U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

PUBLIC HEALTH SERVICE

NATIONAL INSTITUTES OF HEALTH

SPECIAL RESEARCH RESOURCE ANNUAL REPORT

Grant Number RR 00311-04

ACME

August 1, 1969 to July 31, 1970

Joshua Lederberg, Ph.D., Principal Investigator

Stanford University School of Medicine

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

PUBLIC HEALTH SERVICE

NATIONAL INSTITUTES OF HEALTH

SPECIAL RESEARCH RESOURCE ANNUAL REPORT

Report Period: (same as current 12-month budget period)	Grant No.
From: August 1, 1969 To: July 31, 1970	RR 00311-04

Resource Title	Resource Address	Resource Tel. No.
Advanced Computer for MEdical Research (ACME)	Stanford University School of Medicine Palo Alto, California	(415) 321-1200 Ext. 6121
Principal Investigator Lederberg, Joshua	**Title** Professor	**Academic Dept.** Genetics
Grantee Institution Stanford University School of Medicine	**Type of Institution** Private University	**Investigator's Tel. No.** (415) 321-1200 Ext. 5801

Name of Institution's Special Research Resource Advisory Committee:
ACME Policy Committee

Membership of Special Research Resource Advisory Committee
(Indicate Chairman)

Name	Title	Department	Institution

see next page

Typed Name and Title of Principal Investigator Joshua Lederberg, Professor	Signature	Date
Typed Name and Title of Grantee Institution Official	Signature	Date

ACME POLICY COMMITTEE MEMBERSHIP

May, 1970

Name	Title	Department	Institution
* Paul Armer	Director	Stanford Computation Center	Stanford University
Malcolm Bagshaw,	M.D.	Radiology	Medical Center
Robert Baldwin,	Ph.D.	Biochemistry	Medical Center
J. Weldon Bellville	M.D.	Anesthesia	Medical Center
Walter Bodmer,	Ph.D.	Genetics	Medical Center
Byron William Brown, Jr.,	Ph.D.	Community and Preventive Medicine	Medical Center
Howard Cann,	M.D.	Pediatrics	Medical Center
* Edward Feigenbaum,	Ph.D.	Computer Science Department	Stanford University
Robert Glaser, M.D.	Dean	School of Medicine	Medical Center
Avram Goldstein	M.D.	Pharmacology	Medical Center
Donald Harrison	M.D.	Cardiology	Medical Center
L. Lee Hundley	Assistant Director	ACME Computer Facility	Stanford University
* Ronald Jamtgaard	Director	ACME Computer Facility	Stanford University
Courtney Jones	Deputy Director	Stanford University Hospital	Medical Center
Burt Kopell,	M.D.	Psychiatry	Medical Center
* Joshua Lederberg, Ph.D.	Principal Investigator	Genetics	Medical Center
* Elliott Levinthal	Ph.D.	Genetics	Medical Center
Lawrence Schneiderman,	M.D.	Medicine-Ambulatory	Medical Center
Bruce Stocker,	M.D.	Medicine-Microbiology	Medical Center
Howard Sussman,	M.D.	Pathology	Medical Center
Jobst Von der Groeben	M.D.	Anesthesia	Medical Center
Gio Wiederhold	Consultant to Director	ACME Computer Facility	Stanford University

Management: Robert Langle, Computation Center Business Manager

William Yundt, Computation Center Associate Director for

Business and Finance

* Reviewed report

TABLE OF CONTENTS

Special Research Resource

Annual Report

General Description of Resource Operation

Introduction: In its fourth year of existence, the ACME Project offered

the time-sharing and real-time data-acquisition services developed during the

first three years and sought to improve its level of service and reliability.

The most significant change during the past year has been the full implementa-

tion of "user fees." The fee for service concept was started in March, 1969,

but only recently have nearly all users become "eligible" for accepting charges

due to grant restrictions imposed by the National Institutes of Health.

A brief summary of the years events follows: July, 1969, was a record month

for terminal hours yielding 4,400 hours of terminal connect time. In August,

N.I.H. awarded a new grant covering ACME. During the fall of 1969, utilization

dropped markedly as the full impact of user charges became evident. Many new

contract and grant awards from Federal agencies provided fewer dollars than had

been hoped for and anticipated. January, 1970, marked the installation of an

additional 64,000 bytes of high-speed core on the 360/50. The effect of the

high-speed core addition was to cut compilation time in half. This also reduced

the effective page minute or core residency charges by providing users with more

efficient computing. In recent months the system appears to be achieving a new

equilibrium described in more detail below in the section on utilization. In

June, additional core for the 1800 will be ordered as will some additional CRT's.

Throughout the year, the staff emphasized tasks which would improve hardware and

software reliability.

Organizationally, two changes occurred in the past year. A new subcommittee

to the ACME Policy Committee was established to serve as a short and long-range

plan review group. This subcommittee consists of Dr. Elliot Levinthal, Dr. Edward

Feigenbaum, and Mr. Gio Wiederhold.   In May, 1970, Mr. Ron Jamtgaard was appointed

Director of the ACME Facility.

In late May, the staff of ACME began an evaluation of various methods of

providing desired expansions to standard services.   A key question involved

is the basic approach of adding one medium-sized satellite processor to handle

a variety of functions versus multiple mini-computing systems each handling one

or two functions.   The study was extended into June, thereby missing the dead-

line for this report.   Some of the incremental services being considered are:

multiple processor access to 2314 disk files; expansion of available 2741 ports;

back-up or redundant capacity for recording data from real-time data-acquisi-

tion users; various fail-safe devices for terminal users; and allowance of

considerable expansion room in the field of graphics in terms of central hardware.

This Annual Report covers the period August 1, 1969 through May 31, 1970,

plus estimated operating results for the period through July 31, 1970.   ACME

was created in July, 1966, under a three-year grant from National Institutes

of Health, Special Research Resources Branch.   The initial goal was to provide

a time-shared computer facility and real-time, data-acquisition system for

research groups within the Stanford Medical Center.   A second three year grant

was approved by NIH in August, 1969.   The primary goal of the second three-

year grant has been improvement of reliability of both hardware and software.

The facility is administered by the Stanford Computation Center under the direc-

tion of Paul Armer.

The ACME System achieved the initial goal with considerable success.   There

are over 200 projects presently on the system operating from some 50 terminals

in the Medical Center.   In addition, there are twenty-one (21) laboratories

connected to ACME for real-time data-acquisition and process control.

ACME's hardware consists of an IBM 360/50 with a 2-million byte extended core storage, plus an IBM 1800 processing unit used for data-acquisition and control of graphics devices. The language used is a subset of PL/1 which was chosen for its power and ease of learning.

For more details on tasks accomplished during the past year and new "core research" tasks started, refer to <u>Description of Core Research Activities</u> on page 9.

SOME GOALS AND ACCOMPLISHMENTS OF PAST YEAR:

SOFTWARE RELIABILITY: In the grant proposal one year ago, it was noted that software failures stem mainly from interface problems between IBM's Operating System and the ACME system, error recovery procedures within OS, unanticipated user demands, etc. Failure rates were shown to be dependent on the rate of change of the software system. At that time, approximately one-third of the total system failures were caused by software. One plan for the new grant period was to reduce the number of modifications to the system by taking advantage of the existing structure to meet new requirements. In practice, this intent has been only partially satisfied. New software has been added to the system using the basic structure (a command "Show Undefined", graphics control software for "add on" graphics units to be used in conjunction with 2741 typewriter terminals; etc....) However, some changes have called for modifications to the basic structure: software for the link between Campus Facility 360/67 and the ACME system, and a new communications software package for the 1800. The goal was to improve the system to a point where software would be responsible for system failure no more often than once every two to three weeks. Despite much effort on this activity over the past nine months, software accounted for 10 failures between mid-April and mid-May. The effort will continue.

HARDWARE RELIABILITY: The proposal cited three specific hardware boxes which had caused an inordinate number of system failures -- 2702 transmission control unit, 7720 adapter for the 1800, and the 270X-Y high speed data transmission units. The problems involving the 2702 device appear to have been solved. This unit has failed only three times in the past year and has operated without failure for the past nine months. The 7720 adapter for the 1800 continued to provide some problems until a software solution was implemented. In addition, a number of recent crashes of the 1800 system have been traced to the input/ output hardware. The cause of the problem remains unidentified. A number of IBM service personnel have been assigned to this task with no success to date.

The 270X high speed data transmission unit has proven totally unsatisfactory. The unit was provided on an experimental basis by IBM, and was purchased jointly by Dr. Djerassi's Chemistry Laboratory, Dr. Levinthal's Instrumentation Research Laboratory, and ACME. In recent negotiations, IBM offered to buy back the 270X and four 270Y's. In the near term ACME hopes to replace the 270X with a satellite computer system. The exact configuration of the satellite system is dependent upon further study by ACME and the Chemistry Laboratory. The issue should be resolved prior to the end of July, 1970.

During the past year ACME has monitored preventive maintenance work performed by the manufacturer's Customer Engineer more closely. This step has proven effective in isolating hardware from software problems and has helped to keep hardware at a proper operational level.

A failure control program has been initiated. The system has been modified so that many flaws which formerly caused the entire system to crash are now trapped and allowed to impact only one user. ACME has taken over operation of the machine hardware error interrupt operation.

REAL-TIME DATA ACQUISITION: The proposal called for two significant changes on the 1800. First, more core storage was to be added in order to increase the 1800 capacity from 16 simultaneous lines to about 48 effective lines. Secondly, software multiplexing was to provide an increase from 12 actual simultaneous lines to approximately 24 effective lines. So far 12 actual lines have been increased to 16 lines. However, the additional core is to be ordered in June, 1970 and this acquisition will permit the changes to be made. At the present time, all core on the 1800 is full; a recent system change could not be implemented immediately due to a shortage of only 8 words of memory. It is packed tight.

SERVICE: ACME provides services for a wide variety of applications. The system design is such that almost any user requirement can be met within the existing framework. The uses of ACME fall into a number of discrete categories, although a given user may have several projects which fall into different categories.

Real-time data collection and analysis is a major category which may be subdivided by data source and type of analysis. Sources which may be identified are: direct input from instruments with a wide range of data acquisition rates - such as mass spectrometers, blood analyzers gas chromatographs and related instruments; direct input from subjects (human and animal) such as EEG, EKG, catheterization pressures, respirator functions and other physiological parameters; and immediate terminal input of experimental data. The types of analyses on these data are quite varied. They include auto-correlations, cross-correlations, Fourier analysis, peak location and classification programs, area determinations, and many others.

Mathematical modeling and computation is another category in which there is considerable activity. Projects include neutron diffraction studies, molecular modeling, respiratory function models, heart electrical activity models, and other similar studies.

In the category of data storage, retrieval and manipulation are projects in human and animal genetics, psychological test data, a stroke registry, a drug interaction study, and clinical laboratory data collection and dissemination. It is expected that projects involving patient care will increase dramatically in the near future.

DESCRIPTION OF CORE RESEARCH ACTIVITIES

The following paragraphs describe projects which are potentially useful to several biomedical investigators. The identification of the need for research in a particular computer application may originate with a single user; but the ACME staff is aware of the possibilities of wider utilization. The staff is, of course, at all times also concerned with improving the efficiency of the system for the benefit of all users.

1. The STRUCTURE feature of the PL/1 language has been implemented on ACME for data files. This feature allows the writing of mixed variable types into a single file record such as a character string for a label and an array of numeric data. Such record structures are frequently required for patient record files and until now had to be simulated using characters only for record formats.

2. CSMP: The implementation of the Continuous Systems Modeling Program is well underway. The ability to develop significant models of physiological process-es is of major importance to predictive analysis of drug and other treatment methods. We expect that a machine of the speed of ACME will not allow very extensive simulation of physiological models, and that developed models will be shipped over a link to the Campus Facility 360/67 for processing; but having interactive capability during the model development process is essential for the design and debugging of non-trivial processes without assistance of computer specialists.

3.   Link: The hardware link between the ACME and Campus Facility systems is complete and data has been transmitted experimentally over the link. At present, user-oriented software is being written and a system to translate ACME to OS files and the reverse is being coded.

4.   Variable Length Files: A file system modification to allow records of any size to be written is being developed. At present, individual records are restricted to a maximum of 1984 characters per record. A by-product of this modification will be the ability to handle a larger variety of storage devices and as such a lessening of single vendor dependence

5.   Small Machine Support: Improved support for small machine users is becoming a major research effort. A small machine assembler has been written on ACME which will generate codes for the PDP-8, PDP-12, LINK, LINK-8, or 1800. It will be expanded to include other small machines as the need arises. The assembler is conversational and offers powerful editing features. It is in check-out phase at present and will soon provide software development for several small machines currently in the laboratories of medical investigators.

6.   1800 Disk Spooling: The 1800 data collection system has been expanded to include a facility for spooling data to the 1800 disk and retrieving it after collection. This feature operates in a way which makes it independent of the 360/50 status and is therefore suitable for data collection on long experiments (such as sleep experiments and long scintillation counter runs) when the main system might be down or is being used for the nightly file maintenance procedures. This continuous data collection task was identified in the proposal as a requirement.

7.   1800/360 Communications: The 1800/360 communication software has been rewritten to provide greater speed and more sophisticated error recovery techniques. As far as we know, we have been able to overcome (by programming) IBM's design deficiencies in its 1800/360 direct link and we are among the few, if not the only installation, using this facility intensively. Double precision

has been implemented for all arithmetic functions. These routines have been thoroughly checked and rewritten where required for speed and accuracy.

8.   Graphics: The proposal called for adding central hardware to accomodate up to 16 CRT's. It was also assumed that a second interactive graphics unit would be needed (see addendum to original proposal). In view of the high cost associated with the second interactive graphics unit, the limited budget, and the general interest demonstrated in CRT's, the plan was changed. Instead of providing central hardware for 16 units, ACME has placed orders for "add on" type displays which will be available for users to mount in their laboratories and offices. The units (including CRT and hardware interface) will cost slightly less than $5,000 each. From three to six units should be available by late July or early August, 1970.

9.   Heuristic Problem Solving: In May, ACME started a new research effort by adding one senior staff member with considerable experience in LISP. The LISP language typically requires extensive amounts of core which ACME can provide. By mid-summer, a batch version of LISP will be mounted during the overnight service blocks on ACME. By late summer, an interpretive version of LISP will be made available to ACME terminal users. The significance of this addition can best be demonstrated in terms of a research project called DENDRAL involving Drs. Joshua Lederberg and Edward Feigenbaum. The name "Dendral" was given an algorithm developed by Lederberg which is capable of generating all of the topologically possible isomers of a chemical formula. Heuristic DENDRAL will perform the following two classes of tasks: (1) Given the mass spectrum of an organic molecular sample and the chemical formula of the molecule, the program will produce a short list of the molecular "graphs" as hypotheses to explain the given data in the light of the program's models of mass spectrometric processes and stability of organic molecules. The list is rank-ordered from the most satisfactory explanation to the least satisfactory; and (2) If no mass spectrum

is given, but only a formula, the program will produce a list of all the chemically plausible isomers of the molecule in the light of its model of chemical stability of organic molecules. According to Feigenbaum, "The flow diagram of the system is a closed loop consisting of phases of data inspection, hypothesis generation, prediction, and test, corresponding closely to a simple 'scientific method' loop." It is assumed that the results of DENDRAL operated on the ACME system will lead others in the Medical School to investigate heuristic problem solving techniques using computing.

10. File System Improvements: File system changes have been made to increase ease of data manipulation. Increased utilization of the facility for data storage and retrieval is anticipated, particularly by those involved in direct patient care. The reliability record of the ACME file system gives cause for considerable pride. Only two user data blocks have been lost in the entire history of ACME.

TRAINING:

ACME continues to offer informal courses in the use of the system to both beginning and advanced users. The beginning course is given an average of twice monthly and the advanced class once a month. Class size is usually about ten students. Each course consists of three one and one-half hour sessions. All ACME programming personnel spend a portion of their time consulting with users. In addition, three full-time and one part-time staff members are completely involved with consulting for users.

A formal course in biomedical computing is now being offered to medical students by the Genetics Department, using ACME as their primary computing system.

PLANS AND OBJECTIVES:

During FY 1971 and FY 1972 efforts will continue in the area of realiability. Soft-

ware reliability will improve as the basic system becomes increasingly stable. Major work on hardware error recovery is indicated by the failure statistics. As most hardware errors are transient in nature, and quite often only impact a single user, it is obvious that considerable improvement can be made.

The 270X and four 270Y's will be replaced as soon as possible.

The 1800 core will be expanded by late summer. Increased usage is causing some users to delay their experimental procedures while waiting for available ports to the 1800. The storage scope displays are being supported on the 1800 in line with ACME policy to support all non-standard devices on the 1800 or satellite system in order to insulate operation of the 360/50 from real time users as much as possible. The 1800 is almost immune to external device failure and therefore system reliability is enhanced. Small machine support will be a major effort. In addition to the assembler, a method allowing the use of the PL/ACME language and its compiler to compile code for small machines is being investigated. New methods of allowing the small machines access to ACME are under consideration. It is felt that the support of small machines is an area that requires considerable research and cooperation to provide a true symbiotic relationship.

The support of a version of the General Purpose Simulation System language (GPSS) is under consideration. The language (GPSS) is designed for operations research-type problems and would be very applicable to patient scheduling, clinical laboratory systems, and similar activity modeling.

The plans for LISP have been described above. Hopefully, another team within the Medical Center will be found with strong interest in problems which LISP can readily support.

ACME will continue to expand its direct user support activities of teaching

13

and consulting. More sections of the Medical Center Will be introduced to ACME and its capabilities. The direct patient care areas appear to be the most likely candidates for near-term seminars and lectures on computing in general, and on ACME. The data acquisition and control users of ACME are well established and can be expected to grow, requiring from ACME a continued level of engineering and consulting support.

UTILIZATION DATA:

On March 26, 1970 a rate change was announced to users. The change was made retroactive to February 16. A summary of utilization data for the period August, 1969 through May, 1970, is presented below.

Total Utilization from August 1969 - May 1970

Month	Page Minutes	Blocks
August 1969	2,605,374	135,632
September	2,633,017	124,443
October	1,773,297	116,272
November	1,576,599	114,130
December	2,002,034	112,806
January 1970	1,637,933	112,122
February	1,875,170	107,812
March	2,604,178	115,308
April	2,356,168	108,059
May	2,546,881	106,660

Note that the above figures include utilization by ACME staff which normally accounts for 10% to 14% of total usage of page minutes. A "page minute" is defined as the holding of one page or 4,000 bytes in core for one minute. The general downward trend in use of page minutes from August through January is

attributed to the inception of user charges, reduced availability of grant funding from Federal sources, and addition of high speed core on the Model 360/50. Charging for ACME service was initiated in March, 1969; however, most users' grants were not eligible to receive charges until later in the year. Various parts of the ACME/PL system were moved from 8 microseconds bulk core to the incremental high speed core added in January, 1970. The effect of this shift is to speed up compiling, thereby resulting in fewer page minutes being charged to the user.

Note that the August, 1969 level of 2.6 million page minutes was nearly attained in May, 1970 despite the effect of charging for services. Also note that 2.54 million page minutes in May reflects more computing than 2.6 pageminutes last August due to the addition of high speed core to the 360/50.

The number of terminal hours (2741 connected hours) dropped sharply from a peak over 4400 hours in July, 1969, to about 2400 hours in December. The effect was desired and predicted. By adding charges for system use, a system of allocating scarce resources was implemented. Presumably, users make more efficient use of terminal connect time. Since that time, about 50% of the drop has been recouped. The past four months have been roughly equal in terms of terminal hours.

ACME file utilization has remained essentially constant over the past six months at about 70% of capacity. The present capacity is approximately 400 million bytes or two IBM 2314 Direct Access Storage Devices. In August, 1969, disk usage hit a high of 86% of capacity. The reduction appears to be due to the change to "fee for service" and to better knowledge on the part of users about efficient file handling.

RATES FOR USER SERVICE CHARGES:

In addition to renting their terminals, ACME users are charged for two elements of service -- page minutes and disk storage. Page minutes are charged at

varying rates based upon a User's classification. For example, a lower rate is charged to real-time data collection users involved in medical research than is charged to non-medical or practicing clinical users. Some users are totally supported by the Facility Grant; such users include medical students and research users whose grants from NIH are ineligible to pay for computing.

After nearly one year of charging user fees, a rate reduction seemed to be indicated. The revenue goals of the facility could be met despite a rate reduction. At the same time the funding of many medical research projects was reduced placing computing requirements in competition with other needs within limited budgets. The rate change included the addition of a constant "add on" of two and one-half pages to each program regardless of the program size. The intent of this added charge was to increase the cost of tying up a terminal port for a protracted time while using very few page minutes for computing. Limited port capacity into the 360/50 (31 ports) coupled with certain user behavior led to the adoption of this new rate.

In January, 1970 the 360/50 was upgraded by the addition of 64,000 bytes (characters) of high-speed core memory. This resulted in an increase in system speed of almost 50 percent. This was the only major modification during the year to date. During the balance of the year, additional core for the 1800 will be ordered as well as additional "add on" graphics CRT's.

The table on the next page compares the two rate schedules in effect during the period covered by this report.

