changes in the Registrar's operation would be in order. These would eliminate some current problems. As it is, frequent updating is uneconomical, so about every three weeks all information on hand is inserted.

A recent check disclosed 540 errors on a tape. Some were keypunch errors, but most were errors such as registering for wrong courses or nonexistent courses.

4. The biggest single file is on one reel of tape. It maintains information on all students who have been here since October 1966. Other more active files concern current students and courses. Tapes are being used for virtually all files.

5. Data is prepared in the Registrar's Office on the first floor in a form ready for keypunching. The keypunching is done in the basement, except that at peak periods commercial keypunching is used, and sometimes the work gets done in a different way.

6. Mr. Van Der Laan expressed the belief that The University of Chicago Registrar's operation is moderately sophisticated for a second generation system. Very likely some third generation systems are in operation elsewhere, but this is not known for certain.

7. The financial aspects of a move to a third generation system are uncertain. Anyway, it is conceivable that money could be saved now by going back to handwork. However, this would mean doing without certain things we now have, for example, quick production of lists of students in special categories.

8. After the sit-in of February 1969, both the Comptroller and the Registrar faced large backlogs. There was good collaboration and, with heavy use of overtime, the work was brought up-to-date.

9. Mr. Van Der Laan discussed briefly the proposed merger of the Comptroller's office and the Computation Center. He reviewed some of the technical aspects, and in particular he had grave reservations about the effectiveness on most jobs of the 1401 simulator.

Library

(Herman Fussler)

April 23, 1969
(revised December 18, 1969)

1. Some three years ago, after about two years of study, an NSF grant was obtained with which the Library started a project to mechanize its data processing as much as reasonable. The grant of about $450,000 was for three years. The University has matched the grant with about $200,000, some of which was used for programming, supervision, and the input clerical staff.

2. NSF has made a grant for a one-year extension of the book processing system, but beyond that the outlook is not bright. Approaches have been made to the Council on Library Resources (a Ford Foundation organization) and the Rockefeller Foundation. The Council on Library Resources is willing to look at proposals; Rockefeller is still examining whether this would be within their scope.

3. The work is basic data processing, for the most part building, maintaining, and searching massive files. The Library is among the pioneers in the effort to develop such a capability.

4. In the current operation there is a manual input to paper tape on IBM 1050s. The tapes are then read into the 360/50 at the Center via telephone data sets. All book purchase orders and all new acquisitions in the Roman alphabet are being handled. A significant fraction of new acquisitions are not in the Roman alphabet. At present the major products include catalog cards for all Roman alphabet material with all headings (subject title, etc.) added and cards printed in filing order for the particular catalog or shelf list for which they are intended; all book purchase orders, batched in printing for the dealer for whom they are intended; book circulation cards; pocket labels; some phases of book fund control; and some in-process file data.

5. The Library has developed the software for machine handling of machine readable tapes from the Library of Congress containing full bibliographical data on current English imprints. When these data are available, they eliminate the need for virtually all manual input. The Library of Congress expects to expand the coverage in this service.

6. At present the unit costs are higher than the superseded manual costs. It is reasonable to anticipate that the two cost curves will cross eventually. In any event, there are the advantages of smooth handling of seasonal loads and relief from the problems of turnover and shortage of clerical help. Cost/benefit ratios will improve rapidly as the amount of Library of Congress data for automatic input is increased and as the system's software can be extended to handle order searching and many other processing or service data functions.

7. Mechanizing the circulation of books looks like a simple inventory problem. However, closer inspection reveals that a responsive system will present a variety of complex problems. Development costs will be relatively high, and funding is

not currently available. Benefits to readers could be quite substantial.

8. The Library started with a 360/30, upgraded to a 360/40, and switched to the Center's 360/50. The 360/30 to 360/40 conversion was not bad, the 360/40 to 360/50 was painful.

9. Work on routine output has more or less reached a plateau. In due course more computer time will be needed in connection with the Library of Congress tapes. An on-line circulation project would significantly increase time on the 360/50.

10. Access to the Computation Center and its people—some of them talented—has helped the Library. Initially the Center staff thought the Library's problems to be trivial, but as they got involved, they found technical and intellectual challenges.

11. The number of Library staff involved has run between six and ten.

12. It certainly will be necessary to have design and software staff on campus. During such highly experimental development it seems preferable to have hardware on campus, but perhaps remote access to a suitable computer would be adequate. At a later time a group of libraries might find it advantageous to share a common computer and software system.

Laboratory of Molecular Structure and Spectra
(Clemens Roothaan)
April 14, 1969

1. The Laboratory has, as its current faculty, Juergen Hinze, Robert Mulliken, and Clemens Roothaan. Paul Cade, a professional physicist who is responsible for a large part of the computing, is also a member of the staff. (He will leave for the University of Massachusetts in the autumn of 1969.) There are three postdoctoral fellows, two of whom work primarily with Mr. Cade. There are currently approximately ten students; this is the normal number.

2. The Laboratory has two principal aspects—experimental and theoretical. The experimental work does not generate much computing. The theoretical work is largely concerned with quantum mechanics and stationary states of atoms and molecules and is heavily oriented toward computing.

3. The work is such that it could saturate a reasonable computer. In fact, in the early days of our Center, the Laboratory used all time available after other needs were satisfied. When audit regulations changed, this was no longer possible; Advanced Research Projects Agency (ARPA) paid about a third of a million dollars to rectify the situation retrospectively.

4. Current support for the theoretical work comes from ARPA ($100,000) and NSF ($93,000). Proposals submitted for 1969–70 are for the amounts $80,000 (ARPA) and $75,000 (NSF). The NSF ceiling hurt for awhile but was recently alleviated.

5. Several "graduates" of the Laboratory are working for IBM at San José, California (this is one of three IBM research facilities). IBM will support their work and make a Model 360/91 available. They have submitted a parallel proposal to ARPA. Consequently, Chicago's ARPA proposal contains little for computing.

6. Mr. Roothaan has not used Argonne since about 1960 (i.e., before our Center started). He remarked that one needs an inside track to Argonne.

7. Up to about a year ago all the Laboratory's computing was done at the Center. The changed situation of course entails a loss of income to the Center.

8. In answer to a question he offered the following opinion. To make the facility here attractive, the University needs to make a commitment to a major center with appropriate systems support. University support should be in the vicinity of $500,000 a year. At present about $100,000 a year is being spent on people; this could profitably rise to $150,000 to $200,000. It was people of this calibre who made the 7094 the best of its kind.

9. Questioned about the feasibility of gaining access to large computers by long distance lines, he answered that he could live with it, but he thought this would not meet campus needs.

Institute for Computer Research (ICR) and Committee on Information Sciences
(Victor Yngve)
April 10, 1969

1. Mr. Yngve began by sketching the history of ICR. It was started in 1958 explicitly as the vehicle for building Maniac III. This sort of hardware experimentation continues, although other activities are increasing rapidly.

2. It is good for the Committee on Information Sciences to have this kind of hardware work in progress on the premises.

3. The ICR staff has no major complaints about

the Center. In part this is because they don't use it much, except for the connection between the 360/50 and the equipment that replaced the 360/40 formerly on the premises. The price charged for computer time and peripheral needs has turned out to be around ten times what was anticipated. As a result, there have been attempts to cut down costs by reprogramming, and there are tentative ideas about getting equipment to make it possible to terminate the connection. This would, of course, result in a loss of income to the Center.

4. Student use in Information Sciences leans heavily on the Center, and they are second to Business in student use. The funds come out of regular University budgets. This use will probably gradually increase.

5. Students miss certain aids to computer education (graphics, time-sharing).

6. ICR, with Atomic Energy Commission (AEC) support, is building a small time-sharing computer. It will be used largely for research and experiment.

7. In addition to Maniac III, AEC has furnished a PDP/8, acquired some three years ago with the approval of the Computer Policy Committee. On the day of the interview it was at Yerkes (it is highly portable). The book value of AEC equipment at ICR is $1,400,000, of which $35,000 is represented by the PDP/8. AEC has offered to give both Maniac.III and the PDP/8 to the University.

8. The pattern of research use by the ICR and Information Sciences staff is not likely to change much. This means that developments at the Center will not have as direct and vital an effect as in other areas of the University. Nevertheless, Mr. Yngve expressed the opinion that a strong Center is highly desirable.

9. He saw no particular objection to having a substantial part of the University's computer needs filled by a remote connection to a large computer elsewhere. However, having a substantial Computation Center right on the scene is good for students.

High Energy Physics (HEP)

(Norman Gelfand)

April 17, 1969

1. HEP occupies its own building and in addition has space in the Enrico Fermi Institute and in the Accelerator Building. The faculty are Herbert Anderson, Norman Booth, Giovanni Conforto, Albert Crewe, Norman Gelfand, Roger Hildebrand, Riccardo Levi Setti, Valentine Telegdi, Roland Winston, and Courtenay Wright. In the HEP building there are two full-time professional people, one working with Mr. Gelfand and one with Mr. Levi Setti. Mr. Gelfand has four students at work.

2. Messrs. Anderson and Telegdi need a lot of computing power, but only for limited periods (three to six months at a time). A machine like a CDC 6600 or IBM 360/91 is called for. They both use Argonne and in addition they get free time—Mr. Anderson at Los Alamos and Mr. Telegdi at SLAC (Stanford Linear Accelerator). Mr. Gelfand's needs are continuous, but the 7094 is quite adequate.

3. On the premises Mr. Gelfand has an EMR 6050 and a variety of auxiliary equipment. Total purchase price would have been about $200,000; however, half is on rental. The $100,000 purchase was funded by NSF ($60,000), Air Force ($20,000), and Navy ($20,000). The NSF and Air Force contributions now have title vested in the University. The complex pattern of ownership has complicated a currently pending application to AEC for additional equipment. The rental portion is funded by current NSF grants. (Note added December 16, 1969: This equipment is now owned entirely by the University.)

4. At the time this equipment was acquired, it turned out that little could have been saved by getting a machine with less computing capability (e.g., a PDP/8). Having some computation on the premises is good for the students. In sum, Mr. Gelfand has both needs—the big central facility plus smaller equipment on the scene.

5. Current NSF support for computing in Mr. Gelfand's group is running $30,000 a year, and he hopes that it will remain at least at that level. Work of the kind he is doing stretches into the indefinite future. If additional capability of handling experiments is acquired, potential use of the 7094 could rise to 8 hours a day, 365 days a year. Money for that amount of computing is nowhere in sight.