User Categories	3/21/69 - 4/15/70 Rate Per Page Minute	4/16/70
Biomedical Research Service- RealTime	1¢	1/2¢
Biomedical Research Service- Routine Terminals	2¢	1¢
Biomedical Research Service- Outside Stanford	3¢	2¢
Stanford Medical School and Hospital Administration	1 1/2 ¢	1 1/4¢
Stanford, non-medical school	3¢	2 1/2¢
Pilot projects and projects anticipating funding	No Charge*	No Charge*
Student education, Medical School	No Charge	No Charge
ACME staff	No Charge	No Charge

Storage Block per Month

All Chargeable users	10¢
Medical School students; pilot project or funding anticipated; ACME staff	No Charge

Connect Time charge

All Chargeable users	2 1/2 page minutes X r(rate) X t(time)
Medical School students, pilot project or funding anticipated; ACME staff	No Charge

* subject to approval of Subcommittee (of Policy Committee) on user charges.

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT		Current Annual Amt.	User Cate- gory	COMPUTER EQUIPMENT		
			Identification Number	Agency			General Description	Pageminutes(K)	Block Storage(K)
						7	ACME staff	at .1 cent per pageminute (full credit)	at .10 cents per block (full credit)
Allen, L.	Computation Center	System tests.	*RR00311	NIH		7		2	40
Bassett, R.	ACME	User consultation.	*RR00311	NIH		7		369,973	5,290
Beebe, R.	Computation Center	System demonstrations.	*RR00311	NIH		7		1	104
Berns, R.	Computation Center	System demonstrations.	*RR00311	NIH		7		1	172
Breitbard, G.	ACME	System development and testing.	*RR00311	NIH		7		33,389	721
C.E., IBM	ACME	Terminal testing.	*RR00311	NIH		7		20,627	228
Class, C.	ACME	Daily operations equipment inventory; system testing and demonstration.	*RR00311	NIH		7		1,084,070	2,037
Cower, R.	ACME	Daily operations.	*RR00311	NIH		7		4,261	17
Crouse, L.	ACME	Development of real-time medical procedures.	*RR00311	NIH		7		92,423	28,777
Cummins, D.	ACME	Communication systems development.	*RR00311	NIH		7		23,018	547
De la Roca, D.	ACME	Assembler development.	*RR00311	NIH		7		61,234	1,906
Emerson, D.	ACME	File system development.	*RR00311	NIH		7		285	45
Feigenbaum, E.	Computation Center	System demonstrations.	*RR00311	NIH		7		4,626	119
Feigenbaum, E.	Computation Center	System demonstrations.	*RR00311	NIH		7		0	24
Frey, R.	ACME	File system testing; consulting programs.	*RR00311	NIH		7		51,240	2,337
Girardi, S.	ACME	File testing.	*RR00311	NIH		7		86,581	4,111
Godwin, J.	ACME	Student instruction: how to use ACME.	*RR00311	NIH		7		1,449	81
Granieri, C.	ACME	System development and testing.	*RR00311	NIH		7		15,693	1,280
Granieri, C.	ACME	System development and testing.	*RR00311	NIH		7		40,625	1,810
Gray, R.	ACME	Daily operations.	*RR00311	NIH		7		2	20
Hattendorf, V.	ACME	Text editing.	*RR00311	NIH		7		78	132
Hundley, L.	ACME	Real-time data acquisition.	*RR00311	NIH		7		70,430	3,554
Kelley, E.	ACME	Daily operations.	*RR00311	NIH		7		425,375	1,599
Known, U.N. (Miscellaneous Users)	ACME	Minor student desk calculator services; no file storage.	*RR00311	NIH		7		1,587,015	46
Lederberg, J.	Genetics	System tests.	*RR00311	NIH		7		1	280
Lederberg, J.	Genetics	Test editing.	*RR00311	NIH		7		40,635	6,927
Lederberg, J.	Genetics	Program development.	*RR00311	NIH		7		83,229	12,335
Liere, R.	ACME	Library programs.	*RR00311	NIH		7		232,873	6,307
Liere, R.	ACME	Statistical programs.	*RR00311	NIH		7		2,264	1,018

* Grant supporting more than one user.

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT Identification Number	Agency	Current Annual Amt.	User Category	COMPUTER EQUIPMENT General Description	Pageminutes(K)	Block Storage(K)
						7	ACME staff	at .1 cent per pageminute (full credit)	at .10 cents per block (full credit)
Matous, J.	ACME	Daily operations.	*RR00311	NIH		7		1,221	346
Miller, J.	ACME	Assembler development.	*RR00311	NIH		7		644	381
Miller, J.	ACME	File development.	*RR00311	NIH		7		477	1,690
Miller, S.	ACME	System development.	*RR00311	NIH		7		22,865	498
Montgomery, R.	Computation Center	Text editing.	*RR00311	NIH		7		0	6
Morris, M.	Genetics	Departmental service routines.	*RR00311	NIH		7		49,064	8,029
Osborne, D.	ACME	System tests.	*RR00311	NIH		7		18,485	388
Osterby, O.	ACME	System development.	*RR00311	NIH		7		6,753	69
Plasch, G.	ACME	Text editing.	*RR00311	NIH		7		21,505	2,617
Public, J.Q.	ACME	Development and storage of PUBLIC files.	*RR00311	NIH		7		50,563	6,429
Rieman, J.	ACME	Daily operations.	*RR00311	NIH		7		4,708	218
Salisbury, J.	ACME	System development.	*RR00311	NIH		7		23,969	1,366
Sanders, G.	ACME	User consultation.	*RR00311	NIH		7		11,603	1,251
Sanders, W.	ACME	Hardware and software development.	*RR00311	NIH		7		13,219	2,698
Sandoval, C.	ACME	Daily operations.	*RR00311	NIH		7		12,736	21
Schlumberger, M.	ACME	System development.	*RR00311	NIH		7		0	1
Smith, P.	ACME	System tests by IBM system engineer.	*RR00311	NIH		7		11,527	738
Sutter, J.	ACME	Daily operations.	*RR00311	NIH		7		140,088	419
User, A.	ACME	Programming aid for users.	*RR00311	NIH		7		4,403	41
Van Tassel, J.	ACME	Daily operations.	*RR00311	NIH		7		157,309	357
Whitner, J.	ACME	Statistical program development.	*RR00311	NIH		7		66,819	184
Wiederhold, G.	ACME	Developing continuing system modeling program.	*RR00311	NIH		7		2,041	3,987
Wiederhold, G.	ACME	Demonstrations for visitors to ACME.	*RR00311	NIH		7		22,205	1,786
Wiederhold, C.	ACME	System testing to make sure it meets old and new specifications.	*RR00311	NIH		7		59,188	3,934
Wiederhold, G.	ACME	Usage statistics, accounting, and yearly reports.	*RR00311	NIH		7		56,162	9,374
Wiederhold, V.	ACME	Editing the PL/ACME manual.	*RR00311	NIH		7		11,981	962
Wilson, D.	ACME	Development of real-time medical procedures.	*RR00311	NIH		7		0	5
							TOTAL	5,100,935	129,659

* Grant supporting more than one user.

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT			User Cate-gory	COMPUTER EQUIPMENT		
			Identification Number	Agency	Current Annual Amt.		General Description	Pageminutes(K)	Block Storage(K)
						1	Biomedical research service - real time	at .01/2 cent per pageminute	at .10 cents per block
Anderson, D.	Genetics	Instrumentation and control of mass spectrometer.	*NSG8160	NASA	$459,717.50	1		39,653	843
Bacon, V.	Genetics	Operating quadrupole mass spectrometer.	*NSG8160	NASA	459,717.50	1		973,571	28,457
Bridges, J.	Genetics	Control of quadrupole mass spectrometer.	*NSG8160	NASA	459,717.50	1		12,680	244
DeGrazia, J.	Nuclear Medicine	Evaluation of rate of metabolism of specific biochemical pathways in human disease.	RG69	National Academy of Science	1,573.73	1		14,568	561
Hanawalt, P.	Biological Sciences	Use of radioisotope tracers in studies of molecular biology of cell growth and repair of damage to genetic material.	GM09901	NIH	82,976.19	1		77,278	820
Harrison, D.	Cardiology	On-line cardiac catheterization data analysis; recognizing abnormal EKG complexes.	HE09058	NIH	37,236.10	1		150,531	6,807
Jones, R.	Biochemistry	On-line kinetic measurement of fluorescence as a function of time-data acquisition and data reduction.	*NGR05020	NASA	54,783.20	1		10,274	12,773
Kennedy, D.	Biological Sciences	Analysis of neurophysiological data.	NB02944	NIH	35,648.25	1		0	6
Lederberg, J.	Genetics	Automation, operation, and service on the Finnigan 1015 mass spectrometer.	*NSG8160	NASA	459,717.50	1		0	6
Lederberg, J.	Genetics	Program instruction; work area for programming and instrumentation use practice.	*NSG8160	NASA	459,717.50	1		4,727	121
Liebes, S.	Genetics	Relationship of mass spectroscopy to organic materials.	*NSG8160	NASA	459,717.50	1		2,881	5,610
Reynolds, W.	Genetics	Automation in mass spectrometer instrumentation systems.	*NSG8160	NASA	459,717.50	1		99,044	11,675
Stryer, L.	Biochemistry	Electronic energy transfer; structure of macromolecules; protein structure and function.	*NGR05020	NASA	54,783.20	1		181	376
Tucker, R.	Genetics	Computer system to control mass spectrometer - GLC apparatus; data analysis.	*NSG8160	NASA	459,717.50	1		109,225	7,920
Wilson, D.	Biological Sciences	Analysis of neurophysiological data.	NB07631	NIH	61,364.44	1		768	982
Yguerabide, J.	Biochemistry	Electronic energy transfer; structure of macromolecules; protein structure and function.	*NGR05020	NASA	54,783.20	1		30	37
Zwick, M.	Biochemistry	Theoretical techniques for solving protein crystal structures.	*NGR05020	NASA	54,783.20	1		1	152
							SUB-TOTAL	1,495,412	77,390

* Grant supporting more than one individual user.

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT			User Category	COMPUTER EQUIPMENT		
			Identification Number	Agency	Current Annual Amt.		General Description	Pageminutes(K)	Block Storage(K)
						2	Biomedical research service - routine terminals	at .1 cent per pageminute	at .10 cents per block
Atkinson, M.	Stanford Medical School - Admissions Committee	Assist Admissions Committee in selecting new Medical School classes.	None	University Funds	University Operating Account	2		6,677	368
Bagshaw, M.	Radiology	Radiation dosimetry.	None	American College of Radiology	$ 9,499.52	2		3	48
Bergstresser, P.	Dermatology	Computing blood flow in fingers and toes.	None	University Funds	University Operating Account	2		228	020
Brown, B.	Community & Preventive Medicine	Computations done in support of a multitude of public health research projects.	None	University Funds	University Operating Account	2		51,311	1,682
Brown, B.	Community & Preventive Medicine	Development of new biostatistical techniques.	None	University Funds	University Operating Account	2		23,099	302
Brown, B.	Community & Preventive Medicine	Conduct various statistical computations in support of research in the Department of Anesthesia.	GM12527	NIH	243,415.35	2		8,899	80
Crowley, L.	Surgery	Study of results of antibiotic agents instilled into wound at time of surgery to reduce infection rate of general surgery patients.	None	Bristol Laboratories	10,000.00	2		5,072	164
Durbridge, T.	Pathology	Compute research statistics.	None	University Funds	University Operating Account	2		363	83
Enlander, D.	Pathology	Statistical analysis of the data generated in the clinical lab.	None	University Funds	University Operating Account	2		47,070	174
Fletcher, G.	Anesthesia	Statistical analysis of laboratory results from in-vivo and in-vitro studies of uptake, metabolism, and elimination of sedative drugs.	*None	Hartford Foundation	154,715.98	2		2,676	2
Forrest, W.	Anesthesia	Develop quality and quantity control system for large masses of clinical data.	None	University Funds	University Operating Account	2		1,442,030	31,179
Forrest, W.	Anesthesia	Develop quality and quantity control system for large masses of clinical data.	None	University Funds	University Operating Account	2		958	26,724
Grindle, J.	Community & Preventive Medicine	Correlate data of newborn infants with respiratory distress syndrome treated with oxygen and mechanical ventilation.	None	Council for Tabacco Research	18,633.09	2		0	4
Hilf, F.	Psychiatry	Differentiating paranoid from non-paranoid patients.	MH10976	NIH	160,407.26	2		3,079	3,370
Hogness, D.	Biochemistry	Recognize chromosome fragments in Drosophila.	AM07535	NIH	59,605.94	2		1,412	3
Huberman, J.	Biochemistry	Reducing data from equilibrium dialysis.	*GM07581	NIH	218,562.12	2		13,001	509
Kohen-Raz, R.	Pediatrics	Diagnosis and treatment of statis balance impairment in educationally handicapped school children.	OEG0701263	U. S. Office of Education	65,044.00	2		42,352	1,727
Koran, L.	Psychiatry	Relationship of student test scores to other variables.	None	University Funds	University Operating Account	2		0	24

* Grant supporting more than one individual user.

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT			User Category	COMPUTER EQUIPMENT		
			Identification Number	Agency	Current Annual Amt.		General Description	Pageminutes(K)	Block Storage(K)
						2	Biomedical research service - routine terminals	at .1 cent per pageminute	at .10 cents per block
Kountz, S.	University of California - San Francisco - Surgery	Select recipients for renal homotransplantation; measure hemodynamic changes in transplant patients.	AM11290	NIH	$199,088.00	2		231,172	2,588
Kraemer, H.	Psychiatry	Biostatistical analysis of various psychological data.	None	University Funds	University Operating Account	2		37,963	1,398
Lederberg, J.	Genetics	Generate chemical structures on Sanders 720 display unit.	*NSG8160	NASA	459,717.50	2		84	1,427
Levinthal, E.	Genetics	Photointerpretation and enhancement.	*NSG8160	NASA	459,717.50	2		0	60
Lieberman, M.	Psychiatry	Measurement of the efficacy of "small groups" in education.	None	University Funds	University Operating Account	2		0	8
Liebes, S.	Genetics	Design aspects of imagery system to be landed on surface of Mars in course of Viking 1973 Lander Mission.	*NSG8160	NASA	459,717.50	2		0	5
Liebes, S.	Genetics	Investigating means of data processing for interpretation of photographic data from the Mariner Mars 1971 Orbiter program.	*NSG8160	NASA	459,717.50	2		0	8
Lorenson, M.	Pharmacology	Molecular mechanisms that control sheep-heart enzyme and carbohydrate metabolism.	AIO4214	NIH	27,318.16	2		12,597	162
Luzzatti, L.	Pediatrics	Study family with chromosomal mosaicism in three generations.	CRCS40	National Foundation	68,190.68	2		54,997	2,226
Maffly, R.	Medicine - Lipid Research	Relationship of metabolism to sodium transport.	67627	American Heart Association	15,680.99	2		15,035	268
Maffly, R.	Medicine - Lipid Research	Study disorders of serum sodium concentration and serum urea nitrogen concentration.	None	University Funds	University Operating Budget	2		47,476	774
Miller, R.	Community & Preventive Medicine	Strabismus statistical evaluation.	RR00241	NIH	207,106.00	2		300	36
Nall, M.	Dermatology	Etiology of chronic skin disease.	None	Psoriasis Research Foundation	3,154.46	2		70,442	9,297
Nall, M.	Dermatology	Effect of electron beam on mycosis fungoides.	None	Presbyterian Medical Center, San Francisco	100.00	2		0	785
Nye, W.	Medicine - Microbiology	Immunochemistry statistical calculations and bibliography compilations.	*AIO8211	NIH	127,454.83	2		30,584	649
Petralli, J.	Medicine - Infectious Diseases	Improvement of antibiotic sensitivity data and guidance in therapy.	None	University Funds	University Operating Account	2		381,813	30,044
Reynolds, W.	Genetics	Text management to support engineering instrumentation.	*NSG8160	NASA	459,717.50	2		1,552	3,131

* Grant supporting more than one individual user.

22

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OF CONTRACT SUPPORT			User Cate-gory	COMPUTER EQUIPMENT		
			Identification Number	Agency	Current Annual Amt.		General Description	Pageminutes(K)	Block Storage(K)
						2	Biomedical research service - routine terminals	at .1 cent per pageminute	at .10 cents per block
Rosenberg, L.	Medicine - Micro-biology	Levels of serum complement in mice of diverse pedigree.	*AI08211	NIH	$127,454.83	2		8,795	1,216
Schneiderman, L.	Medicine - Ambula-tory	Clinical research data indexing.	None	University Funds	University Operating Account	2		177,070	11,250
Sforza, L.	Genetics	Simulation of population genetics studies.	GB7785	NSF	51,528.00	2		61,065	1,962
Smallwood, R.	Medical Facilities Planning	Design of Stanford Medical Care Facilities.	None	University Funds	University Operating Account	2		168,560	14,405
Smith, P.	Anesthesia	Mechanical ventilation influences in newborns having respiratory failure.	*None	Hartford Foundation	154,715.98	2		0	192
Solomon, G.	Psychiatry	Relationship of stress and environmental man-ipulation to immunity.	None	Research Foundation	4,893.54	2		0	228
Stuedeman, D.	Genetics	Capital equipment inventory.	*NSG8160	NASA	459,717.50	2		2,154	2,314
Weissman, I.	Pathology	Statistical analysis and data handling.	AI09072	NIH	12,792.03	2		21,428	358
Whitcher, C.	Anesthesia	Establishing anesthesia staff call schedule.	None	University Funds	University Operating Account	2		14,222	644
Zackheim, H.	Dermatology	Determination of serum copper and cerulo-plasmin levels in psoriasis patients.	None	Hartford Foundation	86,585.73	2		3,501	172
							SUB-TOTAL	2,991,740	152,070
						3	Non-Stanford, medical	at .2 cents per pageminute	at .10 cents per block
Clemes, H.	Mental Research Institute			U. S. Medi-cal Research and Devel-opment Com-mand		3		32,708	2,265
Daughters, G.	Palo Alto Medical Research Foundation			Foundation Funds		3		19,008	615
Daughters, G.	Palo Alto Medical Research Foundation			Foundation Funds		3		28,964	1,622
Daughters, G.	Palo Alto Medical Research Foundation			Foundation Funds		3		18,740	812
Daughters, G.	Palo Alto Medical Research Foundation			Foundation Funds .		3		4,806	181
Ingels, N.	Palo Alto Medical Research Foundation			Foundation Funds		3		52,828	1,563
Stewart, L.	Palo Alto Medical Research Foundation			Foundation Funds		3		0	24

* Grant supporting more than one individual user.

23

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT		Current Annual Amt.	User Category	COMPUTER EQUIPMENT		
			Identification Number	Agency			General Description	Pageminutes(K)	Block Storage(K)
						3	Non-Stanford, medical	at .2 cents per pageminute	at .10 cents per block
Tickner, E.	Palo Alto Medical Research Foundation			Foundation Funds		3		521,027	2,518
Tickner, E.	Palo Alto Medical Research Foundation			Foundation Funds		3		8,236	80
							SUB-TOTAL	686,317	9,680
						4	Student education, Medical School	at .1 cent per pageminute (full credit)	at .10 cents per block (full credit)
Brast, N.	Medical Student	Storing and searching biographic information.	*RR00311	NIH		4		113	426
Brast, N.	Medical Student	Calculating descriptive and inferential statistics on experimental data.	*RR00311	NIH		4		42,888	1,859
Britt, R.	Medical Student	Auditory pathway responses to acoustic stimuli.	*RR00311	NIH		4		0	698
Brody, W.	Medical Student	Information processing in sensory systems.	*RR00311	NIH		4		918	2,173
Brody, W.	Medical Student	History taking and formulation of differential diagnoses.	*RR00311	NIH		4		32,911	306
Brown, B.	Medical Student	Serum levels of therapeutic agents and analyzing assay data.	*RR00311	NIH		4		45,237	4,544
Buchanan, B.	Medical Student	Determine whether medical students can learn statistical concepts by computer simulation.	*RR00311	NIH		4		45,702	1,321
Buchanan, B.	Medical Student	Determine whether medical students can learn statistical concepts by computer simulation.	*RR00311	NIH		4		6,818	13
Buchholz, W.	Medical Student	Investigation of time perspective, temporal relationships, and social function in para and quadraplegics.	*RR00311	NIH		4		0	29
Calvert, J.	Medical Student	Devising mathematical models to be used for public administration.	*RR00311	NIH		4		11,070	483
Edwards, D.	Medical Student	Effects of hormones on the alpha rhythm and temporal perception.	*RR00311	NIH		4		0	131
Enzmann, D.	Medical Student	Determination of secondary peristalsis of the esophagus.	*RR00311	NIH		4		108,120	12,875
Gamel, J.	Medical Student	Indicator dilution techniques for measuring pulmonary blood flow and lung transfer function.	*RR00311	NIH		4		97,928	3,833
Gelfand, M.	Medical Student	On-line analysis of cardiac catheterization data.	*RR00311	NIH		4		93,732	6,985
Gleason, C.	Medical Student	Self-education: how to use computers in electrophysiological research.	*RR00311	NIH		4		13,880	737
Hahn, P.	Medical Student	Interpretation, quantification, and systematic retrieval of information from gel electrophoreses.	*RR00311	NIH		4		18,578	406

* Grant supporting more than one individual user.

| INVESTIGATOR | DEPARTMENT INSTITUTION | PROJECT TITLE | DIRECT GRANT OR CONTRACT SUPPORT | | | User Cate-gory | COMPUTER EQUIPMENT | | |
			Identification Number	Agency	Current Annual Amt.		General Description	Pageminutes(K)	Block Storage(K)
						4	Student education, Medical School	at .1 cent per pageminute (full credit)	at .10 cents per block (full credit)
Harris, R.	Medical Student	Correlation between human emotions and their appraisals of their environment.	*RR00311	NIH		4		5,776	204
Helikson, M.	Medical Student	Evaluating liver blood flow with radioactive isotopes.	*RR00311	NIH		4		105,576	10,178
Jan, W.	Medical Student	Statistical tests on data from laboratory experiments.	*RR00311	NIH		4		68,645	1,273
Levine, R.	Medical Student	Evaluate and process data obtained during biochemical assays.	*RR00311	NIH		4		7,174	320
Lipp, M.	Medical Student	Survey of medical students and graduate physicians regarding their experience with and opinions of marihuana.	*RR00311	NIH		4		12,680	26
Miller, S.	Medical Student	Analysis of data from an ANGER scintillation camera in connection with kidney blood flow studies.	*RR00311	NIH		4		52,512	5,502
Monnin, L.	Medical Student	Relationship of articulation and identification abilities of normal and speech defective children.	*RR00311	NIH		4		3,375	140
Nestor, L.	Medical Student	Establishment of computer-based program aimed at differential diagnosis.	*RR00311	NIH		4		8,333	181
Nola, G.	Medical Student	Perform statistical analysis of hemodynamic parameters.	*RR00311	NIH		4		0	14
Nowack, W.	Medical Student	Behavioral effects on catecholamine metabolism in the brain.	*RR00311	NIH		4		2,251	33
Peters, J.	Medical Student	Evaluation of residuals and outliers in parallel line assays.	*RR00311	NIH		4		44,914	323
Pope, S.	Medical Student	Statistical analysis of data sets of cardiovascular function parameters of various pharmaecologic agents.	*RR00311	NIH		4		2,568	185
Portlock, C.	Medical Student	Study of motivations for pregnancy.	*RR00311	NIH		4		0	8
Propper, R.	Medical Student	Study of inter-relationship of annogenesis glucomedgenesis in the perfused kidney.	*RR00311	NIH		4		2,637	139
Raybin, D.	Medical Student	Calculate results of assays and to handle other data calculations, statistics, etc.	*RR00311	NIH		4		1,210	3
Rosenfeld, R.	Medical Student	Studying the psychophysiological adaptation of male patients to the Coronary Care Unit.	*RR00311	NIH		4		0	9
Rosenthal, W.	Medical Student	Speech and language pathology; normal speech perception.	*RR00311	NIH		4		4,048	670
Sachs, D.	Medical Student	Study population growth rates in various nations and correlate these with natural resource use in order to understand medicine's role in alleviating problems posed by environmental deterioration.	*RR00311	NIH		4		7,523	938

* Grant supporting more than one individual user.

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	Identification Number	Agency	Current Annual Amt.	User Category	General Description	Pageminutes(K)	Block Storage(K)
						4	Student education, Medical School	at .1 cent per pageminute (full credit)	at .10 cents per block (full credit)
Schwartz, B.	Medical Student	Statistical modeling of the growth, development, and ultimate senescence of cultured human fibroblasts.	*RR00311	NIH		4		487	19
Sethi, S.	Medical Student	Understand the replication of rhinoviruses.	*RR00311	NIH		4		6,892	63
Sinclair, A.	Medical Student	Measurement of intervals between beats of individual heart cells and administering drugs to cells to change environmental conditions, etc.	*RR00311	NIH		4		4,445	332
Smith, R.	Medical Student	Experimental study of family structure; socio-physiological studies of kidney transplant patients.	*RR00311	NIH		4		3,379	1,133
Swanson, G.	Medical Student	Interpret therapeutic drug action on respiratory control.	*RR00311	NIH		4		177,595	10,134
							SUB-TOTAL	1,040,215	68,546
						5	NIH grants not eligible to be charged – real time	at .01/2 cent per pageminute (full credit)	at .10 cents per block (full credit)
Bellville, J.	Anesthesia	Respiratory control mechanisms.	*GM12527	NIH	$243,415.35	5		97	158
Bellville, J.	Anesthesia	Pharmacology of anesthetics and related agents.	*GM12527	NIH	243,415.35	5		506,090	9,816
Bunnenberg, E.	Chemistry	Analysis of mass spectra and spectropolorimeter spectra; routine chemical analysis.	*GM12173	NIH	26,211.17	5		97,392	3,933
Bunnenberg, E.	Chemistry	Analysis of mass spectra and spectropolorimeter spectra; routine chemical analysis.	*GM12173	NIH	26,211.17	5		178,264	2,296
Bunnenberg, E.	Chemistry	Analysis of mass spectra and spectropolorimeter spectra; routine chemical analysis.	*GM12173	NIH	26,211.17	5		133,860	5,360
Bunnenberg, E.	Chemistry	Analysis of mass spectra and spectropolorimeter spectra; routine chemical analysis.	*GM12173	NIH	26,211.17	5		3,349	61
Duffield, A.	Chemistry	Analysis of mass spectra and spectropolorimeter spectra; routine chemical analysis.	*GM12173	NIH	26,211.17	5		377,988	2,519
Glick, D.	Pathology	Laser-microprobe element analysis.	HE06716	NIH	47,793.18	5		99,504	1,603
Roth, W.	Psychiatry	Habituation of evoked response and EEG desynchronization distinguishing arousal produced by emotional stimuli.	*MH11028	NIMH	90,936.37	5		82,604	2,924
Stillman, R.	Chemistry	Analysis of mass spectra and spectropolorimeter spectra; routine chemical analysis.	*AM04257	NIH	18,282.13	5		6,065	694
Trudell, J.	Chemistry	Interpreting mass spectroscopy.	*AM04257	NIH	18,282.13	5		319	78
							SUB-TOTAL	1,482,832	29,478

* Grant supporting more than one individual user.

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT			User Category	COMPUTER EQUIPMENT		
			Identification Number	Agency	Current Annual Amt.		General Description	Pageminutes(K)	Block Storage(K)
						6	NIH grants not eligible to be charged - routine terminals	at .1 cent per pageminute (full credit)	at .10 cents per block (full credit)
Bernfield, M.	Pediatrics	Biochemistry in birth defects.	*HD02147	NIH	$257,700.07	6		29,059	655
Cann, H.	Pediatrics	Frequencies of genes controlling human heritable characters.	*GM15593	NIH	107,013.84	6		262,376	58,129
Cann, H.	Pediatrics	Frequencies of genes controlling human heritable characters.	GM15593	NIH	107,013.84	6		38,015	992
Champoux, J.	Biochemistry	Analytical ultracentrifuge experiments.	*AM07535	NIH	59,605.94	6		4,423	269
Chase, R.	Surgery	Evaluate facial growth in cleft palate children and to assess velopharyngeal competence.	DE02803	NIH	21,046.71	6		17,809	329
Clayton, R.	Psychiatry	Effects of steroids and hormones of RNA activity on the brain.	*HD00801	NIH	40,068.56	6		1,147	2,723
Cooper, J.	Psychiatry	Biochemical correlation of neonatal sexual differentiation in rats.	*HD00801	NIH	40,068.56	6		52,164	513
Doering, C.	Psychiatry	Investigating the causal connections, on a biochemical level, between hormones and behavior in stress.	*HD00801	NIH	40,068.56	6		11,585	2,561
Doherty, R.	Pediatrics	Random sampling of cells; statistical evaluations of data.	*HD02147	NIH	257,700.07	6		4,608	204
Efron, B.	Community & Preventive Medicine	Theoretical and applied research in biostatistics.	GM14554	NIH	30,268.39	6		8,896	569
Folk, W.	Biochemistry	Mitrants of Ecali, having altered activating enzymes.	GM13235	NIH	94,669.41	6		292	75
Fries, J.	Medicine - Immunology	Clinical information about rheumatic diseases.	AM05425	NIH	74,894.28	6		1,076	188
Hahn, G.	Radiology	Study of radiochemotherapy of mammalian cell cultures.	CA04542	NIH	20,647.49	6		45,865	682
Herzenberg, L.	Genetics	Collating multiple mouse immunoglobulin levels; store data and direct antiserum production.	*HD01287	NIH	53,728.13	6		32,027	9,193
Herzenberg, L.	Genetics	Collating multiple mouse immunoglobulin levels; store data and direct antiserum production.	*HD01287	NIH	53,728.13	6		5	12
Herzenberg, L.	Genetics	Collating multiple mouse immunoglobulin levels; store data and direct antiserum production.	*HD01287	NIH	53,728.13	6		8,287	624
Laipis, P.	Genetics	Statistical and mathematical reduction of data from experiments involving sucrose and cesium choloride gradients in the ultracentrifuge.	GM14108	NIH	43,240.25	6		0	157
Pearson, M.	Biochemistry	Compute normalized chromatographic elution profiles of viral SRNA.	*AM07535	NIH	59,605.04	6		0	10

* Grant supporting more than one individual user.

27

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT			User Cate-gory	COMPUTER EQUIPMENT		
			Identification Number	Agency	Current Annual Amt.		General Description	Pageminutes(K)	Block Storage(K)
						11	Non-funded user; pilot project: routine terminals	at .1 cent per pageminute (full credit)	at .10 cents per block (full credit)
Alway, R.	Pediatrics	Compare information on family structure, attitudes, etc. in order to predict general illness symptomatology.	*RR00311	NIH		11		0	14
Butler, E.	Urology	Create uniform method of information retrieval and computer based data processing for operative statistics and other patient care information.	*RR00311	NIH		11		0	631
Doering, C.	Psychiatry	Storing and searching an author and subject index.	*RR00311	NIH		11		241	1,896
Enlander, D.	Pathology	Filing and retrieving coded medical diagnoses.	*RR00311	NIH		11		2,159	1,369
Enlander, D.	Pathology	Filing and retrieving coded medical diagnoses.	*RR00311	NIH		11		22,534	13,084
Enlander, D.	Pathology	Filing and retrieving coded medical diagnoses.	*RR00311	NIH		11		240,115	40,101
Friedland, G.	Radiology	Determination of the function of gastric sling fibers.	*RR00311	NIH		11		53,325	1,242
Henry, P.	Psychiatry	Automatic staging of sleep EEG data and develop pattern recognition subroutines to identify and count monophasic sharp waves recorded from the lateral geniculate during sleep.	*RR00311	NIH		11		31,128	803
Hillman, R.	Psychiatry	Construct computerized psychiatric "patient."	*RR00311	NIH		11		24,561	291
Korn, D.	Pathology	Data retrieval of autopsy records.	*RR00311	NIH		11		26,195	506
Lamb, E.	Gynecology - Obstetrics	Relative potency and confidence limits for total gonadotropic bioassay.	*RR00311	NIH		11		24,624	1,365
Lederberg, J.	Genetics	Study of characteristics of unusually high birthweight relative to IQ, diseases, parent income, educational background, parity, and sex of child.	*RR00311	NIH		11		2,475	4,003
McGann, L.	Community & Preventive Medicine	Survey of Stanford Medical Center hospital charges for the aged.	*RR00311	NIH		11		19,266	274
Mesel, E.	Pediatrics	Interaction between physician and computer model.	*RR00311	NIH		11		344	795
Mesel, E.	Pediatrics	Store patient identification and diagnosis obtained during the course of illness.	*RR00311	NIH		11		5,452	5,470
Morrell, L.	Neurology	Multivariate statistical evaluation of data relating electroencephalographic measures to motor behavior.	*RR00311	NIH		11		10,239	1,330
Noble, E.	Psychiatry	Effects of alcohol on CNS of rodents.	*RR00311	NIH		11		8,808	1,349
Whitcher, C.	Anesthesia	Spectral analysis of blood pressure sounds.	*RR00311	NIH		11		0	12
							SUB-TOTAL	471,466	74,535

* Grant supporting more than one individual user.

29

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	Identification Number	Agency	Current Annual Amt.	User Category	General Description	Pageminutes(K)	Block Storage(K)
						_12_	Non-funded user; funding anticipated - real time	at .01/2 cent per pageminute (full credit)	at .10 cents per block (full credit)
Angel, R.	Neurology	Movement patterns, limb displacement and velocity, and electromyography.	*RR00311	NIH		12		54,566	23,255
Constantinou, C.	Urology	Study of the electrophysiology of the ureter.	*RR00311	NIH		12		121,869	3,651
Duffield, A.	Chemistry	Analysis of mass spectra and spectropolorimeter spectra; routine chemical analyses.	*RR00311	NIH		12		4,088	122
Gersch, W.	Neurology	Research in application of time series methods to problems in neurophysiology and medicine.	*RR00311	NIH		12		342,121	49,491
Reynolds, W.	Genetics	Analysis of mass spectra and spectropolorimeter spectra; routine chemical analyses.	*RR00311	NIH		12		522,499	7,737
Ross, R.	Chemistry	Analysis of mass spectra and spectropolorimeter spectra; routine chemical analyses.	*RR00311	NIH		12		157,929	3,538
Stillman, R.	Chemistry	Analysis of mass spectra and spectropolorimeter spectra; routine chemical analyses.	*RR00311	NIH		12		331,568	7,824
							SUB-TOTAL	1,534,640	95,618
						_13_	Non-funded user; funding anticipated - routine terminals	at .1 cent per pageminute (full credit)	at .10 cents per block (full credit)
Assaykeen, T.	Urology	Control of renin secretion.	*RR00311	NIH		13		12,682	160
Cohen, S.	Pharmacology	Establishment of computer-based program aimed at preventing undersirable drug interactions.	*RR00311	NIH		13		0	12
DeNardo, G.	Nuclear Medicine	Using radioactive methods to assess regional distribution of ventilation and pulmonary blood flow.	*RR00311	NIH		13		9,968	891
Fries, J.	Medicine - Immunology	Establishing clinical, pathologic, and laboratory correlations in the immunologic diseases and assessing these correlations in regard to classification, pathogenesis, prognosis, and response to therapy.	*RR00311	NIH		13		45,705	840
Govan, D.	Urology	Clinical management and follow-up of patients with neurologic dysfunction of the bladder.	*RR00311	NIH		13		88,190	1,462
Kakihana, R.	Psychiatry	Effects of alcohol on the CNS of rodents.	*RR00311	NIH		13		8,099	516
Kriss, J.	Nuclear Medicine	Calculate results of bioassay for long-acting thyroid stimulator and of radioactive iodine assay for TSH.	*RR00311	NIH		13		59,343	1,478
							SUB-TOTAL	223,987	5,359

* Grant supporting more than one individual user.

30

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT			User Cate-gory	COMPUTER EQUIPMENT		
			Identification Number	Agency	Current Annual Amt.		General Description	Pageminutes(K)	Block Storage(K)
						14	Suspended pending in-dividual Institute approval - real time	at .01/2 cent per pageminute	at .10 cents per block
Dong, E.	Cardiovascular Surgery	Effects of heart transplants; white cell cor-relations; pulmonary data collection.	*PH436711	NIH	$ 86,696.30	14		595,813	34,664
Dong, E.	Cardiovascular Surgery	Develop a controller for an artificial heart.	*PH436711	NIH	86,696.30	14		2,423,332	139,194
Mesel, E.	Pediatrics	Hemodynamics of congenital heart disease.	HE11996	NIH	13,949.04	14		29,090	4,208
Morris, S.	Genetics	Analyze the incorporation of radiolabeled amino acids into brain proteins.	*GM00295	NIH	122,628.87	14		39,142	689
Smith, N.	Anesthesia	Calculating cardiovascular data from normal patients.	*GM12527	NIH	243,415.35	14		4,623	1,082
Smith, N.	Anesthesia	Data file storage; statistical analyses.	*GM12527	NIH	243,415.35	14		171	1,846
Thathachari, Y.	Dermatology	Structure of melanins; radioactive tracer techniques to detect and treat melanins.	CA08064	NIH	56,573.13	14		74,446	1,442
Warrick, G.	Psychiatry	Analyzing continuous EEG for averaged evoked responses.	*MH10976	NIMH	160,407.26	14		25,013	1,060
Wittner, W.	Psychiatry	Influence of correctly and incorrectly guessed visual patterns on visual average evoked response.	*MH10976	NIMH	160,407.26	14		40,620	1,100
							SUB-TOTAL	3,230,250	185,285
						15	Suspended pending in-dividual Institute approval - routine terminals	at .1 cent per pageminute	at .10 cents per block
Aronow, L.	Pharmacology	Laboratory data analysis related to anti-cancer drugs.	CA05672	NIH	39,591.45	15		8,114	212
Bagshaw, M.	Radiology	Classify and retrieve patient data from the tumor registration.	*CA05838	NIH	670,523.17	15		478,452	9,875
Baldwin, R.	Biochemistry	Characterization and helix of short DNA helices.	AM04763	NIH	65,319.15	15		10,113	1,057
Bausek, G.	Medicine - Infec-tious Diseases	Radiotherapeutic treatment of lymphonas.	*CA05838	NIH	670,523.17	15		132,797	2,703
Beard, R.	Community & Prev-entive Medicine	Behavioral responses and influences of in-haling CO.	UI00852	NIH	93,333.19	15		238	60
Bodmer, W.	Genetics	Human white blood cells and population genetics.	GM14650	NIH	54,840.84	15		1,786,136	222,623
Brutlag, D.	Biochemistry	Computer application to medical research.	*GM07581	NIH	218,562.12	15		81,984	1,526
Cady, P.	Psychiatry	Study of endocrine function and behavior.	MH14528	NIMH	32,007.19	15		58,106	1,039
Collins, K.	Biochemistry	Compare model compounds with experimental spectra; analyze chromatograms; ultracentri-fugation.	*GM11788	NIH	36,111.63	15		3,224	1,010

* Grant supporting more than one individual user.

31

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT Identification Number	Agency	Current Annual Amt.	User Category	COMPUTER EQUIPMENT General Description	Pageminutes(K) at .1 cent per pageminute	Block Storage(K) at .10 cents per block
						15	Suspended pending individual Institute approval - routine terminals		
Conner, R.	Psychiatry	Relating neuroendocrine function to behavior.	HD02881	NIH	$152,462.38	15		60,735	2,896
Fung, D.	Anesthesia	Research of acute ventilary insufficiency.	*GM00862	NIH	42,675.48	15		6,418	297
Fung, D.	Anesthesia	Determine response of pulmonary circulation to changes in inspired gas composition and intra-treacheal pressure.	*GM00862	NIH	42,675.48	15		25,951	322
Glattke, T.	Otolaryngology	Collecting and processing ANS data; patient categorization.	NB05582	NIH	28,159.32	15		0	55
Goldstein, A.	Pharmacology	Drug-induced mouse activity.	*MH13963	NIH	122,801.54	15		17,459	1,319
Goldstein, D.	Pharmacology	Biochemical action of barbital.	*MH13963	NIH	122,801.54	15		1,349	97
Hackney, J.	Pharmacology	Drug-induced mouse activity.	GM00322	NIH	14,563.03	15		0	13
Hilf, F.	Psychiatry	Interactive on-line psychological testing.	*MH11028	NIH	90,936.37	15		0	3,852
Hwang, J.	Genetics	Birthweight and IQ in relation to sex, parents, education, race, and income.	*GM00295	NIH	122,628.87	15		12,751	7,396
Kaplan, B.	Psychiatry	Relation to ANS responses to attentional sets (thinking and environmental observation).	MH08304	NIMH	227,168.20	15		4,057	515
Kapp, D.	Radiology	Data analysis of sedimentation patterns of DNA following X-irradiation.	CA10372	NIH	328,104.46	15		13,217	146
Kessler, S.	Psychiatry	Mating speed analysis in drosofhela pseudoolscura.	MH14364	NIMH	24,604.54	15		3,645	2,582
Kriss, J.	Nuclear Medicine	Calculate plasma and blood volumes and red cell mass in patients receiving radiation.	AM07642	NIH	53,263.30	15		0	12
Lederberg, J.	Genetics	Statistical and miscellaneous programs used by the Genetics Department.	*GM00295	NIH	122,628.87	15		10,395	4,975
Leiderman, P.	Psychiatry	Effects of early separation of mother and infant on maternal behavior and on infant growth and development.	HD02636	NIMH	81,859.15	15		21,099	3,073
Luetscher, J.	Medicine - Metabolic Research	Secretion and metabolism of adrenal hormones.	AM03062	NIH	53,804.43	15		78,860	10,436
Melges, F.	Psychiatry	Understanding psychotic processes.	MH29163	NIMH	25,050.61	15		13,863	800
Miller, R.	Community & Preventive Medicine	Biostatistical consulting to Stanford Medical Center.	GM02511	NIH	92,129.00	15		44,237	786
Miller, R.	Community & Preventive Medicine	Biostatistics research and/or education.	*GM00025	NIH	86,423.87	15		0	10
Miller, R.	Community & Preventive Medicine	Teaching of courses in biostatistics.	*GM00025	NIH	86,423.87	15		0	16
Nelsen, T.	Surgery	Clinical cancer research record protocols and storage and analysis.	*CA05838	NIH	670,523.17	15		13,520	2,170

* Grant supporting more than one individual user.