6. Mr. Gelfand has never gone elsewhere for computing. The work is very much large-scale number crunching (e.g., inverting matrices as large as 21 by 21). It is production type work; some deterioration of turnaround time on the 7094 would be acceptable. Service in general has been good. No tapes have been lost, etc. The operations staff is competent.

7. He tried the 360/50 just once. It was troublesome and he gave up. Others at HEP are using it. There is really no incentive to switch to the 360, in terms of finances or turnaround.

8. If the machine changes some day, no serious problems are likely. Most programs will run on the 360. IBM has a package to help bubble chamber work. CDC equipment would also be acceptable.

9. The present link of the EMR 6050 to the 7040 has to be switched to the 360 some nine months from now. The change involves problems and costs, and the Center will have to help. At present, unfortunately, Mike Williams, operating systems manager at the Center, is over his head in work.

10. One complaint is that the Stromberg-Carlson 4020 is down some 60 percent of the time. Apparently no one is complaining hard enough or to the right people to get it fixed properly.

11. The Center is hurting for lack of a full-time director. Mr. Gelfand firmly believes the director should be a nonfaculty professional.

12. Mr. Gelfand's concluding remark was to urge that serious work begin now on the concept of a big regional computer. Within the foreseeable future it is highly unlikely that a university like ours will acquire this kind of equipment.

Computer Needs of the High Energy Physics Program at the Enrico Fermi Institute (EFI)

(Riccardo Levi Setti)

December 15, 1969

An updated survey of computer needs is in progress at the Fermi Institute, as part of the activity of the EFI "Master Plan" Committee. This recent investigation, carried out by personal interviews, revealed a situation which is inadequately described in the response to the questionnaires circulated by the Computer Policy Study Committee, at least in the area of High Energy Physics. It is felt that even at this late stage, the information which has only recently emerged is very relevant to the scope of the Computer Policy Study Committee and should be brought to its attention.

1. *High Energy Physics faculty and scientific personnel.*—Faculty members engaged in experimental activity in the field of High Energy Physics are Herbert L. Anderson, Norman Booth, Giovanni Conforto, Norman Gelfand, Roger Hildebrand, Riccardo Levi Setti, Luke Mo, Valentine Telegdi, Roland Winston, and Courtney Wright. In addition, five to seven research associates and twenty to twenty-five graduate students typically participate in the program.

2. *Use of Computation Center facilities.*—The High Energy Physics group has been, during the 1968–69 fiscal year, the largest individual user of the Computation Center, with a total expenditure of $100,300—entirely from NSF funds. Computer time has been purchased in the amount of approximately 430 hours of IBM 7094 and 130 hours of IBM 360/50.

3. *Use of outside computers.*—A total of approximately 2,200 hours of 7094 equivalent CPU (Central Processing Unit) time has been used during 1968–69. This includes use of the following computers: CDC 3600, CDC 6600, IBM 360/75, and IBM 360/91. Only 10 percent of this time was purchased on a low priority, reduced cost basis; the remaining 90 percent was procured at no cost to the user.

4. *Jobs.*—Heavy users of the 7094 system indicate that of the used time, 50 percent was for long jobs, 20 percent for medium, and 30 percent for short jobs.

Of the time used on outside computers, 50 percent was for long, 50 percent for medium duration jobs. About 1,000 hours of either 360/75 or 360/91 were spent on jobs of one hour.

5. *Opinion about the facilities of the Computation Center.*—For the purposes of the High Energy Physics program the concensus is that the central computer speed and central computer memory are inadequate. As to the corollary items, a consensus is also reached with regard to the inadequacy of working room and insufficient number of keypunch machines.

6. *Additional equipment needed.*—The basic requirement of the High Energy Physics group as a whole is to have easy access to a larger, faster computer. This could be a 360/75 system as a minimum, but preferably a computer in the CDC 6600 or 360/91 class. The computing costs should be much less than the present rate for equivalent work. It has been suggested that the majority of the long jobs (50 percent of the total load) could be run on a low priority basis, at a cheaper rate.

7. *Comparison with other computation centers.*—From the standpoint of High Energy Physics, the Computation Center facilities are obsolete by at least five years. Next to the availability of a high energy particle accelerator, large computers are the primary asset. The competition of better equipped experimental groups is fierce. In addition

to the large national and international laboratories, a substantial number of other universities have the facilities which we lack. A very limited list includes Columbia with a 360/91, Stanford with a 360/91, New York University with a CDC 6600, and Heidelberg, with a 360/75.

8. *Projection of computer needs.*—The yearly rate mentioned in items 2 and 3 has been maintained at comparable levels over the last few years. The projection for fiscal 1969–70 indicates a 25 percent increase over 1968–69 in the funds budgeted for computing. Actual needs in the immediate future will increase from a factor of four to a factor of six over the amount which can be purchased (at the present rates). This corresponds to a total of 3,400 hours a year of 7094 equivalent CPU time.

9. *Repartition of computer use.*—Research in High Energy Physics involves typically two stages:

(a) Production of large amounts of data. This accumulation of data proceeds at a fairly uniform rate in the average of several experiments. Individual experiments may involve peak requirements of several times the average rate every few years (e.g., 1,000 hours of CDC 6600 one out of four years—over an average of 100 hours a year).

(b) Fitting of multiparametered functions to the retrieved data (up to one hundred parameters in, for example, phase shift analysis and resonance hunts).

Note that both stages (a) and (b) in general follow and do not overlap with the use of on-line smaller computers, which for all purposes can be regarded as an integral part of the detecting equipment.

10. *Programming.*—High Energy Physics programming is in general the result of massive efforts of large computation centers at national laboratories or is often an integral part of the experimental program of individual users. It has so far been carried out without the aid of Computation Center personnel.

11. *Summary.*—In conclusion, the computing requirements of the High Energy Physics program at the Fermi Institute cannot be met by the present Computation Center facilities. The limitations are of both technical and budgetary nature.

Access, in whatever feasible form, to a modern super computer is essential and urgent.

Computational Needs of the Education Quadrangle
(R. Darrell Bock)

October 28, 1969

1. *Background.*—The education quadrangle occupies the two city blocks from Kimbark to Dorchester Avenues and from 58th to 59th Streets. Within the quadrangle are housed the Department of Education, the Graduate School of Education, the Committee on Human Development, and the Laboratory School, including the lower, middle, and high schools. The quadrangle maintains a small computing facility in Judd Hall, 5835 South Kimbark Avenue. This facility is called the Department of Education Statistical Laboratory and is based on an IBM 1130 system. Equipment includes the 1130 central processor with 8K core (32 bit words) and resident disk capacity of half a million words. The unit is served by a combination reader punch with a read capacity of up to 400 words per minute and a 1403 printer with maximum speed of 350 lines per minute. At the present time the system is being extended to include a mark page reader under computer control and a dial-up data link to be used with the 360/50 or 360/65 of the University's Computation Center. Synchronous communication adapter for this setup will be shared with the Institute for Juvenile Research of the State of Illinois. The Statistical Laboratory also contains a 1,000-card per minute sorter with counters and five 029 keypunches, one of which has the interpreting feature.

The personnel of the Laboratory include a half-time supervisor and two half-time assistants in the machine room and a programmer and third-time programmer in the user's room. Three graduate students in the Measurement, Evaluation and Statistical Analysis (MESA) program serve as statistical and programming consultants to faculty and students on a part-time basis. Responsibility for the policy of the Laboratory resides in a Statistical Laboratory Policy Committee, consisting of R. Darrel Bock, chairman, Benjamin D. Wright, David E. Wiley, John R. Ginther, Frederick F. Lighthall, J. Alan Thomas, John R. Bormuth, Donald O. Conway, and the assistant dean, Arthur Wise. The present operating budget of the Laboratory is approximately $60,000 a year. At the present time a large part of this budget is covered by a development grant from the U.S. Office of Education.

2. *Computing needs of the education quadrangle.*

(a) Administrative needs of the Laboratory School. Mr. Conway, Director of Administrative Services of the Laboratory School, makes use of the facilities of the Statistical Laboratory for class assignment in pupil accounting. The Laboratory Records Office processes scholastic achievement data, and the high school is begining the implementation of a measurement system for an ungraded English program. The 1130 system probably will be used in these applications.

(b) Student use, Department of Education and Graduate School of Education. Students require access to computers for the following purposes: to learn a programming language such as FORTRAN; to perform calculation in connection with class exercises in the educational statistics courses, Quantitative Inquiry I, II, and III; and to do dissertation research. Most students in Education and Human Development make use of the 1130 facility to learn FORTRAN and to prepare class exercises in statistics. Students find it difficult to use the main Computation Center for this type of computer work because of crowded quarters and slow turnaround time. Because of the numerous and unavoidable trivial errors which new programmers make, the slow turnaround prevents most students from completing a sufficient number of practice problems and exercises in the time available in a one quarter course. This is particularly critical for students in the education quadrangle because of our relative remoteness from the main Computation Center. Students are not able to take advantage of the time between classes to work on computer problems if they must walk back and forth from the Computation Center or depend on the courier service. The capacity of the 1130 to perform small-scale computations for instructional purposes effectively solves these problems. Turnaround is virtually instantaneous and students have access to the equipment any time between 9 a.m. and 9 p m. when they are in Judd Hall.

Dissertation research, on the other hand, often involves larger-scale computations, possibly with the use of magnetic tape records, and for the most part is done at the main Computation Center. In this instance most students make use of the Statistical Laboratory to prepare runs and utilize the courier service to get jobs to and from the Computation Center. It is expected that this use will be greatly facilitated when the data link becomes available in November 1969.

(c) Faculty use of computers. There are several different types of computer work done by the Education faculty: (i) Processing of research data. This work is done primarily at the Computation Center, using programs in the social sciences program library. In many cases these data originate on IBM answer sheets (mark pages), which are now scorable on the 1230 optical reader in the Statistical Laboratory. When the data link is in operation we expect to be able to prepare magnetic tape records directly from IBM mark pages. This should considerably facilitate research carried out in the form of mental testing or survey questionnaires.

(ii) Card preparation, reproducing, listing, minor calculations, and data screening. Most of this work is done in the Statistical Laboratory. Its facilities are indispensable for this purpose.

(iii) Original production program development. This activity is carried on primarily by the MESA faculty and probably accounts for the majority of the department's use of the central Computation Center. In the past the necessity of relying on the courier, having the research assistants wasting time going back and forth to the Computation Center, or spending long hours in the Computation Center at night have made this type of work tedious at best. Nevertheless, over the past five years a number of important large-scale data processing programs have been developed by the MESA faculty and students. (These programs carry the MESA label in the social sciences program library.) This type of work will be greatly facilitated by the data link.