32

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT Identification Number	Agency	Current Annual Amt.	User Category	General Description	Pageminutes(K) at .1 cent per pageminute	Block Storage(K) at .10 cents per block
						15	Suspended pending individual Institute approval - routine terminals		
Payne, R.	Medicine - Hematology	Extending leukocyte and/or tissue antigen classification by serologic and genetic analysis.	HE03365	NIH	$ 40,659.31	15		213,302	25,678
Porter, R.	Biochemistry	Steady-state kinetics of aspartate transcarbamylase.	*GM11788	NIH	36,111.63	15		21,057	1,470
Reaven, G.	Medicine - Lipid Research	Relationship between glucose, insulin, and triglyceride kinetics and diabetes mellitis and arthereosclerosis.	AM05972	NIH	60,745.54	15		87,343	947
Reaven, G.	Medicine - Lipid Research	On-line display procedure to determine physiological models of metabolic processes.	*HE08506	NIH	38,509.29	15		38,885	791
Reaven, G.	Medicine - Lipid Research	Calculating theoretical curve displayed on a CRT and comparing data on CRT.	*HE08506	NIH	38,509.29	15		15,399	340
Reitan, J.	Anesthesia	Processing cardiac interval timing to monitor contractile state under varying loads and drugs.	*GM00862	NIH	42,675.48	15		36,557	8,189
Rosenberg, S.	Oncology	Correlating drug responsiveness in cancer patients.	CA08122	NIH	136,309.93	15		191,346	4,153
Smith, P.	Anesthesia	Premature or sick newborn infant research.	RR00081	NIH	306,503.34	15		1,957	1,137
Spevack, A.	Psychiatry	Classical conditioning experiments of amygdalectomyed and intact monkeys.	*MH08304	NIH	227,168.20	15		39,141	3,159
Stark, G.	Biochemistry	Analyze data on enzyme experiments and to process chromatograms generated by an amino acid analyzer.	*GM11788	NIH	36,111.63	15		55	39
Stillman, R.	Psychiatry	Interviewing and testing psychiatric patients	MH11028	NIMH	90,936.37	15		14,072	4,252
Stocker, B.	Medicine - Microbiology	Genetics and physiology of salmonella typhimurium.	*AI08942	NIH	3,713.87	15		36,232	8,159
Strickland, R.	Medicine - G. I. Division	Analyzing gastric secretory function tests.	AM05418	NIH	81,177.77	15		0	431
Summerlin, W.	Dermatology	Biochemical control of collagen formation.	AM05318	NIH	45,651.42	15		0	49
Vosti, K.	Medicine - Infectious Diseases	Cross-tabulating variables associated with bacterial infections.	AI03638	NIH	30,313.95	15		15,448	1,183
							SUB-TOTAL	3,597,514	341,850
							TOTAL	19,697,693	1,237,426

* Grant supporting more than one individual user.

33

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT			User Cate- gory	COMPUTER EQUIPMENT		
			Identification Number	Agency	Current Annual Amt.		General Description	Pageminutes(K)	Block Storage(K)
						9	Stanford Non-Medical School and Non-Bio-medical Research	at .2-1/2 cents per pageminute	at .10 cents per block
Ashley, H.	Aero & Astro					9		99,947	5,702
Barrish, B.	School of Education					9		4,172	190
Buchanan, B.	Computer Science					9		44,907	1,457
Deinhardt, C.	Anthropology					9		0	4
Enlander, D.	INDEX					9		40,844	532
Fork, D.	Carnegie Institution					9		28,779	459
Garwin, E.	Stanford Linear Accelerator Center					9		2	10
Gittelman, B.	Stanford Linear Accelerator Center					9		14,377	75
Gray, C.	INDEX					9		6,297	73
Gustavsen, D.	Stanford Linear Accelerator Center					9		157,017	6,357
Hall, R.	University of California, Berkeley - Econom-ics					9		7,404	4,609
Halpern, M.	INDEX					9		30,496	731
Hanko, H.	Stanford Research Institute					9		0	8
Hardwick, J.	School of Business					9		0	6
Headrick, T.	School of Law					9		180,681	854
Headrick, T.	School of Law					9		1,234	36
Johansen, D.	Aero & Astro					9		209,316	1,621
Jurow, J.	Stanford Linear Accelerator Center					9		15,992	3,533
Linn, M.	INDEX					9		15,914	355
Miller, S.	INDEX					9		18,394	218
Naumes, W.	School of Business					9		69,512	2,546
Niebuhr, W.	School of Business					9		95	20
Olson, G.	Chemistry					9		1,482	101
Pavlina, N.	Controller's Office - Systems					9		0	144
Rabinowitz, M.	Stanford Linear Accelerator Center					9		30	95
Richter, B.	Stanford Linear Accelerator Center					9		66,259	2,126

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT			User Cate- gory	COMPUTER EQUIPMENT		
			Identification Number	Agency	Current Annual Amt.		General Description	Pageminutes(K)	Block Storage(K)
						9	Stanford Non-Medical School and Non-Bio- medical Research	at .2-1/2 cents per pageminute	at .10 cents per block
Ritson, D.	Physics					9		53,644	2,027
Saal, H.	Stanford Linear Accelerator Center					9		41,436	1,908
Schawlow, A.	Physics					9		3,696	244
Schrader, G.	INDEX					9		6,135	138
Wiederhold, G.	INDEX					9		48,225	2,182
Wiederhold, G.	MASCOR					9		21,571	49
Winfield, E.	Center for Material Research					9		81,562	9,739
							TOTAL	1,269,420	48,149

TOTALS:

	Number of Projects		
CORE RESEARCH PROJECTS	56	5,100,935	129,659
INDIVIDUAL USER PROJECTS	138	19,697,693	1,237,426
OTHER USE (Non-health related use)	33	1,269,420	48,149
GRAND TOTAL - RESOURCE USAGE	227	26,068,048	1,415,234

ACME

RENTAL EQUIPMENT

360/50 CONFIGURATION   LIST OF COMPONENTS ON ORDER OR ON HAND   04/30/70

QTY.	TYPE-SERIAL	DESCRIPTION	MODEL NO.	LOCATION	RENTAL START DATE	MONTHLY RATE	E/A%	EDUCATIONAL ALLOWANCE	TAX	NET RENTAL	UNIV. ACCT. CODE
01	1052-50618	Console Typewr	07	S101-MED. CTR.	12-13-66	63.00	20	12.60	2.52	52.92	10
01	1403-14708	Printer 600 LPM	02	"	"	833.00	20	166.60	33.32	699.72	10
01	2050-11047	Additional CPU	F	"	"	1,600.00	25	400.00	60.00	1,260.00	10
01	2050-11047	CPU		"	"	10,040.00	35	3,514.00	326.30	6,852.30	10
01	2314-11149	DIR ACESS STGE		"	4-12-68	5,250.00	20	1,050.00	210.00	4,410.00	10
01	2314-12326	DIR ACESS STGE		"	1-6-69	5,250.00	20	1,050.00	210.00	4,410.00	10
01	2361-10102	Core Storage		"	7-1-68	10,990.00	45	4,945.50	302.23	6,346.73	10
01	2401-10877	MAG TAPE UNIT		"	12-13-66	335.00	20	67.00	13.40	281.40	10
01	2403-70738	MAG TAPE UNIT CONTROL		"	"	890.00	20	178.00	35.60	747.60	10
01	2540-12531	CARD READER PUNCH		"	"	660.00	20	132.00	26.40	554.40	10
01	2701-11144	DATA ADAPTER UNIT		"	12-13-66	1,025.00	20	205.00	41.00	861.00	10
01	2702-20185	TRANSMISSION CONTROL		"	12-13-66	1,670.00	20	334.00	66.80	1,402.80	10
01	2821-12464	CONTROL UNIT		"	12-13-66	1,085.00	20	217.00	43.40	911.40	10
		0/50 CONFIGURATION TOTAL				39,691.00		12,271.70	1,370.97	28,790.27	

ACCOUNT   DISTRIBUTION
  CODE   ACCOUNT NO.   AMOUNT

  10   0-KKG-041-92635   28,790.27

ACME

RENTAL EQUIPMENT

CONTRACT PRO 250   LIST OF COMPONENTS ON ORDER OR ON HAND   04/30/70

QTY.	TYPE-SERIAL	DESCRIPTION	MODEL NO.	LOCATION	RENTAL START DATE	MONTHLY RATE	E/A%	EDUCATIONAL ALLOWANCE	TAX	NET RENTAL	UNIV. ACCT. CODE
01	2316-24122	DISK PACK		S101-MED. CTR.	5-8-68	20.00	20	4.00	.80	16.80	15
01	2316-24124	"		"	"	20.00	20	4.00	.80	16.80	15
01	2316-24125	"		"	"	20.00	20	4.00	.80	16.80	15
01	2316-30092	"		"	4-12-68	20.00	20	4.00	.80	16.80	15
01	2316-30093	"		"	"	20.00	20	4.00	.80	16.80	15
01	2316-30094	"		"	"	20.00	20	4.00	.80	16.80	15
01	2316-30095	"		"	"	20.00	20	4.00	.80	16.80	15
01	2316-30096	"		"	"	20.00	20	4.00	.80	16.80	15
01	2316-30097	"		"	"	20.00	20	4.00	.80	16.80	15
01	2316-30098	"		"	"	20.00	20	4.00	.80	16.80	15
01	2316-30099	"		"	"	20.00	20	4.00	.80	16.80	15
01	2316-30100	"		"	"	20.00	20	4.00	.80	16.80	15
01	2316-30101	"		"	"	20.00	20	4.00	.80	16.80	15
01	2316-30102	"		"	"	20.00	20	4.00	.80	16.80	15
01	2316-30103	"		"	"	20.00	20	4.00	.80	16.80	15
01	2316-57822	"		"	10-13-68	20.00	20	4.00	.80	16.80	15
						320.00		60.00	12.00	272.00	

LIST OF ACME TERMINALS ON HAND

04/30/70

QTY.	TYPE-SERIAL	DESCRIPTION	LOCATION	RENTAL START DATE	MONTHLY RATE	E/A%	EDUCATIONAL ALLOWANCE	TAX	NET RENTAL
01	2741-10472	COMM. TERMINAL	ACME-STAT.	12-13-66	100.50	20	20.10	4.02	84.42
01	2741-10473	"	FLEISCHMAN	12-13-66	100.50	20	20.10	4.02	84.42
01	2741-10477	"	GENETICS	12-13-66	100.50	20	20.10	4.02	84.42
01	2741-10490	"	ACME-OPRTR.	12-13-66	100.50	20	20.10	4.02	84.42
01	2741-10508	"	ACME-TEACH	12-13-66	100.50	20	20.10	4.02	84.42
01	2741-10509	"	GENETICS	12-13-66	100.50	20	20.10	4.02	84.42
01	2741-12847	"	ACME-SYST.	5-1-68	105.50	20	21.10	4.22	88.62
01	2741-12856	"	ACME-DEMO.	5-1-68	100.50	20	20.10	4.02	84.42
01	2741-12883	"	ACME-SEC'Y	10-6-67	100.50	20	20.10	4.02	84.42
01	2741-14382	"	ACME-S'tware	5-10-68	100.50	20	21.10	4.22	88.62

1800 RENTAL EQUIPMENT

QTY.	TYPE	DESCRIPTION	RENTAL START DATE	ANNUAL RENT
01	1826	DATA ADAPTER UNIT	9-22-66	$ 7,691.00
01	1442	CARD READ PUNCH	9-22-66	2,591.00

OTHER RENTED EQUIPMENT

Description	Manufacturer	Model No.	Rental Start Date	Annual Rent
Card Punch	IBM	029	9-22-66	$675.00
5 Data Sets	Westinghouse Electric	103A2		2,322.00

RESOURCE EQUIPMENT LIST--PURCHASED

Period Covered 18/1/67 - 4/30/70

EQUIPMENT LOCATED IN MAIN RESOURCE AREA

Description / Identification	Manufac-turer	Model No.	Date In-stalled	Date Accepted	Purchase Price	Source of Funds	
1800 System							
Process Controller	IBM	1801				Other Fed. Agency	
Printer Keyboard	"	1816				" " "	
Enclosure	"	1828				" " "	
Analog Input Terminal	"	1851			2,908	" " "	
Analog Output Terminal	"	1856			6,540	" " "	
Digital Display	ACME				(1)	SRR	
Oscilloscope	Hewlett-Packard				1,500	Macy Grant	
Pulse Generator	E. H. Research Labs	139B			1,275	" "	
Data Transmission Device	IBM	270 X/Y	12/14/67	4/15/69	73,500	51,086.	SRR
						22,414.	Other Fed. Agency

(1) Fabricated and assembled by ACME staff.

Beatrice, E., I. Harding-Barlow, and D. Glick, "Electric Spark Cross-Excitation in Laser Microprob-Emission Spectroscopy for Samples of 10-25 Micron Diameter," APPLIED SPECTROSCOPY, vol. 23, pp. 257-259, 1969.

Beatrice, E. and D. Glick, "A Direct Reading Polychromator for Emission Spectroscopy," APPLIED SPECTROSCOPY, vol. 23, pp. 260-263, 1969.

Bellville, J., G. Fleischli, and J. Defares, "A New Method of Study Regulation of Respiration--The Response to Sinusoidally Varying CO2 Inhalation," COMPUTERS FOR BIOMEDICAL RESEARCH, vol. 2, no. 4, pp. 329-349, June 1969.

Bernfield, M. and P. Maenpaa, "Quantitative Variation in Serine Transfer Ribonucleic Acid during Estrogen-Induced Phosphoprotein Synthesis in Rooster Liver," BIOCHEMISTRY, vol. 8, pp. 4926-4935, 1969.

Bodmer, W., J. Bodmer, D. Ihde, and S. Adler, "Genetic and Serological Association Analysis of the HL-A Leukocyte System," COMPUTER APPLICATIONS IN GENETICS (ed. N. Morton), Univ. Hawaii Press, pp. 117-127, 1969.

Bodmer, W., V. Miggiano, and M. Nabholz, "Hybrids between Human Leukocytes and a Mouse Cell Line: Production and Characterization," WISTAR INSTITUTE SYMPOSIUM, monograph no. 9, "Heterospecific Genome Interaction," (ed. V. Defendi), THE WISTAR INSTITUTE PRESS, 1969.

Bodmer, W., M. Nabholz, and V. Miggiano, "Genetic Analysis Using Human-Mouse Somatic Cell Hybrids," NATURE, vol. 223, pp. 348-363, 1969.

Bodmer, W. and L. Cavalli-Sforza, "The Genetics of Human Populations," FREEMAN AND COMPANY, in press.

Bodmer, W. and J. Bodmer, "Studies on African Pygmies IV: A Comparative Study of the HL-A Polymorphism in the Babinga Pygmies and Other African and Caucasian Populations," AMERICAN JOURNAL OF HUMAN GENETICS, in press.

Bodmer, W. and B. Gabb, "A Micro Complement Fixation Test for Platelet Antibodies," HISTOCOMPATIBILITY TESTING, in press.

Bodmer, W., J. Bodmer, A. Coukell, R. Payne, and E. Shanbrom, "A New Allele for the LA Series of HL-A Antigens: The Analysis of a Complex Serum," HISTO-COMPATIBILITY TESTING, in press.

Bodmer, W., J. Bodmer, and M. Tripp, "Recombination between the LA and 4 Loci of the HL-A System," HISTOCOMPATIBILITY TESTING, in press.

Bodmer, W., P. Mattiuz, D. Ihde, A. Piazza, and R. Ceppellini, "New Approaches to the Population Genetic and Segregation Analysis of the HL-A System," HISTO-COMPATIBILITY TESTING, in press.

Clayton, R., "Methods in Enzymology," STEROIDS AND TERPENOIDS, vol. 15, Academic Press, 1969.

Cohen, S. and C. Miller, "Multiple Molecular Species of Circular R-Factor DNA Isolated from Escherichia coli," NATURE, vol. 224, pp. 1273-1277, 1969.

Cohen, S. and C. Miller, "Non-Chromosomal Antibiotic Resistance in Bacteria: II. Molecular Nature of R-Factors Isolated from Proteus mirabilis and Escherichia coli," JOURNAL OF MOLECULAR BIOLOGY, in press.

Cohen, S. and A. Chang, "Genetic Expression in Bacteriophage: III. Inhibition of E. coli Nucleic Acid and Protein Synthesis during Development," JOURNAL OF MOLECULAR BIOLOGY, in press.

Collins, K. and G. Stark, "Aspartate Transcarbamylase: Studies of the Catalytic Subumt by Ultraviolet Difference Spectroscopy," JOURNAL OF BIOLOGICAL CHEMISTRY, vol. 244, pp. 1869-1877, April 1969.

Collins, R., M. Weinberger, C. Gonzales, G. Nokes, and J. Luetscher, "Catecholamine Excretion in Low Renin Hypertension," CLINICAL RESEARCH, vol. 18, p. 167, 1970, (abstract).

Crouse, L. and G. Wiederhold, "An Advanced Computer System for Real-Time Medical Applications," COMPUTERS AND BIOMEDICAL RESEARCH, vol. 2, no. 6, pp. 582-598, December 1969.

Doering, C., "Cholesterol Side Chain Cleavage Activity in the Adrenal Gland of the Young Rat: Development and Responsiveness to Adrenocorticotropic Hormone," ENDOCRINOLOGY, vol. 85, pp. 500-511, 1969.

Doering, C., "A Microassay for the Enzymatic Cleavage of the Cholesterol Side Chain," METHODS IN ENZYMOLOGY, (ed. R. Clayton), vol. 15, pp. 591-596, Academic Press, 1969.

Englund, P., J. Huberman, T. Jovin, and A. Kornberg, "Enzymatic Synthesis of Deoxyribonucleic Acid, XXX. Binding of Triphosphates to DNA Polymerase," submitted to JOURNAL OF BIOLOGICAL CHEMISTRY, vol. 244, pp. 3038-3044, 1969.

Fries, J., "Experience Counting in Sequential Computer Diagnosis," submitted for publication.

Gersch, W. and G. Goddard, "Epileptic Focus Location: Spectral Analysis Method," submitted to SCIENCE, January 1970.

Gersch, W. and E. Dong, Jr., "A Note on Warner's Vagus Heart Rate Control Model," submitted to CIRCULATION RESEARCH, January 1970.

Gersch, W., D. Eddy, and E. Dong, Jr., "Cardiac Arrhythmia Classification: A Heart Beat Interval-Markov Chain Approach," submitted to COMPUTERS AND BIOMEDICAL RESEARCH, February 1970.

Gersch, W., "Spectral Analysis of EEG's by Autoregressive Decomposition of Time Series," to appear in MATHEMATICAL BIOSCIENCES.

Glick, D. "Cytochemical Analysis by Laser Microprobe-Emission Spectroscopy," ANNALS OF THE NEW YORK ACADEMY OF SCIENCES, vol. 157, pp. 265-274, 1969.

Glick, D., K. Marich, P. Carr, and E. Beatrice, "Laser Microprobe-Emission Spectroscopy," ANNALS OF THE NEW YORK ACADEMY OF SCIENCES, vol. 168, pp. 507-509, 1970.

Harrison, D. and R. Gianelly, "Studies on the Antiarrhythmic and Circulatory Actions of Lidocaine (Xylocaine(R))," ALABAMA JOURNAL OF MEDICAL SCIENCES, vol. 6, p. 74, 1969.

Harrison, D. and R. Gianelly, "Drugs Used in the Treatment of Cardiac Arrhythmias," DISEASE-A-MONTH, January 1969.

Harrison, D., M. Klughaupt, M. Flamm, and E. Hancock, "Non-Rheumatic Mitral Insufficiency: Determination of Operability and Prognosis," CIRCULATION, vol. 39, p. 307, 1969.

Harrison, D., W. Henry, S. Kountz, R. Cohn, and S. Robison, "Changes in Pulsatile Blood Flow in Autograft and Homograft Kidneys during Rejection," TRANSPLANTATION, vol. 7, p. 545, 1969.

Harrison, D., B. Treister, R. Gianelly, and R. Cohn, "The Circulatory Effects of Isoproterenol, Acetylstrophanthidin and Volume Loading in Acute Pericardial Tamponade," CARDIOVASCULAR RESEARCH, vol. 3, p. 299, 1969.

Harrison, D. and M. Perlroth, "Cardiogenic Shock: A Review," CLINICAL PHARMACOLOGY AND THERAPEUTICS, vol. 10, p. 449, 1969.

Harrison, D., R. Gianelly, and B. Treister, "The Effect of Propranolol on Exercise-Induced Ischemic ST Segment Depression," AMERICAN JOURNAL OF CARDIOLOGY, vol. 24, p. 161, 1969.

Harrison, D., J. Schroeder, R. Popp, E. Stinson, E. Dong, Jr., and N. Shumway, "Acute Rejection Following Cardiac Transplantation: Phonocardiographic and Ultrasound Observations," CIRCULATION, vol. 40, p. 155, 1969.

Harrison, D., B. Wintroub, J. Schroeder, M. Schroll, and S. Robison, "The Dynamic Response to Dopamine in Experimental Myocardial Infarction," AMERICAN JOURNAL OF PHYSIOLOGY, vol. 217, pp. 1716-1720, December 1969.

Harrison, D., B. Wintroub, S. Robison, and S. Pirages, "The Pulmonary and Systematic Circulatory Response to Dopamine Infusion," BRITISH JOURNAL OF PHARMACOLOGY, in press.

Harrison, D., S. Robison, and M. Schroll, "The Circulatory Response to Lidocaine in Experimental Myocardial Infarction," AMERICAN JOURNAL OF MEDICAL SCIENCES, in press.

Harrison, D. and J. Ridges, "Nomograms for Determination of Mixed Venous O2 Content and O2 Stepup in Atrial Septal Defect," AMERICAN HEART JOURNAL, in press.

Harrison, D., R. Stenson, W. Henry, and L. Crouse, "Analysis of Hemodynamic Data from Cardiac Catheterization with a Digital Computer," OPTICS TECHNICAL REVIEW, 1969.

Hodgson, G., E. Petterson, K. Kvenvolden, E. Bunnenberg, B. Halpern, and C. Ponnamperuma, "Search for Porphyrins in Lunar Dust," SCIENCE, vol. 167, pp. 763-765, January 1970.