(iv) Professional training. In the coming year the Statistical Laboratory of the Department of Education will be host to a workshop in educational data processing, sponsored by the American Educational Research Association and financed by the U.S. Office of Education. It is anticipated that the best possible turnaround time will be needed during the portion of these workshops devoted to student exercises. It is hoped that we will be able to make special arrangements with the Computation Center to ensure good turnaround time during the two or three days involved.

(v) Real time use of computers in stimulus presentation, data recording, and programmed instruction. This is an area of potentially great importance in educational research, but up to now work has been pursued in this area only by Mr. Ginther. At the present time he is using equipment in the Institute of Computer Research for this purpose; however, depending on the financial support available, it may be possible to do some of this work from terminals in Judd Hall.

3. *Recommendations.*—The following are sug-

gestions concerning the central computation facility as it reflects the needs of the education quadrangle. These recommendations are those of the undersigned and have not yet been discussed with the Statistical Laboratory Policy Committee or other members of the department. It is planned to discuss these matters at the meeting of the Statistical Laboratory Policy Committee planned for late January 1970.

(a) Applications work should not be physically or administratively the responsibility of the Computation Center. Applications programming, program development, program libraries, and advice should be the responsibility of divisions, schools, and centers of the University which make use of the computer in their area of research. These groups should be supported by the regular budget of the unit involved and should be located in close proximity to a remote batch terminal to the main computer. These groups should be under the supervision of faculty members of the respective unit. This is especially important relative to the technical certification of the computer programs in the library of the group and the kinds of advice and instruction the members of the group give to students and other faculty.

(b) The main Computation Center personnel should be concerned primarily with maintaining and increasing the efficiency of the programming systems. The effort should be in the direction of variety and flexibility of programming languages, data storage retrieval and manipulation techniques, and maximum response of the facility to its terminals.

(c) The University should exert its influence to have the rate structure for data transmission and line conditioning revised downward for small users. The cost of lease lines and the conditioning of lines is at the present time excessive when volume is modest. These rates are highly arbitrary and it is questionable that the Federal Communications Commission has given them the study they deserve from the point of view of the University's needs.

(d) The University should not attempt to support a super computer unless it is underwritten by an external agency. The University should, however, investigate the possibility of a data link between the University's Computation Center and a computer of very large scale. It should be possible to reach that computer from the University's main computer or from any of its terminals. Again, some revision of telecommuncations rates to encourage this kind of development should be sought.

REPORT OF THE COMMITTEE ON FACULTY RECREATIONAL FACILITIES

April 13, 1970

In the Winter Quarter of 1970 Provost John T. Wilson appointed a faculty committee to review and make recommendations concerning the University's recreational facilities for faculty. The committee was chaired by Leonard Olsen, Associate Dean of the College and Associate Professor of Humanities. Members of the committee were Mary Jean Mulvaney, Kyle Anderson, Joseph Ceithaml, Walter Hass, Leonard Linsky, Charles O'Connell, and Harry Roberts. The text of the committee's report follows.

Since the report was submitted to the Provost on March 27, 1970, swimming hours especially available to the faculty have been extended in both Ida Noyes Hall and Bartlett Gymnasium. The pool in Ida Noyes Hall, for example, was kept open for a number of hours each day during the spring interim, and an additional hour of early morning swimming was made available to faculty, staff, and students from 7:30 to 8:30 a.m. several mornings a week during the Spring Quarter. Records of attendance were maintained, and the results were sufficiently encouraging that the extended hours will be maintained for Autumn Quarter 1970.

Mr. Wilson appointed a faculty committee in Spring Quarter to review requests for the use of University athletic and recreational facilities by groups outside the University itself. This action was taken in accordance with recommendation 2g of the report that follows. The committee is chaired by Walter Walker, Vice-President for Planning.

Although brief descriptions of available facilities in Ida Noyes Hall, Bartlett Gymnasium, and the Field House have been published each fall by the Departments of Physical Education for Men and for Women and have been available to those faculty who have expressed interest, a more detailed brochure is planned for Autumn Quarter 1970 and will be distributed to all members of the faculty.

CHARLES D. O'CONNELL
Dean of Students

Feeling that the circumstances do not warrant an expensive statistical survey, your committee has based its observations on its own experience

explored in numerous committee meetings and that reported by faculty colleagues.

Although new, better, more extensive facilities would always be nice, the committee thinks that a realistic assessment indicates the desirability of (1) better information concerning existing facilities, (2) increasing hours of availability, and (3) improvement of some facilities.

1. Information.—Publish and distribute annually a brochure describing recreational facilities available to members of the faculty. Give information that is reasonably accurate and detailed concerning procedures, hours (days of the week, interim periods), locker arrangements, towels, bus transportation, etc. Indicate availability of facilities for spouses and children.

2. Availability.

(a) Squash and handball are among the most popular with the faculty. Present facilities are inadequate. The completion of three new courts may satisfy the need. Records should be carefully kept of use by students, faculty, and staff (distinguishing each). Records should be reviewed after about six months to reassess adequacy of facilities.

(b) Facilities for swimming are not good but might be reasonably adequate if hours are extended and maintenance improved. This applies to late hours and weekends. (At the time of writing we understand that some action has already been taken to increase availability.) Increased use of Boucher pool should be encouraged by rerouting busses, making lockers and towels available, and providing adequate security. Records should be kept.

(c) Basketball is very popular and currently enjoys a great deal of mixed faculty-student participation. Care should be taken to preserve and extend availability of basketball courts for general use. (Preempting Bartlett for the first week of each quarter, as well as half the month of September, for registration purposes should be reexamined.)

(d) Track, jogging, miscellaneous exercising, etc. are popular with the faculty and their families. Availability of the Field House, Stagg Field, and other facilities for faculty and families should be accurately indicated, times adhered to, and appropriate security provided. The committee recognizes the difficulty of the security problem, especially at the Field House and Stagg Field, but urges that adequate surveillance be provided as far as possible.

(e) Tennis is popular among faculty of all ages. Indoor facilities are at a premium. Their condition and availability should be carefully maintained. Records should be kept. Outdoor courts are much used by faculty as well as students. Their location and procedures for using them should be well publicized. Attention should be called to the availability of the "varsity courts" for night play.

(f) The availability of additional facilities should be explored and publicized, for example, Sunny Gym, Jackman Field, U-High, and International House tennis courts.

(g) The availability of University facilities to outside groups should be severely scrutinized and rigidly limited.

3. Improvement.

(a) Field House. Although considerable expense is involved, we recommend that serious consideration be given to the installation of a Tartan floor. Having examined the use of such flooring at the University of Illinois, we think it would provide an enormous increase in the value of the Field House to the University. It would greatly increase its versatility by providing an excellent surface for tennis, track, basketball, volleyball, and badminton. Requiring virtually no maintenance, it could be available at all hours of the day and night. It would provide a varsity basketball floor, solving a problem which now seems insoluble. It would make the Field House considerably more healthful by eliminating the dust clouds now hanging in the air from frequent raking of the dirt surface. (Its resilient surface would benefit the aging joints of faculty joggers, a nontrivial advantage.) It would lighten the interior and generally make it much more attractive. Its real cost would be significantly less than the apparent cost because of the substantial reduction in maintenance cost. We are informed that the Field House roof leaks and ought to be replaced. The interior walls ought to be cleaned and/or painted.

(b) Bartlett. The basketball floor and the running track are in almost constant use and need repair. The plumbing should be gone over (there are showers that don't work). Locker space is severely limited.

(c) Tennis courts. The tennis courts at 58th and University were "improved" at considerable expense a few years ago but the job was botched. Someone who knows about such things should be consulted and the courts should be improved so that they can serve the purpose intended for them.

(d) In general, it seems likely that it would be

prudent to give more attention to the preservation of existing facilities, some of which are very badly maintained.

KYLE ANDERSON
JOSEPH CEITHAML
WALTER HASS
LEONARD LINSKY
MARY JEAN MULVANEY
CHARLES O'CONNELL
LEONARD OLSEN, *Chairman*
HARRY ROBERTS

REPORT OF THE EVALUATION COMMITTEE ON THE DEPARTMENT OF STATISTICS

June 23, 1970

Members of the Committee

Francis J. Anscombe, Yale University
David H. Blackwell, University of California at Berkeley
Frederick Mosteller, Harvard University, *Chairman*

THE CHANGING ROLE OF STATISTICS

On the Meaning of "Statistics," Its Relation to Other Sciences

The word "statistics" has had, and continues to have, several very different meanings, and a few remarks about these may be helpful. In sixteenth century Italy a "statist" was one who was knowledgeable about political states, their geography, history, customs, politics, etc. The word "statistics" carried scarcely any of its present day connotations until the nineteenth century, when it came to mean factual information about the condition of society, especially numerical information such as could be presented in tables and charts. Statistics was what we should now call a social science, constituting parts of what are now called demography, sociology, economics, public health, political science, criminology, psychology, etc.

The American Statistical Association, founded in 1839, was the second oldest scientific society in the country, and the oldest devoted to a specific discipline.

Later in the nineteenth century there developed a considerable interest in statistical method—meaning methods of arranging, studying, and interpreting bodies of statistical data, and methods of conducting statistical inquiries, such methods being found to be valuable in other fields of study besides what was called statistics, in natural as well as social sciences. Gradually, various basic ideas of statistical method were defined, and mathematics, especially probability theory, was brought to bear on the exploration of the ideas. This development has continued, ever more rapidly, up to the present. It is this kind of study that is often referred to today by the name "statistics." Perhaps the phrase "statistical method" is too modest for what is now a considerable edifice with much broader objectives than formerly. Modern statistical science is concerned not only with the treatment of statistical data and the design of statistical investigations but with the study of decision making and decision procedures, with random phenomena of many sorts, and with much related mathematics. This is the sort of statistics professed by all the departments of statistics in major United States universities (and, as far as we know, in foreign universities as well). Statistical work in the social sciences goes on, vigorously, but is usually thought of as part of economics or sociology or business administration or whatever. The modern department of statistics may, from historical origin and for administrative convenience, be a part of the division of the social sciences (as, for example, at Yale University) or, again for administrative convenience, a part of the division of the physical sciences (as at The University of Chicago). No matter! Such statistics is not concerned with discovery of the real (social or physical or biological) world, but is concerned with tools for such discovery, with thought, theory, philosophy. In this respect statistics is like mathematics, which was once very close to physics but is no longer. Since, indeed, modern statistical science has a large mathematical component and extremely broad possible relevance, it can appropriately be labeled one of the mathematical sciences. That is a more reasonable, less misleading, label than a social science or a natural science, as those terms are generally understood.