Ingels, N., S. Rush, and N. Thompson, "Analytic Stop Motion Stereo Photogrammetry," THE REVIEW OF SCIENTIFIC INSTRUMENTS, vol. 40, no. 3, pp. 487-492, March 1969.

Kessler, S., "The Genetics of Drosophila Mating Behavior II - The Genetic Architecture of Mating Speed in Drosophila pseudoobscura," GENETICS, vol. 62, pp. 421-433, 1969.

Kriss, J., "The Long-Acting Thyroid Stimulator and Thyroid Disease," to be published in ADVANCES IN INTERNAL MEDICINE, 1970.

Kriss, J., T. Mori, and J. Fisher, "Studies of an in vitro Binding Reaction between Thyroid Microsomes and Long-Acting Thyroid Stimulator Globulin (LATS): I. Development of Solid-State Competitive Binding Radioassay Methods for Measurement of Anti-Microsomal and Anti-Thyroglobulin Antibodies," submitted to JOURNAL OF CLINICAL ENDOCRINOLOGY AND METABOLISM, February 1970.

Kriss, J. and S. McHardy-Young, "Simplified Technique for the Radioimmunoassay of Human TSH," JOURNAL OF NUCLEAR MEDICINE, vol. 10, p. 356, 1969, (abstract).

Kriss, J., S. McHardy-Young, and H. Kaplan, "Serum TSH Levels Following Megavoltage Radiotherapy for Hodgkin's Disease," PROGRAM, 45TH AMERICAN THYROID ASSOCIATION, p. 83, July 1969, (abstract).

Kriss, J. and T. Mori, "Studies of a Rapid, in vitro, Binding Reaction between Human Thyroid Microsomes and Radioiodinated Long-Acting Thyroid Stimulator (LATS) lgG Globulin," PROGRAM, 45TH AMERICAN THYROID ASSOCIATION, p. 28, July 1969, (abstract).

Kriss, J., E. Glatstein, and J. Eltringham, "Serum TSH and Thyroid Function Following X-Ray Therapy in Patients with Malignant Lymphoma," CLINICAL RESEARCH, vol. 18, p. 168, 1970, (abstract).

Kriss, J. and T. Mori, "Rapid Competitive Binding Radioassay of Serum Anti-Microsomal and Anti-Thyroglobulin Antibodies: Measurements in Graves' Disease," CLINICAL RESEARCH, vol. 18, p. 170, 1970, (abstract).

Laipis, P., B. Olivera, and A. Ganesan, "Enzymatic Cleavage and Repair of Transforming DNA," PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, vol. 62, p. 289, 1969.

Luetscher, J., M. Weinberger, and R. Collins, "Oral Contraceptives and Hypertension: Clinical and Laboratory Observations," METABOLIC EFFECTS OF GONADAL HORMONES AND CONTRACEPTIVE STEROIDS, edited by D. Kipnis, et al, Plenum Publishing Corporation, 1969.

Luetscher, J., M. Weinberger, A. Dowdy, and G. Nokes, "Effects of Sodium Loading, Sodium Depletion and Posture on Plasma Aldosterone Concentration and Renin Activity in Hypertensive Patients," JOURNAL OF CLINICAL ENDOCRINOLOGY, vol. 29, p. 1310, 1969.

Luzzatti, L., R. Greenstein, D. Harris, and H. Cann, "Cytogenetic Analysis of a Boy with the XXXY Syndrome: Origin of the X-Chromosomes," PEDIATRICS, April 1970.

Luzzatti, L. and H. Pryor, "Body Proportions and Dermatoglyphic Patterns in Children with Cleft Lip and/or Palate," submitted to PEDIATRICS.

McIntosh, S., Jr., T. Weisshaar, and H. Ashley, "Progress in Aeroelastic Optimization - Analytical Versus Numerical Approaches," SUDAAR, no. 383, July 1969.

Morrell, F., "Neural Coding," NEUROSCIENCES RESEARCH PROGRAM BULLETIN, 1969.

Morris, S. and L. Shooter, "Half-Lives of Mouse Brain Synaptosomes," JOURNAL OF NEUROCHEMISTRY, in press.

Murray, G., F. Offensend, D. Silva, E. Sondik, and L. Klainer, "A Medical Service Requirements Model for Health System Design," special issue of the PROCEEDINGS OF THE IEEE ON HEALTH SYSTEMS, vol. 57, pp. 1880-1887, November 1969.

Oliver, I., O. Koskimies, R. Hurwitz, and N. Kretchmer, "Macromolecular Forms of Aspartate Transcarbamylase in Rat Liver," BIOCHEMICAL AND BIOPHYSICAL RESEARCH COMMUNICATIONS, vol. 37, pp. 505-511, 1969.

Porter, R., M. Modebe, and G. Stark, "Aspartate Transcarbamylase: Kinetic Studies of the Catalytic Subunit," JOURNAL OF BIOLOGICAL CHEMISTRY, vol. 244, pp. 1046-1057, April 1969.

Reynolds, W., "Instrumentation in a Time Shared Computer Environment," RESEARCH AND DEVELOPMENT, pp. 20-26, April 1970.

Reynolds, W., V. Bacon, J. Bridges, T. Coburn, B. Halpern, J. Lederberg, E. Levinthal, E. Steed, and R. Tucker, "A Computer Operated Mass Spectrometer System," submitted to ANALYTICAL CHEMISTRY, 1970.

Sachs, D., E. Jellum, and B. Halpern, "Determination of the Stereospecific Hydrolytic Action of Pepsin by Nuclear Magnetic Resonance Spectroscopy," BIOCHEMICAL AND BIOPHYSICAL ACTA, vol. 198, pp. 88-92, 1970.

Schneiderman, L., W. Sampson, W. Schoene, and G. Haydon, "Genetic Studies of a Family with Two Autosocial Dominant Conditions," AMERICAN JOURNAL OF MEDICINE, vol. 46, p. 380, 1969.

Schneiderman, L., L. DeSalvo, S. Baylor, and P. Wolf, "The 'Abnormal' Screening Laboratory Result: Its Effect on Physician and Patient," AMERICAN FEDERATION OF

CLINICAL RESEARCH, 1970, (abstract).

Smith, R., "Discussion Tasks as a Measure of Family Role Structure: Implications for the Study of Pathological Families," submitted for publication in JOURNAL OF PSYCHIATRIC RESEARCH.

Smith, R., "Discussion Versus Communication Network Tasks in the Study of Family Role Structure," submitted for publication in JOURNAL OF NERVOUS MENTAL DISEASES.

Solomon, G., "Stress and Antibody Response in Rats," INTERNATIONAL ARCHIVES OF ALLERGY AND APPLIED IMMUNOLOGY, vol. 35, pp. 97-104, 1969.

Stillman, R., W. Roth, K. Colby, and P. Rosenbaum, "An On-Line Computer System for Initial Psychiatric Inventory," AMERICAN JOURNAL OF PSYCHIATRY, vol. 125, p. 7, January 1969.

Strickland, R., "The Effect of Prednisolone on Gastric Function and Structure in Man," GASTROENTEROLOGY, vol. 56, pp. 675-686, 1969.

Swanson, G., T. Carpenter, D. Snider, and J. Bellville, "A Bioengineering Approach to the Study of Human Respiratory CO_2 Regulation through an On-Line Hybrid Computing System," to be submitted to COMPUTERS AND BIOMEDICAL RESEARCH, April 1970.

Thathachari, Y., "X-Ray Diffraction Studies on Melanins," PROCEEDINGS OF THE VII INTERNATIONAL PIGMENT CELL CONFERENCE, Seattle, Washington, 1969.

Thathachari, Y. and M. Blois, "Physical Studies on Melanins: X-Ray Diffraction," BIOPHYSICAL JOURNAL, vol. 9, no. 1, pp. 77-89, 1969.

Thathachari, Y., "Radial Distribution Studies on Melanins," PROCEEDINGS OF THE THIRD INTERNATIONAL BIOPHYSICS CONGRESS, Cambridge, Massachusetts, August-September 1969.

Thoman, E., S. Levine, and R. Conner, "Suppression of Hormonal and Behavioral Responsiveness to Stress in Lactating Rats," JOURNAL OF COMPARATIVE AND PHYSIOLOGICAL PSYCHOLOGY, in press.

Thoman, E., A. Turner, P. Leiderman, and C. Barnett, "Neonate-Mother Interaction: Effects of Parity on Feeding Behavior," CHILD DEVELOPMENT, in press.

Thoman, E. and A. Korner, "Behavioral Responsiveness to Vestibular Stimulation in Infant Rats," submitted for publication.

Weinberger, M., R. Collins, A. Dowdy, G. Nokes, and J. Luetscher, "Hypertension Induced by Oral Contraceptive Containing Estrogen and Gestagen - Effects on Plasma Renin Activity and Aldosterone Excretion," ANNALS OF INTERNAL MEDICINE, vol. 71, p. 891, 1969.

Wiederhold, G. and L. Hundley, "A Timeshared Data-Acquisition System," PROCEEDINGS

OF THE IEEE COMPUTER GROUP CONFERENCE ON REAL-TIME SYSTEMS, Minneapolis, Minnesota, June 1969.

Wiederhold, G., "An Advanced Computer System for Medical Research," PROCEEDINGS OF THE IBM JAPAN COMPUTER SCIENCE SYMPOSIUM - RESEARCH AND DEVELOPMENT AND COMPUTER SYSTEMS, Tokyo, Japan, pp. B1-B15, November 1969.

Wiederhold, G., "Setting Up a General-Purpose Data-Acquisition System," PROCEEDINGS OF THE IBM SCIENTIFIC COMPUTING SYMPOSIUM ON COMPUTERS IN CHEMISTRY, Data Processing Division, White Plains, New York, pp. 249-264, August 1969.

Wiederhold, G. and G. Breitbard, "A Method for Increasing the Modularity of Large Systems," IEEE COMPUTER GROUP NEWS, vol. 3, no. 2, p. 30, March/April 1970.

Wolf, P., T. Durbridge, and D. Enlander, "An Evaluation of SNOP Coding of Pathologic Data for Computer Retrieval," LABORATORY MEDICINE - THE BULLETIN OF PATHOLOGY, pp. 400-401, December 1969.

SUMMARY OF RESOURCE EXPENDITURES

	SRR Allocation (when applicable)			Total Resource Expenditures		
	Actual Previous Budget Period	Current Budget Period	Estimate Next Budget Period	Actual Previous Budget Period	Current Budget Period	Estimate Next Budget Period
1. Personnel:						
a. Salaries & Wages	163,738	200,309	260,358	175,318	204,574	260,358
b. Fringe Benefits	18,871	23,959	35,842	20,082	24,484	35,842
Subtotal	182,609	224,268	296,200	195,400	229,058	296,200
2. Consultant Services	- - - -	1,500	1,000	- - - -	1,500	1,000
3. Equipment						
a. Main Resource-Rented	293,407	356,313	404,331	351,801	356,313	404,331
b. Main Resource-Purchased	- - - -	39,084	36,000	- - - -	39,084	36,000
c. Supporting Equipment	17,382	21,167	23,944	21,667	21,167	23,944
d. Equipment Maintenance	3,113	3,218	4,000	3,218	3,218	4,000
Subtotal	313,902	419,782	468,275	376,686	419,782	468,275
4. Supplies	20,646	17,600	20,425	21,585	17,600	20,425
5. Travel	2,362	4,000	5,000	2,462	4,000	5,000
6. Alterations & Renovations	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
7. Publication Costs	6,554	4,000	5,000	6,554	4,000	5,000
8. Other						
a. Computer Services	4,249	10,000	10,000	4,249	10,000	10,000
b. Other	8,518	18,850	34,100	8,742	18,850	34,100
Subtotal	12,767	28,850	44,100	12,991	28,850	44,100
9. Subtotal - Direct Costs	538,840	700,000	840,000	615,678	704,790	840,000
10. Indirect Costs	93,221	118,182	153,611	98,026	120,699	153,611
11. Total Costs	632,061	818,182	993,611	713,704	825,489	993,611

	CURRENT BUDGET PERIOD		ESTIMATE FOR NEXT BUDGET PERIOD	
	SRR	Total	SRR	Total
1. PERSONNEL *				
Management	27,528	27,528	46,500	46,500
Programmers	76,283	80,548	81,038	81,038
Other Professionals	23,708	23,708	31,500	31,500
Research Assistants	4,614	4,614	8,079	8,079
Operations	52,593	52,593	53,600	53,600
Technicians and Machinists(1)	3,121	3,121	- - -	- - -
Secretarial and Administrative	12,462	12,462	12,500	12,500
Subtotal - Salaries	200,309	204,574	233,217	233,217
Staff Benefits				
11.6% August, 1969 12.3% 9/1/69 - 8/31/70 13.9% 9/1/70 - 8/31/71	23,959	24,484	32,106	32,106
TOTAL PERSONNEL	224,268	229,058	265,323	265,323

*Supplemental detail submitted to SRRB N.I.H.

(1)Function and personnel transferred to Stanford Computation Center
Engineering Services group.

	CURRENT BUDGET PERIOD		ESTIMATE FOR NEXT BUDGET PERIOD	
	SRR	Total	SRR	Total
2. CONSULTANT SERVICE	1,500	1,500	500	500
3. PERMANENT EQUIPMENT				
IBM 360/50				
1052-50618	638	638	635	635
1403-14708	8,442	8,442	8,397	8,397
2050-11047	94,494	94,494	97,348	97,348
2314-11149 and 12326	106,378	106,378	105,840	105,840
2361-10102	76,553	76,553	76,161	76,161
2401-10877	3,394	3,394	3,377	3,377
2403-70738	9,095	9,095	8,971	8,971
2540-12531	6,686	6,686	6,653	6,653
2701-11144	10,379	10,379	10,332	10,332
2702-20185	15,823	15,823	16,834	16,834
2821-12464	10,992	10,992	10,937	10,937
2316-(16 units)	3,226	3,226	3,226	3,226
2741-(10 units) (12 units 311-05)	10,214	10,214	12,257	12,257
Subtotal, Main Configuration	356,313	356,313	360,968	360,968
IBM 1800 - Additional Units				
1442 -	2,604	2,604	2,591	2,591
1826 -	7,701	7,701	7,691	7,691
1856 - Analog Inputs	- - -	- - -	1,373	1,373
	10,305	10,305	11,655	11,655
Unit Record Equipment 029 - (replace with C22 in FY1971)	679	679	1,055	1,055
Data Set Rental (includes line rental)				
328-7393	519	519	519	519
327-9200	6,606	6,606	7,339	7,339
328-3189	433	433	433	433
77-KD-200	768	768	768	768
77-KD-1647	720	720	720	720
321-3870	1,137	1,137	1,137	1,137
2 add. lines next year	- - -	- - -	318	318
	10,183	10,183	11,234	11,234

	CURRENT BUDGET PERIOD		ESTIMATE FOR NEXT BUDGET PERIOD	
	SRR	Total	SRR	Total
3. PERMANENT EQUIPMENT (Continued)				
IBM 2321-1, Data Cell, del. Feb., 1971. Monthly rental $2,800 - 10% EA, + 5% tax	- - -	- - -	15,786	15,786
IBM 2841, Data Cell Control, del. Feb., 1971. Monthly rental $525 - 10% EA, + 5% tax	- - -	- - -	2,977	2,977
Subtotal Leased Equipment	377,480	377,480	403,675	403,675
Purchased Equipment				
3 graphics terminals with interface	15,000	15,000	- - -	- - -
2 acoustic couplers	760	760	- - -	- - -
IBM 1800 additional core	- - -	- - -	16,000	16,000
Graphics Control Device	23,324	23,324	- - -	- - -
Subtotal Purchased Equipment	39,084	39,084	16,000	16,000
Maintenance	3,218	3,218	4,000	4,000
TOTAL EQUIPMENT	419,782	419,782	423,675	423,675
4. Consumable Supplies				
Office	3,600	3,600	3,000	3,000
Engineering	2,000	2,000	1,000	1,000
Computer	12,000	12,000	13,402	13,402
	17,600	17,600	17,402	17,402
5. Travel	4,000	4,000	4,000	4,000
6. Alterations and Renovations	none		none	
7. Publications Costs	4,000	4,000	4,000	4,000
8. Engineering Services (by S.C.C.)	9,500	9,500	15,000	15,000
9. Computer Services 360/67 and auxiliary from Campus Facility - SCC	10,000	10,000	10,000	10,000
10. Other Expenditures				
Books and Periodicals	150	150	200	200
Postage and Freight	400	400	500	500
Telephone and Telegraph	7,000	7,000	7,000	7,000
Physical Plant	300	300	400	400
Technical Services	500	500	500	500
Total Other Expenditures	8,350	8,350	8,600	8,600
11. IBM S.E. service, program products, and staff training	1,000	1,000	1,500	1,500
GRAND TOTAL DIRECT COSTS	700,000	704,790	750,000	750,000

SUMMARY OF RESOURCE FUNDING

	BUDGET PERIODS		
	Actual Previous Budget Period	Current Budget Period	Estimate Next Budget Period
SOURCE OF FUNDS			
Service Charges (when applicable): (Identify individual rates)	$ 37,277	$170,000	$220,000
Consulting/Programming			
Peripheral Equipment			
Computer Equipment			
Other Service Charges			
Subtotal			
Institution Funds			
Other Support (identify source)			
1. Equipment Rent Refund	35,460		
Subtotal			
SRR Support			
Amount of Current Award: (Line (5) of Award Statement)	559,324	712,689	709,104
Adjustments from prior periods			
1. Line 4 of current award statement	———	0	64,507
2. ROE Adjustment			
Total SRR Support	———	———	———
TOTAL FUNDING	$632,061	$882,689	$993,611

Budget Justification

| | FY 1970 | | | FY 1971 | | | |
	CURRENT AWARD	CURRENT EXPENDITURES	VARIANCE	COUNCIL APPROVED BUDGET BASE	REQUESTED BUDGET RESTORATIONS	CONTINGENCY ITEMS	TOTAL BUDGET
Personnel	221,905	224,268	2,363	265,323	30,877		296,200
Consultants	1,500	1,500	- - - -	500	500		1,000
Equipment	407,390	419,782	12,392	423,675		44,600	468,275
Supplies	25,852	17,600	<8,252>	17,402	3,023		20,425
Travel	4,000	4,000	- - - -	4,000	1,000		5,000
Publications Costs	5,000	4,000	<1,000>	4,000	1,000		5,000
Engineering Services	- - - -	9,500	9,500	15,000	5,000		20,000
Computer Services	10,000	10,000	- - - -	10,000			10,000
IBM S.E. Service, Program Products, Staff Training	16,380	1,000	<15,380>	1,500	1,500	2,500	5,500
Other	7,973	8,350	377	8,600			8,600
TOTAL DIRECT	700,000	700,000		750,000	42,900	47,100	840,000
INDIRECT@57/59%	112,689	118,182					153,611
TOTAL OPERATING COSTS	812,689	818,182					993,611

FUNDING

Service Charge Income Estimate	100,000	170,000					220,000
SRR Support	712,689	712,689					709,104
Requested Carryover to RR 311-05		<64,507>					64,507
TOTAL FUNDING	812,689	818,182					993,611

Budget Justification

The table on the preceding page presents estimated costs for the current fiscal year (both as awarded and an updated estimate). It also presents the original estimate for FY1971, and a current estimate for the coming year which starts August 1, 1970.

In summary, ACME expects to spend $700,000 in direct costs in the current year and to receive user fees or income of about $170,000. For next year, costs are estimated at $750,000 for the base program plus an additional $90,000 for desirable budget restorations and contingency items. The budget justification material presented below contains three parts: (1) changes between amounts awarded and amounts to be expended in current year by budget elements; (2) review of base program requested for next fiscal year; and (3) explanation of proposed additions to base budget for next year and contingency items.

The major variation in expenditures for the current year is found in the part of the award allocated for services by IBM personnel as a result of IBM's un-bundling. The Stanford Computation Center has adopted a position which does not permit acceptance of the IBM service engineering service agreement under its current restraints and conditions. Further, the IBM Service Engineer who has been servicing ACME's support needs, was transferred to the marketing group. ACME did receive some assistance from the former IBM Service Engineer, but was forced to use some of its own staff time to maintain the system software. S. E. Service on IBM's Operating System continues to be given without charge. The IBM S. E. service, programs, products, and staff training were budgeted to cost $16,380, but will result in less than $1,000 in actual cost. A second major change area involves engineering and technician services. In the past, ACME employed its own engineer and technicians. During the past year, ACME elected to use the services

of the Engineering Services Group attached organizationally to the Stanford

Computation Center. These services are no longer budgeted under "salaries";

a new budget category of "Engineering Services" has been added. Finally, the

funds originally budgeted for a second interactive graphics unit have been

applied to the purchase of three add-on graphics units plus an input/output

device control system. This equipment acquisition is the subject of separate

correspondence in which N. I. H. approval is being sought at present.

Revenue from service charges in FY1970 will exceed the estimates prepared

one year ago by approximately $70,000. Last July, user charges were estimated

at $100,000 for the-04 year. This estimate was made on a highly conservative

basis since this was to be the first full year of user charges and the impact of

such charges was not known. During the past fiscal year, most of our users have

become eligible to pay on the anniversary date of their grants. In the first

half of the year, it became apparent that the original estimate was too low.

A major rate decrease was made effective mid-February 1970, this gave some

relief to the researchers whose grant funds had been reduced from earlier ex-

pectations. During May, 1970, ACME received income of approximately $14,000.

Therefore, much of the effect of the rate reduction has been offset by increased

utilization by paying users as well as an increase in the number of paying users.