Changes in the Character of Statistical Science

As we look back over the course of development of modern statistical science, we have the impression (perhaps an illusion) that the development

was clearer in purpose before 1940 than since. The pioneers and leaders up to about 1940 were in the first place concerned with statistical practice, with solving statistical problems arising in agriculture or chemistry or biology or medicine or industry. Statistics was a practicing science, like medicine. The problems came first; they had to be dealt with somehow, well or ill; theory, methods, techniques were developed to make practice more effective. In medicine a strong tradition has survived that research and practice should not be separated. A man primarily interested in medical research at a fundamental level still makes the daily tour of the hospital ward at 7 a.m. In statistics, that association of fundamental research with practice became less common after 1940. Theory for its own sake, motivated by existing theory rather than by practical need, is, vastly attractive. There were rich mines to quarry, in probability theory, decision theory, information theory, statistical inference. Important developments in statistical practice have continued to be made, especially in the design of experiments and sampling inquiries, and many new kinds of practical problems have been addressed. But for a quarter century after 1940 the practice of statistical analysis of data (which may be claimed as the oldest part of statistical science, going back to John Graunt's book of 1662) did not show much progress.

Today statistical science seems again to be changing in character and direction. A potent force for change is the computer. Although computers (high-speed stored-program digital) first became available about twenty years ago, their influence on statistics is still more a promise than a fact; the promise is, however, profound for all parts of the subject. Statistical analysis of data has become once again an exciting field, with many unexplored possibilities for new techniques of analysis and new modes of summarizing and display. The computer offers enormous possibilities in the investigation of random processes and systems, because it permits powerful experimentation. And there are many ways in which the computer can assist in mathematical development of statistical theory. All this is not to suggest that statistics is about to become merely a branch of computing. The role of the computer in statistics may fairly be likened to that of the radio telescope in astronomy—something of immense importance, complementing but not supplanting other modes of study.

We return below to a more detailed consideration of statistical computing.

THE DEPARTMENT OF STATISTICS

Since the statistical community is small and tightly knit, the members of the Committee naturally were well acquainted with the more senior members of the Department before their visit, and they knew some of the younger faculty personally and the rest by reputation. The Department can claim distinction in many ways. We think that a brief and partial documentation of this claim is an instructive exercise.

Members of the Department produce their share of books and articles. The profession values their participation in publication, and so it is common for one or more Chicago faculty members to be an editor or associate editor of a major statistical journal. One member played a major role in the extensive statistical work of the *International Encyclopedia of the Social Sciences*. Furthermore, the Department participates with the Institute of Mathematical Statistics in publishing a series of theoretical books in statistics through The University of Chicago Press.

Members of the Department frequently hold high offices in the statistical societies, with one member being president-elect of the Institute of Mathematical Statistics in 1970. Beyond offices, the faculty has assisted societies in organizing programs for regional and annual meetings. Its members have participated in the Visiting Lecturers in Statistics Program sponsored by the National Science Foundation and the Committee of the Presidents of Statistical Societies. These lecturers speak at many colleges wanting to hear more about probability and statistics but having little or no program of their own. The Department's members frequently serve on governmental panels and committees dealing with such varied topics of national concern as weather, driving safety, behavioral and social science, census enumeration, computing, and health.

The Committee noted that the younger appointees are already producing well and felt that this showed bright promise for the future. The fact that students spoke as often of the fine teaching of the younger members as of the older, and that these comments were frequent, is cheering news for those who may have felt that strength in research must mean neglect of teaching.

For professional meetings, committees on invited addresses frequently ask faculty members from the Department to give special addresses, and some members have been invited to give special lecture series at universities. Among their honors, we men-

tion that some members are fellows of the Institute of Mathematical Statistics and of the American Statistical Association; and some are members of the International Statistical Institute, an honorary society requiring election by scholars from all over the world.

Within the University, members of the Department were repeatedly mentioned by name for their participation in cooperative research and consultation on statistical problems arising in the work of faculty members and students in other departments and schools.

Although all members of the Department might be called theoretical statisticians on the basis of their training and research, their current work covers a broad field ranging from theoretical through practical. Part of the interest in applications can be appreciated from the joint appointments with other departments in the Divisions of the Social Sciences and of the Biological Sciences; the Department of Statistics itself is in the Division of the Physical Sciences mainly because of its traditional association with mathematics. Another part develops through the widespread consulting work of the faculty and students. Along with this appreciation of the spectrum of practical applications, one must also note the Department's strong programs of research in theoretical probability and in the foundations of statistics. (One member of the Department has a joint appointment with the Department of Mathematics.) The student sees a well-rounded Department from the point of view of the theoretical-practical circle.

Balance

The Department is remarkably well balanced. For almost any area of statistics, there is at least one member of the Department with a strong interest in it. At the same time no member is isolated; each one shares at least one specialization with some other member of the Department, and several work closely with faculty members outside the Department. The size of the Department seems about right in relation to its present activities. Any increase in service teaching or any substantial increase in the number of Ph.D. students would require an increase in staff, but a substantial increase in undergraduate majors could be accommodated with the present staff.

Space

Until recently the Department was crowded, with little room for students. The new space, especially if it can be further refurbished, will for a reasonable time to come alleviate the crowding and make casual meeting between students and faculty more frequent.

Atmosphere

Every discipline has its age-old arguments. In some departments these arguments have split the faculty into warring groups. This has not happened in the Department of Statistics at The University of Chicago. While members hold various positions in these arguments, they do not seem to feel it necessary that everyone agree. Rather, the atmosphere is that of men who appreciate and respect one another's work and attitudes without expecting compliance with their own views.

The Department seems to an outsider to be run on democratic lines. The full faculty discusses all business except certain appointments. There are many committees, but though opportunity was offered, no one complained about service on them. We came away with the impression of people who like their teaching and their research, who like working with one another, who like their students, and who are generally satisfied with both the departmental and University administration. Altogether we found an impressive show of unity, but not of complacence. The faculty is actively reconsidering its courses, strengthening its computing arrangements, and studying its relations with its students.

THE TEACHING PROGRAM

The Department offers three types of courses: service, undergraduate major, and graduate. The distinction is not really sharp; for example, some courses are integral parts of the undergraduate major and also prerequisites for courses in other departments. And we believe that making the distinction even less sharp, so that statistics majors would be more often in statistics classes with nonmajors, would be healthy for both groups of students. Statistics and mathematics students tend to be formal and rigorous, while economics and psychology students tend to be intuitive. Since rigor and intuition complement each other, each type of student can learn something useful from the other. We comment separately on the three types of courses.

Service Courses

The Department offers a wide variety of introductory service courses. At the most elementary

level there is a general course and a variation of it with a stronger mathematics prerequisite. These are excellent introductions but do not (and are not intended to) prepare the student to use any but the simplest methods of analysis. Two more demanding and extensive one-quarter courses were introduced this year, one emphasizing biological applications and the other natural science applications. The Department also presents an introductory course to medical students.

More extensive introductory courses are also offered by the Department. There is a two-quarter course established primarily for graduate students in the social sciences and a two- or three-quarter sequence with calculus prerequisites that is the Department's most extensive introductory course; it is taken by students from many departments.

Introductions to probability and theoretical statistics (two quarters of the former and one of the latter) fall into a somewhat different category. These courses would probably be given even if they played no service role, but most of the students in them are from other departments.

Several other departments offer further statistics courses, building on the statistics service courses and emphasizing methods of special importance in the departments' fields. Other departments offer their own introductions to statistics.

Just how many and what kinds of service courses (if any) a statistics department should offer have been much debated. The present rather mixed arrangement at Chicago is not atypical, and the faculty members we interviewed, inside and outside the Department, are generally satisfied.

Undergraduate Major Courses

The Department, like most statistics departments, has few undergraduate majors. Part of the reason is the introductory major sequence: it is overnumbered, having a number appropriate for a graduate course, so that advisers may think it inappropriate for undergraduates. And it tries to cover too much, with a resulting lack of emphasis on mathematical proofs that is unappealing to mathematically inclined students who are the largest single source for prospective statistics majors. The Department has recognized both problems and is next year (1) giving the present sequence an undergraduate number and (2) introducing a new, alternate sequence, also with an undergraduate number, with a sharper mathematical flavor.

The field of statistics, as some parts of this report make clear, offers those who take it up a wide spectrum of possibilities in the mathematical sciences, running from full-time work in abstract mathematics through full-time practical work including participation in actual experiments and field studies. The profession is as well paid as any in the mathematical sciences and provides positions for women as well as men. Successful students are much in demand. It is an especially good field for those who have enjoyed and been successful in their science and mathematics studies but want more emphasis on applications than pure mathematics offers today. Nevertheless, recruitment has always been a problem to the profession. At the same time that the Department introduces its new course above, perhaps it could also give consideration to additional ways of recruiting talented young people to this exciting field.

Statistics as an Undergraduate Subject

Whereas many universities have graduate programs in statistics, not so many have a regular undergraduate major in statistics. Some educators in statistics disapprove of the idea of an undergraduate major. They note that if a person is to pursue a career in statistics, he will find that undergraduate training in mathematics or in one of the principal sciences is very valuable. Statistics may be said to be a secondary discipline, in the sense that it is concerned with and derives impetus from problems arising in other disciplines. For development of the theory of statistics, much mathematics is needed; and for effective practice of statistics, substantial knowledge of fields in which statistical problems arise is always helpful and often mandatory. So, it is argued, the natural way to approach a career in statistics is through an undergraduate major in a traditional discipline, followed by graduate study of statistics. That has been and still is the usual pattern. But we see no reason why it should be the only one or even the modal one.

Many colleges offer undergraduate courses in statistics, even when there is no major in statistics and no graduate program. Such courses are commonly offered in mathematics departments and in various social science departments. Whereas the art of graduate instruction in statistics has been well developed and excellent programs are conducted (at The University of Chicago and elsewhere), undergraduate instruction in statistics is probably on the whole rather unsatisfactory. It stands to benefit greatly from imaginative rethinking and experimentation, which will no doubt be forthcoming in the years ahead.

Two reasons can be given for increased attention

to statistics in undergraduate teaching and in particular for development of regular majors in statistics. One is concerned with recruitment into the statistical profession; the other is concerned with statistics as a valuable experience in a liberal arts program.

As to recruitment, the matter should be considered in relation to all the mathematical sciences. Most undergraduate majors in mathematics are directed toward the main areas of activity in modern pure mathematics; the best students are encouraged to continue in that direction. There is little awareness among the students concerning the other mathematical sciences besides main-line pure mathematics. In addition to the traditional kind of "applied mathematics," directed toward physics and engineering, numerous other kinds of applied mathematics study have developed greatly in recent years. (Some perspective can be obtained by examining the later sections of *Mathematical Reviews*.) Most of these kinds of applied mathematics are insufficiently supplied with entrants. Undoubtedly this is largely because of lack of knowledge of the possibilities on the part of able students. Mathematics students often express a desire to see applications of mathematics to the real world but are presented with only a narrow range of examples. Thus, strengthening and diversifying the applied mathematics courses, including courses on statistics, either as part of the existing mathematics major or as an alternative major, is likely to have a beneficial effect on the mathematical world as a whole.

As for the general cultural value of the study of statistics in a liberal arts environment, not much seems to be said about this currently, and yet a strong case can be made. We are all bombarded today by rudimentary statistical arguments, good and bad, mostly bad, as has been beautifully illustrated in the excellent little book written at The University of Chicago, *The Nature of Statistics* by W. Allen Wallis and Harry V. Roberts. It is good that an educated man today should have some experience in making sense of statistical data, should have some notions about the possibility of gaining reliable information by sampling, and should be acquainted with some statistical principles of experimentation. Such acquaintance with statistical methods, at much less than a fully professional level, can be a valuable asset to the businessman, the lawyer, the physician. Quantitative thinking is important to all. Facility in quantitative thinking concerning everyday affairs can be imparted by elementary instruction in statistics at least as well as by instruction in more traditional mathematics or experimental science. As more attention is paid to the challenge of elementary statistics teaching, as more elementary textbooks of very high quality come to be written (there are all too few today), statistics may for good reason become a far more popular subject of undergraduate study than it now is.

Graduate Courses

The graduate program is high in quality and broad in coverage, but several graduate students commented (not as a complaint) that virtually no data or applications occur in the formal graduate courses. This is somewhat remarkable, since the faculty has a strong interest in applications and has a long and varied history of successful cooperation with faculty members in other departments and of contributions to applications of national interest.

Nevertheless, the students who are about to finish and some recent Ph.D.s whom we talked to agree that somehow they have acquired at Chicago a substantial experience with and feeling for applications of statistics. This has occurred in two principal ways: (1) faculty members informally involve students in their own collaborations with colleagues from other departments, and (2) a special faculty member is put in charge of cooperative research (usually called consulting) by students. Students and faculty members from other departments who encounter statistical problems in their research are encouraged to come to this faculty member, who will arrange for students and perhaps faculty members to work with the scholar who has the statistical problem. This year a third road to cooperative research, (3) a formal course in which people with statistical problems are invited to present their problems, has been introduced and has resulted, in several cases, in successful and stimulating cooperation.

Every statistics department in the country has the problem of managing training in consulting because (1) it is an important source of fresh problems for theoretical statistics; (2) it offers training for graduate students in recognizing, formulating, and attacking real statistical problems; (3) it helps others in the solution of their problems; and (4) many enjoy participating in practical investigations. Other departments may therefore wish to study Chicago's program. Beyond the observations just reported, we have had available a statement on cooperative research prepared by the Department

which we append to this report (see Appendix I). That appendix should be of interest both to people outside the Department at The University of Chicago and to other departments of statistics. We have also reviewed the latest report on the consulting activity which gives details about the effort. It is an impressive document.

We have two minor criticisms of the graduate program:

1. The main graduate sequence is four quarters long—two quarters of measure-theoretic probability followed by two quarters of mathematical statistics. This results in a probably unnecessary delay in introducing the student to the principal areas of mathematical statistics and a corresponding delay in his finding the area that most appeals to him and in which he will write a thesis. We suggest that, with a little thought to order of presentation, the mathematical statistics sequence could be made simultaneous with the probability course, so that the student could have an overview of the subject at the end of the winter quarter of his first year rather than, as at present, after the fall quarter of his second year.

2. Graduate students in the Department rarely take statistics courses outside the Department. The total course load of statistics graduate students this year is 115 courses, of which only 1 is a *statistics* course outside the Department (17 are mathematics and computing courses outside the Department). Many graduate courses with essentially statistical content are given outside the Department (e.g., in time series analysis) and some are in areas not stressed in the Department (e.g., applied probability). Many important statistical ideas originate and are developed mainly outside statistics departments, e.g., factor analysis (psychology, education); information theory (engineering, information sciences); queueing theory (business, operations research); stochastic linear models (economics); and Monte Carlo (computer science). We hope the Department will do more to encourage its students to explore outside statistics courses.

A special feature of many courses in the Department is the systematic use of high speed computers. The Department is among the leaders in the country in recognizing the indispensable role that computers will have in the teaching of statistics (as well as in research and applications), and has developed programs and imaginative approaches that should be of great assistance to other statistics departments as well. We discuss this in more detail below.

Except when discussing the introductory undergraduate major sequence mentioned above, students were unanimous in their praise of the content and teaching of statistics courses. We did not have an opportunity to talk with students from other departments, but faculty members from other departments generally expressed satisfaction with the courses, and those who had actually attended courses were enthusiastic. But one course, the analysis of variance sequence, was mentioned particularly often and with particularly high praise by departmental students. The coordinate-free approach used in this course is new, and when a textbook is published, will probably be widely adopted.

Summer Program for Graduate Students

The graduate summer program except for research work is largely nonexistent, so practical work is especially appropriate. The faculty tries to obtain summer work for graduate students that will give them an opportunity to practice their statistical profession. To this end, one faculty member has the responsibility of finding appropriate positions for all the graduate students. While that has not been possible in every instance, a large proportion of the students do obtain such positions, and the Department's efforts are believed to be in large part responsible for their success. In addition to the three consulting efforts mentioned earlier, this summer program represents a fourth way for students to get practical experience before completing their program.

Time to Ph.D.

Time to Ph.D. interests educators. It always has a distribution with a rather long tail. At the request of the Committee, the Department studied basic facts about the last eighteen Ph.D.s. The number of years from first to last graduate registration at The University of Chicago ranged from 2 to 4, with mode, median, and mean being 3 years. The number of years from first graduate registration at Chicago until the Ph.D. ranged from 2 to 12, with mode 3, median 4, and mean 5 years. The number of years from first graduate work anywhere to Ph.D. ranged from 2 to 13, with mode and median 5 and mean 5.7 years.

It might be useful to the Department and for other departments of statistics to make some comparisons of such figures using common definitions.

Graduates

Students with graduate degrees from Chicago's Department of Statistics have carried on estimable

professional careers, and the Department is justifiably proud of them. Those in academic positions are (or have been) at the University of California at Berkeley, Columbia University, Harvard University, Iowa State University, Bar-Ilan University, the London School of Economics, Rutgers University, the University of Michigan, and other institutions of higher learning. Of these former students, three are (or have been) department chairmen.

Those former students in industrial or government positions are (or have been) at, for example, Bell Telephone Laboratories, the Bureau of the Census, Westinghouse Research Laboratories, the Veterans Administration, and the National Institutes of Health. One Ph.D. from the Department is a successful private consultant.

The Department's students have published an impressive array of technical papers and books on a wide variety of topics in statistical theory and method.

About two-thirds of these former students with doctorates from the Department are in academic positions; the others are with private industry or government. For former students with the master's degree but not the doctorate, the ratio is roughly just the other way; about one-third are in academic positions and two-thirds in industry or government.

Desiderata in Statistical Computing

Statistics has not directly influenced the development of the modern high-speed computer, either in its hardware or its software (though in the pre-computer era statistics had a considerable effect on computing in various ways and in particular can claim credit for the punched card). Until now, statistics has not made demands on the computer that were different in kind from demands already made by other fields. However, the needs for computing now being recognized in statistical teaching and research are in fact somewhat different from the needs of some other computerized fields. All the major advances in computer technology have a bearing on statistics, especially the wonderful increases in speed and capacity. But there is one supreme need in statistical computing, and that is flexibility, the ability to perform new calculations and to depart from established procedures.

For example, statistical analysis of data is not in principle a one-shot affair. A statistician cannot tell, when he begins to study a set of data, what kind of analysis will seem in retrospect to be adequate. He may choose some standard procedure to start with, but often one of the things revealed by such an analysis is that the analysis itself was inappropriate. And in other types of statistical computing, say in experimenting with random processes, the computing probably does not take the form of many large "production" runs of a few standard programs, but rather has the character of improvisation. Thus most persons approaching a computer for statistical purposes, whether they are students or professionals, are likely to need to do something in the nature of programming, even though they may possibly rely extensively on existing programs or subroutines.

So for statistical work interactive computing (time-sharing) through a terminal might well prove to be generally preferable to batch computing, if similar power and inexpensiveness could be achieved in either mode. At the present time interactive computing is still new and rather expensive in many installations. On the other hand, it is technically feasible for batch processing to be operated so that short jobs, such as debugging runs, are executed very fast, with turnaround time in the range of five to fifteen minutes. Getting a new program to work correctly usually requires several debugging runs before useful output is obtained. Under conditions of fast turnaround, a two hour spell, say, will permit a new program to be punched, debugged, and run, with a total expenditure of time and effort not in excess (or not by much) of what would be achievable with a good interactive system. Therefore, while interactive computing offers great promise for statistics and is being actively tried in some universities, it would be rash to assert that batch processing is *necessarily* inferior in convenience and effectiveness. Batch processing under conditions of long turnaround time of several hours, as it is in many installations and (so we were told) has recently been at the computer center of The University of Chicago, is indeed vastly inferior to good interactive computing and offers a severe deterrent to use of the computer. Under those conditions a job that could be done in two hours gets spread over a much longer period, almost certainly with considerable waste of time and interruption of thought. Under those conditions it is scarcely practicable, either for the instructor or for the students, for a course to be concerned to any considerable degree with statistical computing, as a course on statistical analysis of data, for example, ought to be. (A colleague of one of the members of this visiting committee has just completed a graduate level course on statistical analysis in which a wide range of types of statistical data were analyzed in various ways by the students and then discussed in

class. A batch processor with fast turnaround was used, programs being written in Fortran, with numerous previously tested subroutines available. The fast turnaround was found to be essential to the conduct of the course. Such a course seems highly desirable in a graduate program.)

Interactive time-shared computing through terminals brings with it some amenities in addition to fast response. Such terminals are likely to be closer at hand, in one's own building if not in one's own office (or home), than the nearest place where batch processing can be done. Time-sharing in general seems to encourage users to be their own programmers, rather than to seek out large package programs intended to be flexible that all too often turn out obscure, clumsy, and frustrating. Some of the most interesting new developments in languages and systems are associated with time-sharing. In our remarks above about batch processing with fast turnaround, we do not in the least wish to discourage The University of Chicago from developing time-sharing facilities as rapidly as possible.