The ACME renewal proposal included a budget for the second year of the three-

year renewal amounting to $812,000. The Site Review Committee and N. I. H.

Research Council have recommended that ACME be supported at a level of only $750,000

in Year 5. Therefore, a base budget of $750,000 has been prepared; however, it

must be emphasized that some incremental funding over the $750,000 level is

deemed essential in order for ACME to achieve a reasonable number of the goals

established in the renewal proposal and to fulfill the requirements set down by

the ACME users.

The base budget of $750,000 fails to provide adequate funding from ACME's

viewpoint. If no more than this cost level were made available, the core research

activities would suffer. ACME's top priority must now be placed on serving a

community of users; and the development of new facilities and structures will

have to be assigned a relatively lower priority. Also, the base budget permits

no expansion of hardware facilities to accomodate growing user demands. (One

minor exception to this statement is the purchase of additional core for the

1800 system which has been retained in the base budget because of the extreme

need for added 1800 core for real time users.)

A desirable budget for ACME for the next fiscal year (FY1971) would be

$840,000. This level of authorized cost ceiling would provide $42,900 for

personnel, services, and supplies for development activities and expanded

operating hours, and $47,000 for so-called "contingency" items. The items associated

with each of these figures are presented below. In order to reduce the "desired"

budget level to the base budget level, the following personnel costs were with-

drawn:

System Programmer	$15,400
User Consultant (1/3)	4,262
Research Assistance	3,564
Secretarial Assistance	1,000
Computer Operators (for two added shifts per weeek)	2,915
subtotal, salaries	27,141
Staff Benefits on Above	3,736
Total, personnel	$30,877

The system programmer position identified above would constitute a reduction

from present staff, or a redirection of charges to a user group. It is questionable

whether alternate funding could be found in the current tight money situation.

One-third of an exisiting full-time user consultant has been withdrawn from the

base program budget with the assumption that his time will be charged to users'

projects. The research assistance item would cover the hiring of graduate student

assistants to help with various development tasks at ACME. Historically, such

student help has been found to be highly productive and creative. The secretarial

assistance item reflects a part-time position created during the last year to

reduce the amount of clerical work for the professional staff. The tight budget

situation will cause elimination of this part-time position with the consequent

transfer of clerical functions back to other staff. Finally, the additional

shifts of operator coverage have been withdrawn. It was intended that the grave-

yard shifts on Sunday and Monday mornings would be covered during the coming year.

As evening and nighttime use by users increase, it will become increasingly

necessary for system functions to be performed on weekends and for the users' data

on ACME to be available around the clock.

Other budget cuts from a "desired" budget level, exclusive of contingency

items, were:

Outside Consulting	$ 500
Travel	1,000
Publications	1,000
Engineering Services	5,000
IBM Products and Services	1,500
Supplies	3,023
	$12,023

These were arbitrary cuts made in order to get the budget level down to $750,000.

The most significant two items involve engineering services and IBM products and

services. The engineering services budget has been cut from $20,000 to $15,000.

It is likely that this leaves adequate funds for maintenance functions but nearly

zero funding for development tasks. The IBM product and service budget items

covers customer engineering service, system engineering service, and IBM educational

courses. One system programmer course which we would like to make available for a

staff person costs $2,500. This one course is highly recommended but has not been

budgeted specifically. The education courses generally cost $80 to $150 for three

to five day courses. The major six week course costing $2,500 will be incorporated

in the contingency budget.

Contingency items which ACME feels should be included in the FY1971 (RR 311-05) budget include the following:

Added on-line storage (such as data cell and control unit, rented for six months)	$18,800
Second 2701 to accomodate added real time users or special devices (6 months rent)	5,800
Three additional "add-on" graphics units and interface hardware	15,000
Portable typewriter terminal and modems	5,000
Sub Total Equipment	44,600
System Programmer six week course	2,500
Total	$47,100

The added on-line storage device would supplement the two existing 2314 disk drives. It is assumed that normal system growth will result in need for some additional storage capacity within one year. The exact timing of this need is difficult to predict. The second 2701 device is likely to be needed within six months. The present 2701 device has four ports of which three are now used regularly. Support for new devices such as strip printers, mark sense readers, etc. would require additional port capacity from 2701's. In addition, satellite computer systems would likely be connected to the system via a 2701 port. Three "add-on" graphics would simply expand the number of public graphics terminals available to the users. The portable terminal and modems would prove useful for both staff and users of ACME. The portable terminal would facilitate work at home on evenings and weekends as well as presentations to prospective users of the system in their laboratories.

ACME proposes to use FY1970 income in excess of the $100,000 estimate to fund the non-contingency additions to the base budget level as well as the contingency items identified above.

Income for FY1971 (RR 311-05) would amount to $180,000 if the average monthly user fees were equal to May, 1970 fees. Some increase in paid usage appears

reasonable based upon overall utilization history. Therefore, ACME projects user

fees for page minutes and disk storage at $220,000 for FY1971. Some attempt

has been made to allow for rates, the tight money situation, user eligibility

to accept charges in FY1970, normal usage growth, and resource capacity in

making this estimate.

Category 1

Name: Anderson, D.   Project: JOAN

Department: Genetics

Project Description: The project involves instrumentation and control of a
    mass spectrometer using a time-shared computer system interfaced with
    smaller data gathering devices.

Name: Bacon, V.   Project: GAME

Department: Genetics

Project Description: Data collection, storage, analysis from Finnigan 1015
    mass spectrometer. In this on-line project, the decision making capa-
    bilities of the computer are coupled with those of an operator to direct
    the operation of a Finnigan 1015 quadrupole mass spectrometer.

    The computer is used to actively direct the operation of the mass spec-
    trometer by controlling the mass filtering system of the instrument.
    It is used to recognize and control the voltage changes which define
    mass peaks and enable the rapid collection and presentation of data.

    The computer traces out peak shapes of the known masses in a reference
    gas allowing the operator to determine correct mass positions, and to
    enter any shifts in calibration into the computer register for compensa-
    tion automatically.

    While taking data, the information may be displayed on an oscilloscope
    or recorded on magnetic tape. Once data is acquired, the structural
    identification of organic compounds is made from orthogonal coordinate
    or spiral base plots of mass spectra made by computer direction of a
    calcomp plotter. The system is also used to analyze gas liquid chromato-
    graph effluent permitting the structural identification of mixtures of
    organic compounds.

    Stored data offer the future possibility of spectra matching of unknown
    compounds.

Name: Bridges, J.   Project: JOY

Department: Genetics

Project Description: Write programs to control a quadrapole mass spectrometer;
    collect, manipulate, and plot data from same.

Name: DeGrazia, J.   Project: CLINIGAS

Department: Nuclear Medicine

Project Description: This project supplements a second project, RADIOGAS,
    whose purpose is the development of a project co-ordinating the use
    of a computer with an instrument called a metabolic gas analyzer.
    In contrast to RADIOGAS which will be used primarily for program
    development, this project will provide for the routine handling of
    patient data from studies where program development has been basically
    completed. This will allow us to account for our patient computer
    time independently of RADIOGAS.

Name: Hanawalt, P.   Project: TRI_CARB

Department: Biological Sciences

Project Description: The project involves the use of radioisotope tracers
    in studies of the molecular biology of cell growth and repair of damage
    to genetic material. Materials studied include normal and malignant
    human cells in culture as well as polio and adeno-viruses and various
    other virus and bacteriophage systems important to medical research.

Name: Harrison, D.   Project: CATH_LAB

Department: Cardiology

Project Description: An extensive cardiac catheterization data analysis
    program has been developed. Statistical analysis of the results ob-
    tained by the computer justify routinely using such a program on a day-
    by-day basis for calculation of the results of cardiac catheterization.
    This would greatly decrease the amount of time a physician need spend
    after the catheterization in analysis of the data. Because of the time
    required to complete a catheterization, the large size of the program
    and the fact that it is resident in core while data is being collected,
    serious consideration is now being given to the use of digitally coded
    magnetic tapes which may be played back after the completion of the
    catheterization. This would result in decreased computational cost.
    In addition, other catheterization laboratories in the area may then
    be in a position to utilize such a program.

    Given the necessary computer reliability to routinely analyze catheteri-
    zation data, a program is available to automatically transfer the results
    of computation to a patient record in a data file. Forms are available
    which will be used to obtain clinical, X-ray, EKG, and surgical followup
    data permitting statistical correlations on a large group of patients.

    ACME is also being used to develop a program for recognition of abnormal
    EKG complexes. In the near future, we hope to be able to use such a pro-
    gram in a computer devoted to monitoring of Coronary Care Unit patients.

    In view of the cost of the analysis of a complete cardiac catheterization,
    new programs are being developed for a small computer system to carry on
    the same type of analysis of the catheterization data as was originally
    programmed in the ACME system. These new systems will be compared for
    accuracy and reproducibility with the old system presently being utilized
    under the ACME Facility.

Name: Jones, R.   Project: FLU

Department: Biochemistry

Project Description: Work with ACME centers around a nanosecond fluormeter
    designed by Stryer, et. al. which measures kinetics of fluorescence as
    a function of time directly. Data acquisition is accomplished through
    the 1800, and subsequent data reduction is carried out in the 360/50
    proper. The instrument as a whole has been used to determine 1)
    excited state lifetimes of various organic fluorescent compounds;
    2) rotational relaxation times of various proteins, using fluorescent
    labels to determine rotational behavior of the protein in both natural
    and denatural states; and 3) excited state proton-transfer reactions.

Name: Kennedy, D.   Project: NERVOUS

Department: Biological Sciences

Project Description: Perform several basic methods of analysis of neuro-
    physiological data: 1) preliminary conversion of analog to digital
    form of neuronal data, 2) reduction of these data with tabulation and
    graphical display, and 3) statistical treatment of the data, including
    visual display of the results. Further simulation and modelling of
    neuronal systems are also planned on ACME, including Monte Carlo and
    deterministic models.

    Proposed research involving ACME is directly related to an understanding
    of the nervous system. All results support and supplement most medical/
    clinical aspects of neurophysiology.

Name: Lederberg, J.   Project: NOHANDS

Department: Genetics

Project Description: Research and development in methods of automating
    the operation and service on the Finnigan 1015 mass spectrometer
    in the IRL exobiology labs.

Name: Lederberg, J.   Project: LEARN

Department: Genetics

Project Description: Program instruction; work area for programming and
    instrumentation use practice.

Name: Liebes, S.   Project: MS

Department: Genetics

Project Description: This project is directed toward the development and
    application of techniques of high-spatial-resolution mass spectroscopy
    to organic materials of biological interest. The current investigation
    involves the use of focused radiation from a pulsed ruby laser to
    vaporize portions of solid samples in the ionization chamber of a Bendix
    Time-of-1Flight mass spectrometer. The plume of vaporized material is
    ionized by electron bombardment, and the time evaluation of the mass
    spectra of these ions is monitored at a 10-kc/sec repetition rate.

    The materials so far studied include amino acids, the nitrogenous
    base constituents of DNA, samples of DNA, nucleohistone, lymphocytes,
    fibroblasts, and red blood cells. We are moving now to the comparison
    of normal versus abnormal blood and tissue samples.

    The ACME Computer Facility serves the following important supportive
    functions:

        1. Automation of data acquisition.

        2. Storage of all derived mass spectral data.

        3. Manipulation and comparison of data--certain aspects of these
    operations involve extensive use of the interactive television graphic
    display.

        4. Performance of analytical studies related to the interpretation
    of data, the refinement of existing instrumentation, and the development
    of new apparatus.

Name: Reynolds, W.   Project: S007

Department: Genetics

Project Description: This project supports the basic development of automated
    mass spectrometer and other instrumentation systems.

    The mass spectrometer has become of interest in the biochemistry field.
    In the case of DNA and related structures, the basic principles involved
    are common to at least the Genetics Department and to the Organic Chemistry
    Department. Hence the efforts of this project span over five mass spec-
    trometers in three diverse locations on the Stanford campus. The technical
    development consists in the origination of instrumentation concepts and the
    realization, in both hardware and software, of complete operating systems.

    These systems are intended to automate the mass spectrometers (low reso-
    lution Bendix t-o-f, Finnigan quadrupoles, Atlas CH-4, and a high resolu-
    tion AEI MS-9) and to provide the following benefits to the biological
    user-researcher: Saving of the researcher's time in instrument operation
    and data reduction, and improving the quality of the data, improving the
    presentation of the data, and fostering computer files of pertinent data.

    This is being accomplished by basic research and development in the ap-
    plication of computers, both dedicated and time-shared in the field of
    computer-instrument integration.

    The ACME system is being used as the final computer in the automated system
    and as an engineering design aid to achieve the final systems. Some phases
    of this development are in current use. In these cases the usage is sup-
    ported by other projects, i.e., VABACON.GAME.

Name: Stryer, L.   Project: NANOS

Department: Biochemistry

Project Description: The principal aims of the research are: (1) to acquire
    an understanding of mechanisms of electronic excitation energy transfer,
    (2) to develop novel fluorescence and phosphorescence methods which can
    provide detailed information concerning the structure and dynamics of
    biological macromolecules, and (3) to apply these optical techniques to
    obtain insight into aspects of the structure and function of selected
    proteins.

    The experimental approach which is used in these studies involves: (1)
    the synthesis of model compounds which serve to define relationships
    between observable emission parameters and structure, (2) the synthesis
    of fluorescent and phosphorescent labeling reagents which have appropriate
    spectral properties and can be specifically attached to defined sites on
    proteins, and (3) the development of optical instrumentation of kinetic
    measurements in the nanosecond time range and for the detection of fluor-
    escence and phosphorescence emission from membranes and cells.

Name: Tucker, R.   Project: MS

Department: Genetics

Project Description: The project consists primarily of developing a com-
    puter system for the control of a quadrupole mass spectrometer-GLC
    apparatus and the collection, analysis, and presentation of the re-
    sulting data. This system utilizes the 1800 computer to transfer
    control data from the 360/50 to the mass spectrometer and to digitize
    the output of the mass spectrometer for storage in the ACME file system.
    This bidirectional data flow results in the mass spectrometer being
    "set" to successive predetermined position rather than scanned in the
    conventional manner. The data is presented to the user in the form of
    tabular listings and bargraph plots produced by a digital plotter lo-
    cated in the laboratory and driven by the 1800.

Name: Wilson, D.   Project: NERVOUS

Department: Biological Sciences

Project Description: Use ACME in order to perform several basic methods of
    analysis of neurophysiological data: 1) preliminary conversion of analog
    to digital form of neuronal data, 2) reduction of these data with tabu-
    lation and graphical display, and 3) statistical treatment of the data,
    including visual display of the results. Further simulation and model-
    ling of neuronal systems are also planned on ACME, including Monte Carlo
    and deterministic models.

    Proposed research involving ACME is directly related to an understanding
    of the nervous system. All results support and supplement most medical/
    clinical aspects of neurophysiology.

Name: Yguerabide, J.   Project: LUM

Department: Biochemistry

Project Description: Same project description as for L. Stryer, Biochemistry
    Department, project NANOS.

Name: Zwick, M.   Project: CRYSTAL

Department: Biochemistry

Project Description: This project concerns the development of new theoretical
    techniques for the solution of protein crystal structures. The method
    currently used, "isomorphous replacement," generally requires a team
    of scientists working for a number of years with no guarantee of success.
    This method has the surprising feature that it makes virtually no use
    of a great deal of a priori stereochemical information about proteins:
    e.g., the bond distances and angles of the repeating pephile unit in the
    protein backbone or on the amino acid side-chains. Hence it is very
    plausible that new improved methods might be developed which utilize such
    information and which can solve protein structures much more rapidly
    and easily. In this project, attempts are being made to define a new
    set of variables which can specify the protein structure, which is much
    smaller and hence more easily determinable than the set of atomic
    coordinates. This new set of variables might conceivably be determinable
    simply from the X-ray intensities of the native crystal, i.e., isomorphous
    derivative may not be required. The new set of structure variables are
    designed to implicitly include the fact that a protein is a linear polymer
    folded up in some manner in three dimensions, and that this polymer has
    a set of well known bond distances and angles in its repeating unit and
    in its branching side chains.

Category 2

Name: Atkinson, M.   Project: FLYHIGH

Department: Stanford Medical School - Admissions Committee

Project Description: This project is a series of programs to assist the
     Admissions Committee in selecting new Medical School classes. The
     programs all work off of one large file which contains information on
     the applicants. Included in the programs are file creation and update,
     listing, and sorting programs. The sorted listings are then used by
     the Committee to aide in decision making.

Name: Bagshaw, M.   Project: PLAN

Department: Radiology

Project Description: Research is under way, and we hope to be able to use ACME
     to provide the radiation therapists with: 1) external beam treatment plan-
     ning, 2) interstitial and intracavitary dose calculation, and 3) data ac-
     cession and retrieval.

Name: Bergstresser, P.   Project: FLOW

Department: Dermatology

Project Description: Compute blood flow in fingers and toes. The values are
     derived from experimental data and converted to flow, expressed in cc/
     min/100cc digit.

Name: Brown, B. W.   Project: CONSULT

Department: Community & Preventive Medicine

Project Description: Computations done in support of a multitude of public
    health research projects.

Name: Brown, B. W.   Project: RESEARCH

Department: Community & Preventive Medicine

Project Description: Development of new biostatistical techniques.

Name: Brown, B. W.   Project: BIOSTAT

Department: Community & Preventive Medicine

Project Description: Conduct various statistical computations in support of
    research carried out by members of the Department of Anesthesia under
    their Program Projects Grant from NIH.

Name: Crowley, L.   Project: WNDSTUDY

Department: Surgery

Project Description: Study of results of antibiotic agents instilled into
    wound at time of surgery to reduce infection rate of general surgery
    patients.

Name: Durbridge, T.   Project: ROOT

Department: Pathology

Project Description: 1) Statistics: using ACME subroutines, programs, and
    minimal own coding to compute statistics for S.V.H. research projects.
    2) Pathologese S.N.O.P. translation: working with Derek Enlander on
    same.

Name: Enlander, D.   Project: cl050937

Department: Clinical Lab

Project Description: Back-up routines for the clinical lab computerization
    main project. These routines will consist of statistical analysis of
    the data generated in the clinical lab.

Name: Fletcher, G.   Project: DIALYSIS

Department: Anesthesia

Project Description: Statistical analysis of laboratory results from in-
vivo and in-vitro studies of uptake, metabolism, and elimination of seda-
tive drugs.

Name: Forrest, W.   Project: ANALGESI

Department: Anesthesia

Project Description: Same project description as for project DATA.

Name: Forrest, W.   Project: DATA

Department: Anesthesia

Project Description: We use the 360/50 time sharing real-time system to research
   the management and statistical application of methods to the Cooperative
   Study. Problems of pilot studies, data validity, quality, cost of clinical
   trials and useful reduction of data for active sane management are constantly
   evaluated and updated. The plan is to develop an inexpensive system of
   quality and quantity control of large masses of clinical data from several
   sources so that data diarrhea and "gigo" are diagnosed properly and treated
   prophylactically rather than symtomatically.

Name: Grindle, J.   Project: ROSAN

Department: Community & Preventive Medicine

Project Description: The purpose of this project is to correlate the lab-
   oratory and clinical findings in newborn infants with respiratory dis-
   tress syndrome who have been treated with oxygen and mechanical ventil-
   ation. This is a new and unusual group of infants whose natural his-
   tories have been significantly modified by treatment, and who have a
   disease due in part to oxygen toxicity. The disease was first discovered
   at Stanford by Dr. William Northway (Radiology) and Dr. R. Rosan
   (Pathology).

   In this analysis, we seek to correlate the oxygen doses, clinical his-
   tories, and biochemical analyses of the endobronchial secretions. The
   latter analyses, result of a technic also invented at Stanford by our
   group, include DNA/protein ratios, distribution of DNA and protein in
   soluble and insoluble fractions of secretions, and gel acrylamide dis-
   continuous electrophoreses of the fractions. The aim of the computer-
   assisted study is to set up a matrix covering the principle parameters
   and variables in order to permit extraction of the most significant
   correlations.

   The number of elements and categories in the matrix is too large to
   permit of conventional treatment. This is particularly true for the
   electrophoreses, there being some 163 possible band positions in the
   system studied with the resolution used. Therefore, use of the com-
   puter is essential in extracting the most significant and useful in-
   formation from this study of human patients.

71

Name: Hilf, F.   Project: BLACKBOX

Department: Psychiatry

Project Description: We are conducting a study in which paranoid and non-
     paranoid psychiatric patients are tested on-line with the ACME computer.
     The patients are presented with stimuli in the form of character strings
     and are prompted for responses. Reinforcement is non-contingent at
     several different probability levels. An analysis of responses will be
     conducted to see if this method is useful in differentiating paranoid
     from non-paranoid patients.

Name: Hogness, D.   Project: OREGON-R

Department: Biochemistry

Project Description: Analyze experimental data. Use ACME in recognizing
     chromosome fragments in Drosophila. That is, being able to recognize
     a linear band--interband pattern and compare it to known patterns to
     determine the fragment's location, i.e., the chromosome from which it
     came.

Name: Huberman, J.   Project: TEMPLATE

Department: Biochemistry

Project Description: Using ACME to perform the lengthy and tedious calcu-
     lations required to reduce the raw data obtained in equilibrium dialy-
     sis experiments to a meaningful form. I am performing equilibrium di-
     alysis experiments with the enzyme, DNA polymerase, and various nu-
     cleotide substrates, in order to get a better understanding of the
     active site of the enzyme. Using equilibrium dialysis, it is possible
     to answer such questions as--What kinds of molecules bind to DNA poly-
     merase? How strongly do they bind? How many binding sites does each
     enzyme molecule have? The answers to these questions help in under-
     standing the structure of the active site of DNA polymerase and its
     mechanism of action.