There are other ingredients to flexibility besides fast response and ready access to the computer. The user should be able to explore new languages and special program systems. Computing has not reached a steady state. Innovations need to be available, so that they may be called upon, and intelligible, so that they can be called upon effectively. Whereas good primers of Fortran programming, for example, now exist, most new language or program developments come with highly unsatisfactory explanations. In fact, to provide an account of a new language or program system that is both accurate and comprehensible to potential users is a formidable task, comparable with the effort in developing the object to be described and demanding a different talent. A user who is strongly enough motivated to penetrate the designer's explanation of his system may perform an immense service to his colleagues by writing the thing up in English. Such work requires and deserves financial support.

Important developments now taking place both in general programming languages and in special statistical systems offer reduced effort in the programming of novel procedures. Any new computation calls for effort, sometimes large, in clear and precise formulation and in thinking through various possibilities. Over and above this essential effort there is the effort of communicating the procedure to the computer for execution. Ideally the latter effort should be very small compared with the former. At Chicago a special statistical system known as SNAP has been introduced and extended, and seems to offer much promise. Some other recent developments, notably Iverson's language APL, seem not to be at present readily available at The University of Chicago.

The Department of Statistics has unusual strength and interest in computing aspects of statistics. An account of activities in statistical computing by members of the Department has been supplied by the Department at our request and appears as Appendix II.

PREPARATION OF THIS REPORT

The Chairman of the Committee visited The University of Chicago for three days early in January 1970 for purposes largely outside the work of the Committee. This gave him an opportunity to discuss the plans for the visit with the Chairman of the Department of Statistics, to interview individually over half the members of the Department, and to breakfast with two groups of four graduate students together with one of the younger faculty members on each occasion. These interviews gave the Committee a firm basis for its further work because it then knew what matters were especially on the mind of the Department, and perhaps even more important, it knew a host of things that were not troubling either students or faculty.

After planning how to share responsibility for interviewing and for writing the final report, the Committee asked the Department through its Chairman to supply statements on departmental plans, on the encouragement of professional activities, on cooperative research and consulting, and on computation. Beyond these we requested and received vitae and publication lists for faculty members; departmental brochures; University catalogues; statements to entering graduate students about courses, seminars, and other matters; a list of Ph.D.s in statistics together with titles of dissertations; a listing of the courses taken by this year's graduate students (1969–70); sets of examinations; and a list of professors from other departments having interest in statistics.

While the Committe was on the grounds April 14–17, 1970, it interviewed two students who were or had been undergraduates in the Department, fourteen graduate students in the Department, and one alumnus. At least two and usually three members of the Committee interviewed each of the younger faculty members, usually in two sessions. Discussions were held with each of the senior

faculty members of the Department, as were interviews with nine professors from outside the Department of Statistics and interviews with three members of the administration. Three group discussions were held with those faculty members from the Department who are especially interested in the topics of computing, cooperative research and consulting, and the introductory course. In addition, at a final luncheon the Committee reported some of its findings to the full faculty of the Department.

APPENDIX I[1]

COOPERATIVE RESEARCH WITH OTHERS

From its beginning, the Department of Statistics at The University of Chicago has felt a strong obligation to help faculty and students throughout the campus in the application of statistics to research of all kinds. Among ourselves we call this "consultation," but that term is subject to a kind of service-station misinterpretation, so some of us prefer the term "cooperative research."

The motivations for engaging in cooperative research are:

1. It provides a stimulus and a source of problems for theoretical statistics.
2. It provides enjoyable participation in interesting scientific inquiries.
3. It often results in real help to others.
4. It contributes to the training of statistics students.

In the best cases, all four motivations may be present during a piece of cooperative research.

Here are a few examples, among many, chosen to illustrate diversity.

Paul Meier has recently participated with the Hematology group of our Department of Medicine in the design and operation of a randomized follow-up study on the effectiveness of different treatments for Hodgkins disease and various classes of leukemia.

David L. Wallace has been deeply engaged (and Mr. Meier to a lesser extent) in the program operated in the Department of Medicine known as the Myocardial Infarction Research Unit. The subproject concerned with data acquisition and analysis is directed by Dr. Harry Fozzard. Working with Dr. Fozzard, Mr. Wallace has developed a number of programs for the analysis of EKGs in real time.

[1] Prepared by the Department at the request of the Committee, March 13, 1970.

Leo A. Goodman and William Kruskal were led to their interest in measures of association for cross-classifications after discussions with B. Berelson (then of the Graduate Library School) and L. Thurstone (Psychology). Later on, the results themselves led to cooperation with a variety of faculty members, including R. Johnson (Geophysical Sciences) and R. Tapp (Meadville Theological School).

Mr. Goodman became interested in problems of population growth partly as a result of conversations with N. Keyfitz (Sociology). Mr. Goodman's findings then led to further interactions with Mr. Keyfitz and other demographers and to a sequence of research papers.

Christopher Bingham and others, including our student Henry Davis, have worked extensively with Victor Rosenberg, a doctoral candidate in the Graduate Library School. Mr. Rosenberg has been carrying out research on the efficacy of keyword indexing of documents by several methods; the cooperative research included aspects of both design and analysis.

Frederick Glick and our student Stella Machado have helped Theodore Laws, a doctoral student in the Graduate School of Business, with the analysis of an experimental study of subliminal suggestion.

Stephen Fienberg with our student Kinley Larntz cooperated with Alice Jones (Washington University) in her study of wealth in the American colonies just before the Revolution.

Gordon Sande has worked with Dave Fultz (Geophysical Sciences) on the analysis of an experiment showing the effect of the earth's rotation on the slowly rotating fluid of a small-scale laboratory setup.

Our former student Lalitha Sanathanan co-operated with a bubble chamber group in the Research Institutes on the analysis of chamber photograph readings by several independent observers. Her work on this led to her doctoral dissertation.

Students.—We believe that all graduate students, with the possible exception of a few having primary interest in abstract probability, should receive guided experience with cooperative research. A variety of schemes have been tried to effect this.

For the last four or five years we have been primarily using the following arrangement. A member of the faculty is responsible for cooperative research by students. When a request for cooperation comes to the Department's attention, an initial interview is set up with one or two students, the central faculty member, and perhaps one other

faculty member. This initial interview may then lead to further activity as circumstances suggest.

At roughly quarterly intervals we review the activity. The Committee has seen a recent written review by F. Glick, the responsible faculty member for 1969–70.

During 1969–70 we are trying, in addition, a formal course in applied statistics. In most of the sessions an outside speaker describes a scientific problem to which statistical methods have been, or might be, applied. Some sessions are devoted to discussions among ourselves.

These approaches seem to work fairly well, although there are difficulties. For example, the amount of cooperative research activity varies a great deal among students. Again, it is difficult to arrange the kind of long-run, deep cooperative research that is most effective and rewarding.

Other aspects of cooperative research.—Of course we are not able to provide all the statistical aid that might be desired over the campus, nor do we wish for anything so ambitious. In the other direction, many scientific colleagues who might profit from discussions with us do not ask for them, and that for any number of reasons: ignorance that we are often willing to help, pride that precludes asking for help, belief in one's own statistical competence (sometimes justified), fear of being overwhelmed with high-flown theory, dislike of sharing credit, etc.

As on most campuses, there are individuals and groups in other segments of the University who provide statistical help in their own areas. Statistical groups of this kind flourish, for example, in the Graduate School of Business, the Department of Education, the Law School, and the Department of Economics. We have been generally successful in maintaining cordial personal and intellectual bonds with such groups and their members.

The cooperative research program sometimes brings us in touch with scientists off this campus. When they come from other academic organizations or from research institutions, we typically treat the relationship just as if it were on our own campus.

There is a small amount of faculty consultation for pay, most often with industrial concerns. Since the amount of this has never been great, it has not represented a problem for the Department. We monitor it from time to time by asking each faculty member to write down a list of such consultations, with approximate amounts of time spent. The amount of money is not listed.

Members of the Department's faculty also participate from time to time in the activities of government panels and commissions. This is usually done as a public service, without financial recompense.

APPENDIX II[2]

COMPUTATION AND THE DEPARTMENT OF STATISTICS

The Department of Statistics at The University of Chicago is increasingly committed to the idea that computation (the use of high-speed electronic programmable computers) has an indispensable role in the teaching, research, and application of statistics. This is reflected by growing emphasis in the *Announcements* and other Department literature on the importance of computation in degree programs. It is seen in the increasing use of computers by faculty members in their own research and teaching. It is evident in the faculty's activities and associations outside the Department and in their contributions to advances in computing methods and systems. No attempt at completeness will be made in this summary. The emphasis is on communicating the extent and the flavor of the Department's relationship with computation. We begin by sketching a few examples.

Much of Mr. Goodman's work in the past few years has been predicated on the use of computers. Most recently, he adapted the ideas of stepwise regression to stepwise contingency table analysis. As with many forms of data analysis, the availability of a powerful computer is a prerequisite for effective implementation. He also routinely uses the computer to obtain numerical values for estimator bias and other properties of statistical methods.

Mr. Sande makes heavy use of the computer in studying techniques of time series analysis, including the distribution of cepstrum estimates. He also is deeply engaged with geophysicists on campus in applying real-time computer techniques to the analysis of doppler radar data, especially for the investigation of clear air turbulence.

Mr. Wallace and, to a lesser extent, Mr. Meier have been working actively with the data analysis subgroup of a large research project on clinical heart disease that is known as the Myocardial Infarction Research Unit (MIRU). Programs for on-line analysis of EKG signals have been developed,

[2] Prepared by the Department at the request of the Committee, April 3, 1970.

as have digital programs for more detailed summarization of EKGs taken over a period of time. A program for the analysis of indicator-dilution curves has also been developed.

Messrs. Meier and Wallace have over the last several years been involved in the activities of the Biological Sciences Computation Center (now reorganized and renamed the Biomedical Computation Facilities) located in Billings Hospital. As a result, both have been participants in the development of computer applications to a wide variety of problems in the biomedical area, ranging from file processing systems to function minimization and nonlinear least-squares analysis programs.

Mr. Bingham has been active in development of time series analysis programs. In particular, he has consulted on the use of computers in the frequency analysis of intra-aortal blood flow measurements. He also has made routine use of the computer in studying the properties of functions arising in the analysis of observations of directions —that is, of samples from distributions on the circle and the sphere.

The above examples are concerned largely with the computer as a tool for solving problems and for applying results which themselves have little to do with computers. Several members of the Department are also committed to efforts to make this tool more effective and accessible and to understand the properties of the numerical algorithms which actually produce results. Particularly important has been Mr. Wallace's rethinking and rewriting of SNAP, a student-oriented statistical processor that was originally developed at Princeton. With the occasional assistance of Mr. Bingham, Mr. Wallace has vastly improved the power and flexibility of the built-in data library facility, overcoming the lack of the on-link disk that was available on the 7094 at Princeton. The addition of manipulable constants as well as arrays of variables and the improvement of the control of transformations of variables have made SNAP considerably more powerful. Mr. Wallace has also developed programs for a PDP/8 with plotting scope. The programs explore the properties of likelihood functions and their derivatives in a form attractive for classroom use.

Mr. Bingham has programmed a powerful tape handling package which made the improved library facility in SNAP possible. More important to the overall picture, he substantially expanded the software available to all users of the University's Computation Center. For example, by importing and making operational a version of the 7094 monitor system used at Princeton, he made available here the first WATFOR compiler, the first good ALGOL compiler, and a powerful and easy-to-use CRT plotting package. His efforts were also indispensable in getting PSTAT, a large data-set statistical system, operational on the 7094 here.

Mr. Sande has also greatly contributed to upgrading general facilities at the Computation Center, improving the Princeton ALGOL compiler, and putting the 360 version of PSTAT on the air. One of the pioneers in the design and use of the so-called fast Fourier transform, Mr. Sande has continued to make advances in studying its numerical properties and finding new uses for it, especially in time series analysis. As the closest to being a numerical analyst of any member of the Department, he is also doing research on algorithms used in linear equation solving and least squares. During 1970–71, Mr. Sande's appointment will be joint with the Committee on Information Sciences.

To indicate that fascination with the superpowerful does not overwhelm everyone, we should not omit mention of Mr. Glick's creation of ANGST, a set of statistical programs for programmable desk top WANG calculators. ANGST proved extremely valuable in laboratory exercises for a new introductory course in statistics for medical students. This course, taught by Messrs. Meier and Glick, also was the vehicle for our first use of a time-sharing system (COMSHARE) in teaching elementary courses.

The role of the computer in teaching is, of course, influenced by the nature of computer related research here (and vice versa). High speed computation is being increasingly used in introductory courses. One course, Statistics 300, which had been computer oriented for five or six years, is no longer offered. It has been replaced by the previously mentioned medical school course and by two new courses for students in the sciences, both of which are expected to use the computer routinely. For the past two years, Statistics 304-305 has used SNAP as an aid to insight into the nature of random variables and sampling distributions and as a flexible tool to apply methods discussed in the course to more substantial bodies of data than were formerly possible. SNAP is supplemented in Statistics 306 by other programs, including the analysis of variance processor, AARDVARK. Mr. Wallace has made use of PDP/8 programs written in FOCAL in Statistics 350.

On the graduate level, Mr. Sande's courses in

time series and linear equation solving require substantial programming and computation. The same is true of Mr. Wallace's course in data analysis, Statistics 344. The ongoing program of involving students in intra-university consulting is yet another route which may result in experience with computation in applied statistics. In addition, quoting from the *Announcements:* "Graduate students are normally expected to acquire familiarity and experience in the effective use of computers through formal courses in computation and numerical analysis . . ." Another activity that is still in the experimental stage is the assignment of two graduate students to the Computation Center to be on duty for statistical advice, especially with regard to the use of standard statistical packages and systems. One measure of the effectiveness of our efforts to bring students and computers together is the fact that roughly half the recent Ph.D. theses have involved some computation. In perhaps a quarter, computation played a central role.

Most of the computation around the Department of Statistics, and indeed around the University, is batch mode computation on the 7094 and 360/65. We have made effective use of this in the past and will continue to do so in the future. It is, however, increasingly obvious that time-sharing facilities already in wide use elsewhere would increase the effectiveness of much of what is already common, such as use of computers in introductory course exercises, exploratory numerical analysis in thesis research, etc. Time-sharing also makes possible the use of the computer in the classroom. Mr. Wallace's use of the PDP/8 has shown the power of such an approach, but the logistic problems in scheduling classes in the hospital, where the PDP/8 is located, preclude much expansion in this direction. As a first step we have bought a teletype console that is housed in the same building with student study offices, and we are subscribing to two commercial time-sharing services. We would very much like to see such services available from our own Computation Center, but this is not likely in the near future.

The Department takes an active interest in the operation of the University Computation Center. Mr. Bingham is currently a member of the Computer Policy Committee, on which Messrs. Meier and Wallace have served. Messrs. Sande and Bingham regularly attend User Meetings and the like.

A problem that is likely to loom larger and larger is that of obtaining funds for carrying on computing activity of the kind described in this statement.

REPORT OF THE EVALUATION COMMITTEE ON THE DEPARTMENT OF PATHOLOGY

June 14, 1970

Members of the Committee

Dr. Ellis S. Benson, University of Minnesota at Minneapolis

Dr. K. M. Brinkhous, University of North Carolina at Chapel Hill, *Chairman*

Dr. Paul E. Lacy, Washington University in St. Louis

It is our pleasure to submit the report of the Evaluation Committee for the Department of Pathology. The members of the Committee visited the University and Department for two full days on May 19 and May 20, 1970. Prior to the visit the Committee was furnished with a great deal of factual data on the Department, its faculty, budgets, and teaching programs, as well as some general information on The Pritzker School of Medicine. We had the opportunity of discussing the goals and functioning of the Department with the Chairman and with the Faculty Secretary of the Department; all but one of the executive or tenured faculty in Pathology (Dr. Henry Rappaport was away from the institution at the time of our visit); the remaining faculty in Pathology; graduate students, interns, and resident staff in the Department; representative medical students of each class; the chairmen of several of the clinical and basic science departments; a group of faculty of the clinical departments who have significant patient care responsibilities; the Dean and Associate Deans of the Division; and the Director of the Hospital. We are especially appreciative of the time and help given to us by Provost John T. Wilson, Dean Leon O. Jacobson, and Associate Dean C. W. Vermeulen. From the foregoing, we feel that we had an unusual opportunity to view the strengths of one of the most important pathology departments in the country and to review the problems facing the Department, Hospital, and School in relation to changing patterns in educational requirements and governmental research funding and to increasing demands for pathologic services in a modern university medical center.

Historically, the Department of Pathology has been viewed as an oasis of strength in its field since the founding of the University. It was the pioneer in the development of a Ph.D. program in pathology. There have been three chairmen since the

development of the Midway Campus, an indication of the stability of the Department. The current Chairman, Dr. Robert Wissler, took over this responsibility some twelve years ago, at a time when the staff was largely depleted by reason of retirements and transfer of faculty to other institutions. In many ways the current eminence of the Department is due to the devoted efforts of the Chairman and the support of an outstanding faculty.

The Department is one of the most outstanding academic departments of pathology in the nation and represents a vital center for the continued growth and development of academic pathology nationally and internationally. The present superb status of the Department is due to the many major strengths and degree of excellence which exist in administrative leadership; research; senior staff; undergraduate and graduate teaching; resident training in anatomic pathology; and diagnostic services in cytology and autopsy, and in surgical, pediatric, and obstetrics-gynecology pathology. Dr. Wissler has obviously been eminently successful in selecting and recruiting staff members with excellent potential and has created an environment which permits these individuals to flourish and achieve national and international recognition for their accomplishments. Factual evidence for this recognition is not only in their published work but in the continued attempts by many other medical schools to recruit these persons for chairs of pathology in their own institutions. The total Department is seriously and actively committed to undergraduate teaching, and it has worked extremely hard to continue to improve the courses given. Several members of the Department have interacted with faculty from other departments in a most admirable fashion in making changes in the new curriculum. The success of their efforts in teaching was evident from the interviews with the medical students and from the large number of students that choose to do research in Pathology. The M.D.-Ph.D. students in Pathology were obviously brilliant young men and women who were enjoying their training in a most stimulating environment. The resident-trainees in the graduate program were committed to academic pathology and were receiving the type of training that will permit them to have fruitful academic careers and assume positions of leadership in the future.

The major areas of research strength presently include immunopathology, cardiovascular and renal pathology, hematopathology, and oncology; the approaches utilized in each of these areas involve both biochemical and ultrastructural methodology. Outstanding contributions have been made in the understanding of cellular mechanisms of antibody formation, in the pathogenesis of the atherosclerotic lesion (widely used animal models have been developed and the key role of the smooth muscle cell has been identified), in the natural history of renal diseases of man, in viral oncogenesis, in the basic nature of hyaline membrane disease of the lung, and in the effect of low-level, long-term toxic agents on the fine structure of cells. Special mention should be made of the systematic clinico-pathologic correlative studies of hematopoietic neoplasms, with the development of an international reference center for these diseases.

The breadth and depth of research activity are of importance not only in making significant contributions to medical science but also in providing opportunities for research training in multiple areas by the resident-trainees and graduate students. There is no question of the remarkable achievements made by the Department or of the position of eminence that it holds in academic pathology and the equitable balance of teaching, research, and service that exists. The only concern is that in attempting to meet the present and future challenges of this changing era in medicine these vital strengths not be weakened and the tripartite balance be continued in equilibrium.

The new medical curriculum, instituted this year, emphasizes correlative introductory courses in the basic sciences and medicine. There are no longer required courses as such in Pathology. While there is enthusiasm for this approach to teaching, there is also concern about whether this will weaken the total teaching efforts of the Department, particularly in the graduate program, since historically the graduate student in Pathology has come mainly from the medical student body (an M.D. and Ph.D. program requiring at least six years rather than four years for the M.D. alone). Another expressed concern of some was the possibility of an identity problem of faculty members in relation to Pathology, since chemical approaches to pathologic research are so important. Still another concern is the need for greater faculty teaching time, without compensatory increases in staff, and the possibility that this may adversely affect research productivity of the faculty. The Committee believes that the new curriculum should be reviewed in these lights in two or three years, to determine if these potentially adverse effects are likely to materialize. One of the medical students we interviewed stated, "This is a very good Department. It is a Department which is willing to change." In a sense this is one of the

most lavish testimonies of praise in a time which calls for change.

A concern was expressed that some of the graduate students in the Ph.D. program may not continue in Pathology but may select another basic science or clinical field for their future careers. This concern does not apply to the resident-trainees working toward a graduate degree, since these individuals are receiving specialty training in both diagnostic pathology and experimental pathology and will undoubtedly continue in academic pathology. The M.D.-Ph.D. medical students are not in a position to make a definitive commitment to a particular clinical or basic science field, nor should they be at this stage of their development. Some of the individuals doing graduate work in Pathology will select medicine, pediatrics, biochemistry, etc. for their future academic careers. It is the view of the Committee that the training in experimental pathology received by these students will be of tremendous value to their future academic careers regardless of the field of specialization they may select and that this diversity of careers should be a source of great satisfaction to the faculty in Pathology.