Name: Kohen-Raz, R.   Project: ATAXIAM

Department: Pediatrics

Project Description: Diagnosis and treatment of statis balance impairment
     in educationally handicapped school children. Data processing will
     include analysis of electronic ataxia metric data, as well as analysis
     of simultaneous recordings of ataxia-grams, EMG and EEG.

Name: Koran, L.   Project: SEX

Department: Psychiatry

Project Description: We plan to use ACME to complete one, two, and three-way
     analyses of variance on test scores made by one thousand students. We
     wish to explore the relation of these scores to a number of variables
     including sex, class of college, size of home, major field, religion,
     and other demographic information. After completing the analysis of the
     data, we plan to write two articles on the relation of the students
     identifying characteristics to their knowledge as measured by the exam.

Name: Kountz, S.   Project: KIDNEY

Department: Surgery - University of California

Project Description: The ACME computer is used by the Transplant Service at
    the University of California in two areas. The first area is the selection
    of recipients for renal homotransplantation, and the storage and analysis
    of data from the follow-up on the degree of renal function in an effort to
    predict the onset of rejection crisis. The computer has been programmed
    to include sixty or more patients in the Bay Area who are on cronic hemo-
    dialysis awaiting a cadaver transplant. Their ABO blood groups and their
    HL-A antigens are stored in the computer. When a cadaver kidney becomes
    available, similar tests are performed on the donor; the kidneys are pre-
    served and the information on the donor is fed into the computer and the
    matched recipients are then selected and brought into the Hospital for
    transplantation. The second area is to measure and calculate hemodynamic
    changes in transplant patients as a means to detect early incipient
    rejection. Renal function is measured by the single injection of radio-
    isotopes and the disappearance curves are analyzed by the computer and
    compared with previous determinations. This has provided a very accurate
    method of following patients and detecting early incipient rejection. In
    the future we hope to feed all this information into the computer and
    analyze it in terms of survival in an effort to pick out which HL-A anti-
    gens or other factors might be playing a significant role in rejection
    as well as survival.

Name: Kraemer, H.   Project: PSYSTAT

Department: Psychiatry

Project Description: The work done in PSYSTAT is that of developing statistical
    programs and evaluating sets of data coming from research where output is
    not extensive enough to justify opening a separate file.

Name: Lederberg, J.   Project: DENDRAL

Department: Genetics

Project Description: This project is used to do limited generating chemical
     structures and display on Sanders 720 by interfacing.

Name: Levinthal, E.   Project: MM71

Department: Genetics

Project Description: We are just initiating efforts to use ACME for photo-
     interpretation. The direct application is for the 1971 Mars Mariner
     Orbiter Mission. The photointerpretation techniques will be appli-
     cable to medical research problems as they have already been at the
     Jet Propulsion Laboratory.

Name: Lieberman, M.   Project: RACE_GEP

Department: Psychiatry

Project Description: Project involves the measurement of the efficacy of "small
     groups" in education. Relevancy of statistical test will yield hypothesis
     testing of various such efficacies.

Name: Liebes, S.   Project: MV73

Department: Genetics

Project Description: In support of a proposed involvement, on the part
    of members of the Department of Genetics, with the imagery system
    to be landed on the surface of the planet Mars in the course of
    the Viking 1973 Lander Mission.

    The camera system will be utilized for scientific exploration of
    the Martian surface and atmosphere. Investigations will particu-
    larly be directed toward the elucidation of the petrographic char-
    acter of the Martian surface and extant or extinct biota.

    Initial effort will be devoted to design aspects of the camera
    system and an augmented microscopic capability.

Name: Liebes, S.   Project: MM71

Department: Genetics

Project Description: Investigating means of data processing for interpre-
    tation of photographic data from the Mariner Mars 1971 Orbiter program.
    Principle focus at the present is on analogue optical data processing
    by use of coherent light techniques.

Name: Lorenson, M.   Project: PFK_1

Department: Pharmacology

Project Description: A portion of the research work carried out in this
    laboratory is on the sheep heart enzyme, phosophofructokinase. Investi-
    gations are being made on the binding of carbon-14 labelled ligands to
    the enzyme. It is hoped that from these data, information will be gained
    on the molecular mechanisms by which this enzyme and possibly carbohydrate
    metabolism are controlled and regulated in vivo. The method being used
    involved chromatography on G-25 Sephadex columns which have been equili-
    brated with the radioactive ligand. In order for a thorough study,
    large numbers of columns must be run. Statistical analyses must be
    made on a large number of fractions including (1) calculation of radio-
    activity present; (2) specific activity of ligands; (3) determinations
    of units of enzyme activity; (4) determinations of protein concentrations
    and specific activities; (5) and binding and the standard deviations
    involved. In addition, the data are summarized and related to the
    concentrations of unbound ligands. If the computer were not used for these
    calculations, the information to be gained would be difficult to compile
    and the research work would be slowed considerably.

Name: Luzzatti, L.   Project: GRAGSON

Department: Pediatrics

Project Description: Programs previously utilized for statistical analysis
    of chromosome measurements in a family with chromosomal abnormalities
    are now being used for an ongoing study of the morphology of the late
    replicating X chromosome. Programs are also used for another ongoing
    study of synchronization of human lymphocytes in culture.

    The use of the ACME computer for the study of children with birth
    defects continues. In addition, a program is now available for the
    storage of anthropometric data on all patients with congenital defects.
    A study of anthropometric measurements and dermatoglyphic patterns of
    sixty children with cleft lip and/or palate, utilizing the data stored
    in the computer and computer-assisted statistical analysis, has been
    recently completed. By using computer information, we have been able
    to define certain characteristics of body configuration in children with
    clefts. Further similar studies in other syndromes are now in progress.

Name: Maffly, R.   Project: CO2

Department: Medicine - Lipid Research

Project Description: Under study is active sodium transport by the toad
    bladder. We correlate three variables: short circuit current, CO_2
    production, and $C^{14}O_2$ production. The computer is used to calculate
    the variables and to interrelate them, and to perform statistical
    analyses.

    I plan to collect data on patients with elevation of blood urea
    nitrogen and with decreased serum sodium concentration and to use
    the computer to find out the predictive value of a variety of tests
    and procedures and laboratory data.

Name: Maffly, R.   Project: TEACH

Department: Medicine - Lipid Research

Project Description: Develop programs which can be used to educate medical
    students, house officers, and fellows in the principles and practical
    aspects of water and electrolyte problems which occur in patients.
    Develop programs dealing with disorders of serum sodium concentration
    and serum urea nitrogen concentration. We have begun with a program
    obtained from Dr. William Schwartz of Tufts University Medical School
    dealing with the evaluation of acid-base disorders: data on individ-
    ual patients are presented to the computer by the student and the
    computer responds with physiologic interpretation, therapy, logic,
    and references.

Name: Miller, R.   Project: STRABIS

Department: Community & Preventive Medicine

Project Description: Define the relationship of various parameters to the
    results of strabismus surgery. It is our intention to generate, even-
    tually, a mathematical model representing the likely result of any com-
    bination of findings in such a strabismus patient. Furthermore, these
    data will be eventually organized to ascertain the most satisfactory
    strabismus operation for any set of findings.

    To date, valuable new relationships have been established in the rela-
    tionship of size, of the strabismus deviation as compared to a result
    obtained from surgical correction of the deviation, and in the linear
    relationship of the effects of tightening muscles as compared to loosen-
    ing muscles for strabismus. Numerous other linear correlations have not
    been immediately identified as important ones, but they and other par-
    ameters will be evaluated as the study progresses.

    This is an approach which is tedious and time consuming, but appears
    to offer a major improvement in result of strabismus surgery, a field
    where re-operations are required in one-third of the cases because of
    the inaccuracy of assessing data originally.

Name: Nall, M.   Project: PSORIASI

Department: Dermatology

Project Description: Psoriasis is a chronic, scaling skin disease of unknown
    etiology, which affects approximately 4% of the general population (no
    accurate figures are available). It is a lifetime disorder which does
    not take life, but indeed distroys it for all age groups.

    The Department of Dermatology of the Stanford Medical School is a world
    center for both clinical and laboratory investigations on psoriasis. As
    one phase of the over-all Psoriasis Research Program, the Department is
    engaged in a continuing investigation of the epidemiology of the disease.
    A questionnaire survey has been conducted from 1959 to date.

    Presently, the Department is conducting Series II, III, and IV of its
    questionnaire survey; doing follow-up studies on the familial incidence
    of psoriasis and the relationship of psoriasis to other diseases, i.e.,
    arthritis, diabetes, throat infection (The findings from Series I, which
    had been computerized on the 7090 are now being handled by the 360/50
    and 67.).

    We have applied to the National Research Council to participate in their
    Twin Registry of Veterans, in order to utilize the twin method in our
    study of the etiology of psoriasis. In addition, we are applying to
    utilize their registry of veterans in a large scale epidemiology
    investigation.

Name: Nall, M.   Project: MYCOSIS

Department: Dermatology

Project Description: Mycosis fungoides is a fatal skin disease of unknown
     etiology. Various chemotherapeutic agents (i.e., nitrogen mustard,
     steroids, etc.) have been utilized to abate this disease, but the
     X-ray and electron beam are the only techniques that have proven ef-
     fective in producing remissions. The Stanford School of Medicine and
     the Massachusetts General Hospital are the only facilities in this
     Country, who have applied the beam in treating mycosis fungoides;
     although recently the Varian Company has developed smaller accelerators
     which will be used in other hospitals.

     Drs. Harold Schneidman and William Watson of the Dermatology Department
     conducted a retrospective study on the effect of the electron beam in
     comparison to other methods of treatment. In a pilot study of 51 mycosis
     patients (treated at the Stanford Medical Center in the Radiology Depart-
     ment), the investigators developed a data gathering form. The coded
     information was keypunched and read into ACME as a data file, which was
     computed via a number of input-output programs. The investigators were
     able to learn from their preliminary study that by applying the electron
     beam at an early stage of the mycosis that longer periods of remission
     will result.

Name: Nye, W.   Project: STUDENT

Department: Medicine - Micro

Project Description: Under this user name, several people in the Department
     have used this project for statistical calculations and bibliography
     compilations. Several of the users have been graduate students of the
     Department or postdoctoral fellows.

Name: Petralli, J.   Project: MED_DATA

Department: Medicine - Infectious Diseases

Project Description: To improve the quality of antibiotic sensitivity data
    (high potency single disc method) and to guide the interpretation of re-
    sults and antibiotic selection a computer program has been developed.
    Clinical information and zone sizes are entered into the ACME computer
    each day. Each zone size is compared with limits based on previous re-
    sults and unusual values are challenged for further study. This system
    converts zone sizes to resistant, intermediate, or sensitive and prints
    final reports from its memory. Decreased potency of antibiotic disc
    is detected by comparison of periodically determined mean zone sizes.
    Limits of confidence of a single reading are established by review of
    zone sizes observed with a standard organism tested on different occa-
    sions. Knowledge of antibiotic sensitivities of organisms isolated from
    a specific site such as blood or urine will help to guide the selection
    of antibiotics before specific sensitivities are known. Such information
    is of value in selection of antibiotics in treating rarely encountered
    organisms with less well known sensitivity patterns or in selection of
    alternate antibiotics when the first choice drug is hazardous. Yearly
    comparison of antibiotic sensitivity patterns obtained will give infor-
    mation about major trends and suggest appropriate changes in treatment
    of various infections.

Name: Reynolds, W.   Project: TEXTS

Department: Genetics

Project Description: This is a text management project to support general
    engineering efforts in instrumentation. The project supported is:
    W. E. REYNOLDS.S007. "TEXTS" contains commercial technical data and
    information retrieval programs.

Name: Rosenberg, L.   Project: ALEXINE

Department: Medicine - Micro

Project Description: We are studying levels of serum complement in mice using
    ACME to carry out the appropriate statistical analyses and calculations.
    We are storing accumulated data on large numbers of mice of diverse pedigree.
    Using ACME facilitates data retrieval.

Name: Schneiderman, L.   Project: PATCHART

Department: Medicine - Ambulatory

Project Description: The major objective is to develop better methods of
    clinical data processing in order to increase the precision of under-
    standing of patterns and determinants of disease and to direct this
    information toward the improvement of patient care and student teaching.

Name: Cavalli-Sforza, L.   Project: PAVIA

Department: Genetics

Project Description: Programs on storage were mostly developed for simulation
    of population genetics studies. One of them was developed for the I.C.R.O.
    course, and is still being used for research purposes. It deals with
    genetic drift in a human population and takes care of the effects of age
    structure. Another simulates nutrition, drift, and selection in a haploid
    population or in a diploid population with additive selection. Others
    simulate the propagation of hemoglobin mutants in Africa. I will have
    to use these programs in the coming year, but it is difficult at present
    to estimate actual use.

    I am also planning to use ACME for a course for medical students, to
    teach computer use in simulation experiments that may illustrate the
    meaning of major statistical methods and some special use of statistics
    in medical research.

Name: Smallwood, R.   Project: MEDIPLAN

Department: Medical Facilities Planning

Project Description: The Stanford Medical Facilities Planning Project was a
    two-year project that developed several analytical tools for aiding the
    design of medical facilities. This project synthesized several techniques
    for analyzing alternative designs for medical facilities both at the indi-
    vidual nursing unit level and at the overall macroscopic level. All of these
    tools required computational facilities for their implementation. Each of
    them resulted in several computer programs, all of which were programmed in
    ACME PL/1 and used the ACME system for debugging and development.

The Stanford Medical Facilities Planning Project was completed in June 1969
    and a final report describing the results of this study has been submitted
    to the Commonwealth Fund. However, at the completion of the project there
    still remained several unanswered questions concerning the implementaion of
    the tools that were developed. Thus, an additional block of ACME service was
    allocated for testing some of the tools on a more expanded data base. This
    analysis has now been completed and a paper is in preparation that will describe
    the results of this work. In addition, a proposal for a demonstration project
    has been submitted which will, if funded, demonstrate the applicability of the
    results of this project on real design decisions faced by the Stanford
    University Hospital.

Name: Smith, P.   Project: vent1

Department: Anesthesia

Project Description: This project is to find out if any parameter of mechan-
    ical ventilation (rate, pressure vt, i.e., ratio) influences paO_2 in
    newborn infants with respiratory failure. So far ACME has been used to
    store the measured variables and perform statistical maneuvers such as
    correlation coefficient calculations. A program for estimation of
    venous lung shunt is included.

Name: Solomon, G.   Project: STRESS

Department: Psychiatry

Project Description: Concerned with the relationship of various forms of
    stress and environmental manipulation to immunity. The "STRESS" pro-
    gram is one that evaluates the significance of differences in antibody
    titers among control and experimental groups using a Kruskal-Wallis
    test of rank ordering of serial dilution tube numbers. This program
    is applicable to all of our work that involves antibody titrations by
    serial dilution, and is particularly useful for the immobilization assay
    of anti-flagellar antibody.

Name: Stuedeman, D.   Project: ADMIN

Department: Genetics

Project Description: I keep an inventory of IRL capital equipment, update it
    occasionally, use the computer to locate items, sort by room, or whatever
    is required. It can be used for preparing reports to sponsors and pre-
    forming listings in various forms. I also apply the ACME system on
    various mathematical calculations used in my work, including a study of
    the University's retirement insurance program.

Name: Weissman, I.   Project: THYMUS

Department: Pathology

Project Description: Our use of ACME has been limited to developing methods
    of applying statistical subroutines to our particular data needs. This
    has proved most valuable in handling volumes of data which required
    statistical analysis. For example, in the past year we have modified the
    chisquare and bastat subroutines to be able to compare 6 standard bits
    of data with up to 200 test items, giving the exact (p) values of each
    item. We have also studied the feasibility of setting up a program to
    analyze raw liquid scintillation spectrometry data from tissue samples,
    requiring analysis of 3 channels counting simultaneously within different
    "windows". Channels-ratios must then be obtained and compared to a
    plot of counting efficiency vs. channels ration, in order to obtain the
    actual disintegrations/minute/sample. Specific activities and fractional
    input activities must then be calculated, subtracting physical background
    counts (solution, bottles, filters) and control organ background counts.
    Until such programs are developed, and interfaced between ACME and our
    scintillation counters, we cannot properly study quantitive aspects of
    in vivo cellular migration streams in the lymphoid system.

Name: Whitcher, C.   Project: ONCALLA

Department: Anesthesia

Project Description: Computerization of the anesthesia call schedule is
    necessary because the present manual method has proved unsatisfactory.
    Scheduling is complex, excessive errors have occurred despite due care,
    and the time required to write schedules is costly in terms of profess-
    ional and secretarial time.

    The anesthesia consultant staff includes 1 to 3 research fellows, and
    12 to 14 full-time faculty physicians. Duties, responsibilities, and
    needs of these 13 to 17 individuals are diverse, including teaching,
    research, further training, as well as the administration of operating
    room, obstetrical and other forms of clinical anesthesia. Night, week
    ends, and holiday coverage must be scheduled to cover the various
    anesthetizing locations as well as vacations, sickness, and out-of-town
    meetings. Schedules are regularly prepared at monthly intervals.
    However, changes of plans frequently occur, calling for schedule revision,
    at additional expenditure of staff and secretarial effort. At least
    10 different types of night call work have to be tallied and evenly
    divided.

    The computer program already worked out offers several advantages. A
    running tally is accurate and immediately available. Schedule revisions
    required by the staff will be rapidly available and will require a mini-
    mum amount of professional and secretarial staff time. Finally, the
    estimated savings in staff time should be noted: 12 hours per month
    secretarial and an equal amount of anesthetist's time which could be
    more profitably spent in other duties such as income-producing clinical
    work.

Name: Zackheim, H.   Project: PSORIASI

Department: Dermatology

Project Description: The present study is a determination of serum copper and
    ceruloplasmin levels in patients with psoriasis as compared to other
    skin diseases and healthy controls. I anticipate at least 60 determinations.
    I will want the mean, range, and standard deviation on this data.

Category 4

Name: Brast, N.   Project: CATALOG

Department: Medical Student

Project Description: The two program files and two data files in this project
    are an experiment to develop a simple, efficient, and inexpensive arrange-
    ment for storing and searching bibliographic information, e.g., items in
    a reprint collection or references for a library research paper. I have
    used this project in connection with a paper for Physiology 150 and a
    laboratory project for Biochemistry 102.

    During the next six months I shall attempt to complete development of the
    programs and, if they prove useful, submit them to ACME for inclusion in
    the Public Program Library.

Name: Brast, N.   Project: RODENTS

Department: Medical Student

Project Description: This file contains programs which I have written for
    calculating descriptive and inferential statistics (e.g., t-test, analysis
    of variance, regression analysis) on experimental data. One of these
    programs, ANOVATWO (two-way analysis of variance, unequal numbers of data
    per cell) has been added to the ACME Public Program Library.

    In the next six months I anticipate using this file for my own use in con-
    nection with course work in the Medical School.

Name: Britt, R.   Project: STARR

Department: Medical Student

Project Description: These experiments will examine auditory pathway responses
    to meaningful acoustic stimuli. It is a common sense experience that the
    perception of sound is not determined simply by the physical parameters
    of the stimulus (intensity, spectral content), but that factors relating to
    attention, significance, and past experience also play important roles.
    An electrophysiological equivalent of the changing character of perception
    may be the dynamic alteration of evoked responses to unchanging sound
    stimuli recorded in auditory pathway of unanesthetized animals. These
    response modifications are due to activity in regulatory systems including
    the middle ear muscles, the olivo-cochlear bundle, and descending auditory
    connections. The specific experiments to be carried out are: (1) an
    analysis of single unit discharge patterns in central auditory stations in
    cats making an acoustic discrimination; (2) the effects of olivo-cochlear
    bundle activity on single unit discharge characteristics in central auditory
    pathway; and (3) the neural response pattern in auditory cortex of
    squirrel monkey in response to natural vocalizations. An analysis of how
    auditory unit discharges in response to meaningful acoustic stimuli differ
    from their response patterns to non-meaningful stimuli should extend our
    understanding of the role of the regulatory mechanisms in sound perception.

Name: Brody, W.   Project: DIAGNOSI

Department: Medical Student

Project Description: Desire to use ACME to assist medical students with learning
     the process of history-talking and formulation of differential diagnosis.
     Case histories will be entered into the computer and students will interrogate
     the computer to simulate an actual history-talking session.

Name: Brody, W.   Project: FLYHIGH

Department: Medical Student

Project Description: I am using ACME to perform calculations of simple
     simulations of non-linear models of information processing in sensory
     systems.

Name: Brown, B. N.   Project: PROTEIN

Department: Medical Student

Project Description: Studies involve numerous assay data which must be
     summarized and analyzed. Also, studies of serum levels of therapeutic
     agents require correlations with age, body weight, suface area, etc.

     In addition, a study is being made of pharmacotherapy in a group of
     900 hospitalized pediatric patients. Biographical and medical data for
     each patient are stored in the ACME data files. Characteristics of the
     population and the nature of the drug usage are being analyzed.

Name: Buchanan, B.   Project: STAT

Department: Medical Student

Project Description: This project is a renewal of the education experiment, begun in the Spring of 1969, whose purpose is to determine whether medical students can learn statistical concepts by computer simulation. The emphasis of the course is on using ACME to demonstrate the properties of various statistics and statistical tests.