To the Committee, it is natural that a faculty in Pathology, with the breadth and subspecialties of the discipline, should differ regarding the relative emphasis that should prevail for different areas in the future. All are agreed on excellent teaching, which exists. But the same is not true regarding the relative emphasis to be given to scholarly activities and research on the one hand and diagnostic and patient care activities on the other. The Committee strongly urges that the current research strength be protected. To what extent this can be expanded, with present strictures on space and budget, remains to be determined. Regarding the relative emphasis given to diagnostic and patient care activities, it is not believed that this is resolvable by departmental faculty vote, since the societal needs for medical education and related medical care activities will to a large extent be a determinant factor. It is believed that the Department, without in any way detracting from its present strengths, must be responsive to these needs. The way in which these challenges are met will be determined as much by the total posture of the medical center in relation to medical care and community health problems as by the desires of the departmental faculty; for, if the University embarks on a broadened program, the need for pathologic services will have to be met. While the departmental executive faculty functions admirably as a community of scholars facing their common needs and defining goals, it may be asking too much of this organizational structure to resolve at a departmental level a problem that is but part of a broader University problem. Debate is essential, but polarization of the faculty on issues such as this should not be allowed to become a destructive force.

The Department has a base of great strength in research. In its senior faculty it has many scientists who are internationally recognized for their research accomplishments and are honored authorities in their fields. The junior faculty have not yet achieved the positions of eminence of their senior colleagues but show much promise of developing strength within this environment as creative and independent scientists. The faculty as a whole are skilled and devoted teachers and are gratefully recognized as such by their students. Since this Department has such strength in research and teaching, we are very optimistic about its future potential in all areas of diagnostic pathology, including clinical pathology. Further development of its capabilities in service areas of pathology should not be done in a way which diminishes its research and teaching capability but rather in a manner which strengthens and indeed expands research and teaching activities and potentials.

The anatomic diagnostic services were each directed by outstanding pathologists and in most instances were adequately staffed with excellent junior members. The quality of service provided, as well as the training given in anatomic pathology, is above reproach, except for space limitations noted below.

One of the major areas of concern to the Department and to the institution is that of clinical pathology or laboratory medicine. In this area, the difficulties that the Department of Pathology has in resolving its "polarization" dilemmas (research and scholarship versus service and patient care, basic science versus clinical science, "ivory tower" versus community involvement) become intensified. Members of clinical departments whom we interviewed were almost totally in agreement in their dissatisfaction with services provided by the clinical chemistry laboratory. This dissatisfaction seems to have more to do with administrative matters, such as reporting, planning communications, and responsiveness to queries and complaints, than it does with the quality or breadth of services. Though more satisfaction was expressed regarding clinical microbiology and the blood bank, seemingly the services of these sections, too, may require additional strengthening to make them more closely

responsive to the needs of the clinical services.

Members of the Department of Pathology deplored the administrative fragmentation of clinical laboratories. Especially deplorable in their view is the fact that the diagnostic laboratory area of hematology is administratively separate from the rest of clinical pathology. Many other small units exist, especially in the Department of Medicine, all of them providing services of some sort. Some of these are the thyroid function laboratory, endocrine laboratory, and renal disease laboratory. There are approximately twenty of these small units, each of which has been assembled around the research interest of a clinical investigator. Often a single procedure, such as a steroid analysis, is performed in more than one laboratory. This fragmentation, of course, weakens the service capabilities of clinical chemistry, is administratively cumbersome and inefficient, and increases medical costs. Furthermore, it weakens the training programs in Pathology, since these fragmented areas are not readily available for training purposes.

Pathologists in specialty training are more aware than ever of the need to obtain proper professional qualifications in their specialty area. This is true even at The University of Chicago, which has always taken as its primary mission the preparation of medical scientists and academicians. Today it is apparent that even in academic surroundings pathologists must deal with problems of patient care (the ivory tower versus community dilemma again).

In summary, then, clinical pathology is falling short in providing the services required at this modern, model teaching hospital. At the same time, the present organization of the clinical laboratories is less than ideal for the residency training needs of the school in clinical pathology. We believe these two problems can be resolved as one, since we feel certain that if the laboratories become a more lively and stimulating place for training, they will also be in a position to much better meet the service demands, especially in the area of communication.

The Department has thirty-three full-time faculty members. Only four of these are in clinical pathology, and one, the director, is moving to another institution. This immediately points up one of the problems since the faculty of many departments are, on a rough basis, more equally divided between anatomic (surgical, autopsy, cytologic) and clinical pathology.

A search is now in progress to obtain a laboratory director. An individual experienced in one area of clinical pathology (hopefully, in clinical chemistry, wherein lies the greatest need for growth and improvement) should be found and appointed. He should have full authority to organize all parts of clinical pathology in a manner consistent with the best level of service. He should have full authority over training of residents and the encouragement to develop programs of training in allied health fields, such as medical technology, clinical chemistry, and clinical microbiology. He should have the opportunity to recruit several additional faculty members in clinical pathology. The Committee was much impressed with the present faculty contingent in clinical pathology. The three remaining members are all highly competent, resourceful, and dedicated faculty members who hopefully will remain at The University of Chicago, continuing their good work.

The individual who heads this division should be a recognized scientist, able teacher, skillful organizer, and, importantly, should be able to understand clinical problems and communicate effectively with the chiefs of clinical services. In developing the clinical laboratories, the director should have enough autonomy so that he can accomplish the organizational and communicative requirements of his responsibility. We believe this autonomy can be attained in a division of clinical pathology within the Department of Pathology, if such a division were given a considerable amount of budgetary and administrative independence. The progression in due course of a strengthened division in the direction of an independent Department of Laboratory Medicine must be accepted as a natural one. The strengthening of the division at the present time within the framework of Pathology will allow it to derive considerable encouragement and strength from the parent department, particularly in developing a strong research base.

The fragmented areas of the clinical laboratories should be brought into the new autonomous division. The division needs these to fulfill its teaching and residency training missions. Furthermore, consolidation under enlightened new leadership will provide an improved service potential and more efficient and economical overall operation of these areas.

Space is a serious limitation not only in clinical pathology but also in the total service, research, and teaching activities of the Department. This realization came from our tour of the Department, from our inspection of actual space allocation figures, and from our conversations with graduate students, medical students, residents, and junior

faculty members. Graduate and medical students told us of elbow-to-elbow crowding in the faculty's research laboratories. More students would work in this Department, both in Ph.D. programs and on medical student research projects, if there were more room. There are approximately 18,500 square feet of research space assigned to thirty-two faculty members, for a total of about 500 square feet per individual—which is well below the 1000 square feet recommended by several authorities, organizations, and agencies. Several junior faculty members have no space of their own for their research and for prospective students. There has been very little increase in departmental research space since 1927, though the Hospital has more than doubled its beds and the Department has greatly increased in numbers of faculty and other personnel in the intervening years. We hope the planned remodeling of the sixth floor space (formerly used as animal quarters) can be accomplished soon. Furthermore, when new teaching laboratories are constructed according to present plans, the present teaching laboratories should be converted to research facilities. Obviously, development of a strong unified program in Laboratory Medicine will require additional commitment of space. Such space should not be obtained simply by reassignment from other areas of Pathology. A long-range plan envisioning new modern facilities for Pathology, including clinical pathology or laboratory medicine in a new separate building, is strongly urged.

QUANTRELL AWARDS

The Llewellyn John and Harriet Manchester Quantrell Awards for Excellence in Undergraduate Teaching were awarded at the 332nd Convocation on June 12, 1970.

EASLEY BLACKWOOD, *Professor of Music*

Easley Blackwood is a composer and a pianist to whom good teaching is a powerful professional obligation. Good teaching is essential to produce good musicians, and he attacks the problems of teaching with the same zeal that he brings to learning a new and difficult piece. Devotion to his art will not allow him to spare himself or his students; he gives himself fully in his time, in his energy, and in his concern for them, and he demands the best from them. His classes are dynamic, passionate, never easy. He has an astonishing mastery of his materials, which he uses always in a drive for precision—whether in performance, explanation, or criticism—for lucidity, for discipline. A course in elementary harmony taught by him, his students have said, becomes an exciting and profound study of music theory that can change their lives.

JOSEPH CROPSEY, *Associate Professor of Political Science*

Master of the precise phrase and the fully-articulated argument, Joseph Cropsey leads his crowded classes in political philosophy on the long and circuitous path stretching from opinion to knowledge. It is a difficult journey, but never a grim one, as the teacher (through speech and deed) instructs his students in how to be students, together with him, of the writings of the preeminent intellects of ancient and modern times. To this task Mr. Cropsey brings the exactness that comes from the training of an economist, the breadth that comes with careful scholarship in the school of the philosophers, and the wit that comes to one who has observed, long and well, humans in their polity.

STUART A. RICE, *the Louis Block Professor of Chemistry*

As an outstanding physical chemist, a world authority on the theory of the liquid state and on the behavior of electrons and energy in liquids and solids, Stuart Rice possesses an array of talents one might hope to find combined in half a dozen scientists selected to form the nucleus of a distinguished department of chemistry. He is equally gifted as a theoretician and as an experimentalist. He is as concerned with science and public policy as he is with pure research. He is the leader of a large and exciting research group while also writing a revolutionary textbook for basic chemistry.

In a demanding course in basic chemistry, he presents the subject with such clarity, and transmits so much of his own boundless zeal and enthusiasm, that students in their first year in the College are inspired to extend themselves and

develop a real understanding for the breadth and beauty of modern science.

LORNA P. STRAUS, *Assistant Professor of Anatomy*

A gifted teacher, Lorna Straus has amplified her considerable talents in the classroom by the devotion with which she has tended to the individual strengths and weaknesses of her students. She has given untiringly of herself to the many students requiring her help as Senior Adviser of the Biology Collegiate Division and to the even greater number of students in the College who have benefitted by her service as Assistant Dean of Undergraduate Students. A faithful colleague, she has expedited with imagination and good humor the labors of faculty committees concerned with problems of curriculum, governance, and educational facilities.

Her grateful students who have come to know her either in the general biology course required of all College students or in the mammalian anatomy course taken by Biology majors have attested to her skills in exposition, her enthusiasm for scholarship, and her sympathy and understanding of student needs and problems.

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