Name: Buchanan, B.   Project: GEN217

Department: Medical Student

Project Description: This project is a renewal of the education experiment, begun in the Spring of 1969, whose purpose is to determine whether medical students can learn statistical concepts by computer simulation. The emphasis of the course is on using ACME to demonstrate the properties of various statistics and statistical tests.

Name: Buchholz, W.   Project: SPINJ

Department: Medical Student

Project Description: Investigation of time perspective, temporal relationships, and social functions in para and quadraplegics.

Name: Calvert, J.   Project: TEXT

Department: Medical Student

Project Description: Mathematical models, e.g.:

1) Allocation of public funds with multiple objective and decision
    rules, especially with respect to Health, Education, and Welfare.

2) Modified epidemic equations as predicting the interactions of
    populations of neurons, with goals toward predicting evoked po-
    tentials with simple stimuli.

3) Allocation rules in health expenditures; by disease, when given
    incidence rates, probabilities of successful recovery with present
    treatments, direct and indirect costs per case, and average duration
    and mortality data.

Name: Edwards, D.   Project: STRESS

Department: Medical Student

Project Description: Using ACME to conduct research on the effects of hor-
    mones on the alpha rhythm and temporal perception. Data relevant to
    these experiments are reduced statistically using ACME. In addition,
    specific programs are used to: 1) generate time intervals to minimize
    search time for the two-flash threshold, 2) to convert evoked potential
    amplitude measurements into micro volts, 3) to identify the two-flash
    threshold on the basis of a linearization assumption, and 4) to prepare
    and justify manuscripts. In the near future, specific programs will be
    employed (with the 1800) to identify hormone-induced changes in the EEG
    on the basis of Fourier and spectical analysis of recorded EEG's.

Name: Enzmann, D.   Project: SWALLOW

Department: Medical Student

Project Description: The ACME computer is being used to assist in the study
    of both normal and abnormal motions of the human esophagus during normal
    and induced swallowing. A series of simultaneous pressure readings in
    various locations in the esophagus are taken by the use of water filled
    manometers connected to electrical pressure transducers. The electrical
    voltages representing the pressure data are sampled and converted to
    digital values 5 times a second, for each of the pressure measurement
    sources, using the IBM 1800 computer attached to the ACME computer system.
    We plan to have the ACME computer analyze the data from a swallow as it
    is obtained and provide immediate information back to the experimenter,
    via the terminal, of the properties of the last swallow. Various summary
    tables are kept during an experimental run regarding the properties of
    all the swallows obtained so far, and are available for a final summary
    of the experimental data. Initially all the data obtained during an
    experimental run will be saved on the ACME data files to allow different
    methods of analysis of the data to be explored.

Name: Gamel, J.

Project: DOGLAB

Department: Medical Student

Project Description: One of the parameters to be derived from indicator
    dilution measurements of pulmonary blood flow is the "impulse response",
    which is essentially the distribution of transit times of particles
    through the lungs. If Ci(t) represents the dye concentrations in the
    right heart following injection of a bolus of dye at t=0 and Co(t)
    represents the concentration in the left heart, then the impulse
    response h(t) is described by the equation:

$$Co(t) \neq \int_{s=0}^{s=t} h(s)Ci(t-s)ds$$

Replacing the integral with a summation over equally spaced intervals
of time:

$$Co(n) = \sum_{i=0}^{n} h(i)Ci(n-i)$$

Thus a program can be written for a digital computer which solves for the
function h(t) when given the values for Ci(t) and Co(t).

However, a simple staightforward solution yields an impulse response which
is hopelessly disrupted by artifacts in the collected data. A technique
must be employed which somehow filters the data. Several possible methods
are known; one has in fact been successfully used. The program was executed
on the Burroughs 5500, a machine which has twelve significant figures in
regular precision and twenty-four with double precision. A similar program
attempted on ACME accumulated so much error during execution that it proved
useless. Thus if we are to achieve our goal using ACME, we must somehow
obtain greater precision than is now available. Our current efforts are
directed at this problem of insufficient precision.

Name: Gelfand, M.   Project: CARCAT

Department: Medical Student

Project Description: Project "carcat" analyzes cardiac catheterization
     pressure tracings in children. From catheters in the right and left
     heart, pressure tracings to determine atrial, ventricular, arterial,
     venous and wedge pressures. Currently the values in millimeter of
     mercury are calculated for the a and u waves, x and y troughs,
     and mean pressures in the artia and great veins, for systolic and end-
     diastolic pressures in the ventricles, for systolic, diastolic and
     mean pressures in the great arteries, and for mean pressures for the
     wedge positions. These values are calculated immediately and printed
     out on the computer terminal in the catheterization room.

     At this time, efforts are under way to improve and ascertain the accuracy
     of the algorithms used in pattern recognition for atrial and ventricular
     pressure tracings.

     The basic data acquisition and analysis system that has been set up will
     also be used to store data acquisition and the analysis system that
     has been set up will also be used to store data for additional calcu-
     lations and for the preparation of reports. As data is accumulated in
     storage from cardiac catheterizations and from other sources of clinical
     information, it will be possible to analyze rapidly large amounts of
     clinical data using the ACME computer. Research into methods of storing
     and recalling data for analysis of clinical information will be an
     important part of our future efforts.

Name: Gleason, C.   Project: CORTMEAS

Department: Medical Student

Project Description: I have been using ACME primarily in an educational way to
learn how computers can be used in electro-physiological research.

Name: Hahn, P.   Project: OXYTOX

Department: Medical Student

Project Description: This project is concerned with the interpretation,
quantification, and systematic retrieval of information from gel
electrophoreses. In our laboratory, we are looking only at proteins
separated by electrophoresis on acrylamide gels. Since it is very
difficult to get clean backgrounds for the electrophoresis columns,
it is highly desirable to have a computational program capable of
analyzing multiple overlapping bands, correcting the peak positions
and integrated areas of these bands to their appropriate baseline
positions, and storing the information in a useful form.

Name: Harris, R.   Project: PNP

Department: Medical Student

Project Description: Our project is an attempt to demonstrate correlations
       between the emotions experienced by subjects and their own appraisals of
       certain aspects of their environments. Our concept is that emotions
       arise when events in the individual's situation come into certain specified
       relations with his goals. For example, if an individual perceives such events
       as facilitating rather than hindering his potential achievement of the goal,
       then he will experience a positive emotion rather than a negative one.
       Similarly, other dimensions, such as the extent to which the individual feels
       in control of the situation, the extent to which he is explicitly pursuing a
       goal within the situation, and the degree of certainty with which events in
       the situation affect his potential achievement of the goal, are also hypothe-
       sized to be important in determining which of a number of different emotions
       the individual will experience in any situation. The emotional state
       consequent to such appraisals is thought to have physical and cognitive
       effects specific to it. Cognitive effects include changes in the perception
       of time. For example, different emotional states may be associated with
       different focus of attention with respect to past, present, or future events
       in the life of the individual. By physical effects we mean the individual's
       sensations of changes occurring within his body as part of the emotional
       state. We are developing standard inventories for obtaining objective
       measures of these subjective variables.

       The study will have two parts. The first involves the collection of normative
       data from normal subjects with respect to six emotions; namely, anger, anxiety,
       depression, joy, love, and calm. Subjects will be instructed to recall
       experiences that typify their conception of these states and to describe them
       on our inventories. We will use this data to construct normative profiles
       of each emotional state and to calculate correlations between different
       categories of items on our inventories. The second part of the study will
       employ a number of expectant fathers, who will be tested in the waiting room
       prior to delivery and again after the birth. This data will be used to
       determine whether our previous normative data is useful in the identification
       of actual emotional states and to confirm the correlations found in the
       earlier part of the study. We plan to collect the data for the first part of
       the project by the end of February and to process the data at that time. Data
       from the second part of the study will be collected by the end of April and
       processed then.

       If successful, the study could have important theoretical and methodological
       implications. Theoretically, we hope to demonstrate that an individual's
       subjective appraisal of events in relation to his goals are important determin-
       ants of his emotional state. Methodologically, we hope to show that certain
       forms of inventories yield replicable descriptions of subjective events.
       Normative profiles such as I have mentioned could thus be constructed and
       employed as operational definitions of emotional states in a number of experi-
       mental contexts. Studies in the physiological correlates of emotions are
       but one class of examples.

Name: Helikson, M.   Project: LBF

Department: Medical Student

Project Description: Evaluation of liver blood flow with radioactive isotopes.
   Use of the ACME Facility: storage of data, statistical analysis, and
   evaluation of curves into exponential components. We are using radioactive
   Xenon-133 to evaluate the hepatic-arterial and portal-venous contributions
   to hepatic blood flow in dogs. It is our objective to develop a relatively
   quick and technically easy method for determining blood flow in humans on
   a screening basis and in pathologic states.

Name: Jan, W.   Project: NOMAN

Department, Medical Student

Project Description: Processing, storage, display, and statistical analysis
   of laboratory data and text editing; development of programs to aid
   decision making; and information storage, retrieval, and display.

Name: Levine, R.   Project: CPS

Department: Medical Student

Project Description: The purpose of the initial investigations is to isolate
   and purify the carbamyl phosphate synthetase involved in fetal pyrimidine
   synthesis. This enzyme is apparently distinct from that providing car-
   bamyl phosphate for the urea cycle, whose enzymatic activities appear
   later in gestation than the de novo pyrimidine activities.

   The major work thus far has been on development of a rapid simple assay
   for the enzyme. My primary use of ACME has been to evaluate and process
   data obtained during assays. There is no question that without ACME's
   assistance, the already burdensome assay work would become intolerable.

   It is expected that as work with the purification progresses, we will
   examine possible regulatory and control mechanisms in which this enzyme
   may be important.

Name: Lipp, M.   Project: MEDSPOT

Department: Medical Student

Project Description: Survey medical students and graduate physicians regard-
    ing their experience with and opinions of marihuana. We intend to dis-
    tribute questionnaires to medical students at several medical schools
    (Stanford, Nebraska, Buffalo, and perhaps others), disguising the speci-
    fic origins of each set of data in any published report. We will then
    expand our distribution of questionnaires to graduate physicians. All
    responses will be strictly voluntary and ananymous.

Name: Miller, S.   Project: LEARN

Department: Medical Student

Project Description: Analysis of data from an ANGER scintillation camera
    in connection with kidney blood flow studies.

Name: Monnin, L.   Project: DISCRIM

Department: Speech and Hearing Sciences

Project Description: A study of the relationship of articulation and identi-
    fication abilities of normal speaking and speech defective children.
    Distorted speech stimuli will be presented to the subjects so that an
    identification threshold can be estimated.

Name: Nestor, L.   Project: DIFFDX

Department: Medical Student

Project Description: In medicine, many diagnoses are missed merely because
    certain disease entities are overlooked as possible causes of the ob-
    served symptoms. This project will be used to develop a system, which
    can be easily adapted to general practice, which will bring to the
    doctor's attention diseases which he may not have considered in his
    differential diagnosis.

Name: Nola, G.   Project: DIGMI

Department: Medical Student

Project Description: This project will serve to perform statistical analysis
    of hemodynamic parameters, i.e., right atrial pressure, left atrial pres-
    sure, aortic pressure, left ventricular systolic pressure, left ventricular
    dp/dt, aortic flow, and EKG. The analysis would include mean, standard
    error, % change, correlation, and paired and unpaired +- test for permanently
    entered data.

Name: Nowack, W.   Project: CATECHOL

Department: Medical Student

Project Description: Computer analysis and simulation of the metabolism
    of catecholamines in the rat. The changes in different rate con-
    stants offer different behavioral situations. Also drug treatments
    will be studied.

Name: Peters, J.   Project: BIOSTAT

Department: Medical Student

Project Description: Conducting statistical research in the area of evaluation of residuals and outliers in parallel line assays.

Name: Pope, S.   Project: AY21011

Department: Medical Student

Project Description: Statistical analysis of data sets of cardiovascular function parameters of various pharmaecologic agents.

Name: Portlock, C.   Project: PAUP

Department: Medical Student

Project Description: The study involves developing some knowledge to understand the motivations for pregnancy. A great deal of quantitative information is obtained from the patient through questionnaires and through rating by observers of interview behavior. This quantified data is then transformed into a form that can be used for computer analysis. The computer will be used to do a number of types of analyses, i.e., an analysis of the answering patterns of 80 subjects on a recently developed questionnaire.

Name: Propper, R.   Project: TEST1

Department: Medical Student

Project Description: This project will involve the study of inter-relation-
     ship of annogenesis glucomedgenesis in the perfused kidney.

Name: Raybin, D.   Project: ASSAYS

Department: Medical Student

Project Description: Write, store, and run programs: 1) to calculate
     results of assays and 2) to handle other data calculations, statistics,
     etc. Eventually, write up results using text handling programs.

Name: Rosenfeld, R.   Project: CCUPSYCA

Department: Medical Student

Project Description: Studying the psychophysiological adaptation of male
     patients to the Coronary Care Unit. The goals of the research are to
     try to establish some relationships between psychological variables and
     physiological variables, particularly as these latter affect the mor-
     bidity and mortality of patients with acute myocardial infarctions.
     The patients on the Coronary Care Unit are under constant daily obser-
     vation and have a large number of physiological functions monitored.
     The study will provide a huge amount of data daily on each patient.
     The ACME computer will be used to store this data and make a number of
     statistical manipulations of the data.

Name: Rosenthal, W.   Project: RESEARCH

Department: Medical Student

Project Description: I am using the computer essentially for statistical
     analysis of data in connection with various experimental studies in
     speech and language pathology and normal speech perception. These
     studies include research in effectiveness of stuttering therapy, speech
     and auditory perception in aphasic children, and normal speech perception
     in adults and children.

Name: Sachs, D.   Project: POPCIT

Department: Medical Student

Project Description: ACME will be used as a text editing system for a manuscript which is being prepared dealing with various aspects of environmental medicine and the population explosion. ACME will also be used to study population growth rates in various nations, correlate these with natural resource use, and then calculate projections for the next 10, 20, 30, 40 year periods.

Name: Schwartz, B.   Project: CELLSAGE

Department: Medical Student

Project Description: 1) Statistical modeling of the growth, development, and ultimate senescence of cultured human fibroblasts. Special attention will be paid to the possibility that the in vitro senescence of tissue culture cells might parallel age-related degenerative changes found in the intact organism. Variation analyses will be performed on clones of cells. It appears that clone size variation may be accounted for by two processes: a) an exponential, randomly distributed interdivision time and b) a probability of cell mortality, possibility related to time in culture or passage level, which may also be amenable to statistical simulation.

2) The storage, sorting, logical processing, and retrieval of data and observations related to cellular aging. As the amount of descriptive work done in this area explosively increases, it might be helpful to be able to instantly access all the published data dealing with the effects of age on some specific cellular function. Also, in addition to its information retrieval aspects, a routine in the program might be designed to seek logical relationships among the data that might otherwise have been obscured by the diversity and large quantity of the information to be considered.

Name: Sethi, S.   Project: ISOTOPE

Department: Medical Student

Project Description: Analyzing the data from experiments being conducted
    to understand the replication of rhinoviruses. The data involves the
    calculations and plotting of data from the experiments which involve
    the radioisotopic counts in the lucrose gradient factions of RNA. Also,
    the data will be used to calculate the significance of results with
    respect to plaque assay of virus.

Name: Sinclair, A.   Project: HEARTCEL

Department: Medical Student

Project Description: Pharmacological studies using cultured chick embryo
    cells. We have devised a system using television and subsequent photo-
    electric monitoring arrangements to record the beat time intervals and
    motion spike signals of individual cells in culture. We subject the
    cells to various dosage regimens of neuro- and cardio-active drugs
    and note the effects on rate, rhythmicity, and other parameters. At
    this stage, the primary data are the beat intervals. From these in-
    tervals (in specific time intervals after drug administration) we will
    need to compute average intervals, rates, standard deviations and
    errors of mean, and Spearman Rank Correlation Coefficients. After
    computing these parameters we will need drug/control ratios, t-test-
    ing, u-testing, and other comparative statistics.

Name: Smith, R.   Project: FAMILY

Department: Medical Student

Project Description: The ACME system has been used to store analysis data from
    an experimental study of family structure which I conducted during the
    past year. The project contains one data file (SDM) and a number of program
    files to analyze the data. Most of the analysis has been completed during
    the past year, but some still remains to be done. I have also done some
    socio-physiological studies of kidney transplant patients, data which I
    will be entering in the near future. I plan to make intermittent use of
    ACME for further analysis of data from these projects during the next six
    months.

Name: Swanson, G.   Project: THESIS

Department: Medical Student

Project Description: Our long term goal is to interpret therapeutic drug
     action on respiratory control. The objective of my thesis is to
     develop a quantitative description (model) to characterize brain and
     CO_2 chemoreceptor dynamics. We have implemented a system in which
     voluntary effort, inspired CO_2 concentration and, indirectly, alveolar
     CO_2 concentration can easily be controlled. The data obtained (in-
     spired CO_2 concentration, alveolar CO_2 concentration, alveolar ventila-
     tion, tidal volume, exhale time, inhale time, and breathing frequency)
     will be analyzed and used to develop a model. Modeling will be done
     on a hybrid system using ACME and the Department of Anesthesia's analog
     computer.

     The experimental techniques are new because previous CO_2 response
     experiments have been done with step changes in inspired CO_2 and re-
     breathing. Since we can force CO_2 concentrations to follow a pre-
     determined time function, we hope to answer questions relating to
     chemoreceptor rate sensitivity and the role of peripheral chemorecep-
     tors. Modern control theory will be applied to determine optimum res-
     piratory center dynamics with respect to regulation of cerebrospinal
     fluid pH.

Category 5

Name: Bellville, J.   Project: PROBABIL

Department: Anesthesia

Project Description: This study is of the pharmacology of anesthetics and related agents. Statistical programs are stored in the 360/50, so that with the 2741 terminal on cue, the data are entered. Various procedures are carried out. For instance, the relative potency of a biologic compound and its associated 95% confidence limits are computed. Lambda, a measure of efficiency of the assay, is also computed. Standard statistical procedures are stored under this project, and carried out by research fellows or the principal investigator.

Name: Bellville, J.   Project: GAS_MASK

Department: Anesthesia

Project Description: This project involves the use of a special purpose analog computer that preprocesses data, which is then entered into the 360/50 via the 1800. In addition, the 1800 interacts with the experiment to generate sinusoidally varying carbon dioxide which is administered to the subject. Thus, we are doing research not only on the basic physiologic mechanisms involved with the control of respiration, but on the use of digital computers on-line in the control of experiments in the acceptance of data from special purpose analog computers and the storage, analysis, retrieval, and display of these data. This represents an entirely new approach to the study of respiratory control mechanisms, and could not be carried out without the ACME Facility.

Name: Bunnenberg, E.   Project: CHEM

Department: Chemistry

Project Description: The purpose of this project can be summarized as
     follows: (A) The taking of high rate data transmission to write
     experimental analysis programs so as to develop programs for the
     routine analysis and finished output of mass spectra. The trans-
     mission is through the 270X-270Y channel. The project plans to
     develop this interface to service two mass spectrometers (ALTAS CH4
     and AEI MS9). The taken spectra are then to be fed to the Artificial
     Intelligence group under the supervision of Joshua Lederberg and
     Edward Feigenbaum to be used in their investigations. (B) Another
     use of data transmission through the 270Y is to take spectropolorimeter
     measurements and then analyze these spectra for form, bandwidths, and
     similarities between derivatives for theoretical projections. (C)
     The project mentioned also includes a battery of utility programs
     for metastable analysis, chemical rate analysis, C13 substitution
     ratios, and other routine analyses that the chemists wished programmed.

Name: Bunnenberg, E.   Project: JAY

Department: Chemistry

Project Description: Same project description as for project CHEM.

Name: Bunnenberg, E.   Project: MASSPEC

Department: Chemistry

Project Description: Same project description as for project CHEM.

Name: Bunnenberg, E.   Project: PEACE

Department: Chemistry

Project Description: Same project description as for project CHEM.

Name: Duffield, A.   Project: DRONGO

Department: Chemistry

Project Description: The ACME computer system will be utilized for rapid
    accumulation of high resolution mass spectra. The necessary peripheral
    equipment to accomplish this has been assembled and the complete system
    shown to yield data. These spectra will be obtained from organic com-
    pounds; many of them of biological significance. The fast acquisition
    of high resolution data will enable organic chemists to solve problems
    related to their research more quickly.

Name: Glick, D.   Project: LASER

Department: Pathology

Project Description: The ACME Facility is needed to provide the computational
    requirements of the laser microprobe analytical system which we have
    designed, and are continuing to develop, for elemental analysis of micro-
    scopic biological samples down to the single cell and very small volumes
    of fluids. The applications of the system to biological and medical
    research and clinical medicine obviously have impressive potential.
    ACME is involved in data calculation for definition of sample size as
    well as content and concentration of elements. Statistical evaluations
    include calculation of F-ratio, T-test, U-test, population means and
    and also linear regressions, graphical interpolations and curve fitting.
    A second system has been built so that one can be devoted to applications
    and the other to continued technological development. This will, of
    course, at least double our need for use of ACME. Eventually we expect
    to automate the system, which would further increase our dependence on
    ACME.

Name: Roth, W.   Project: COMP

Department: Psychiatry

Project Description: This project involves computer analysis of habituation
    of the evoked response and EEG desynchronization. Also an attempt will
    be made to distinguish states of arousal produced by emotional stimuli.
    Analysis methods include spectral density calculations based on the
    "fast" Fourier transform, period analysis (Burch), and response averag-
    ing to improve the signal-to-noise ratio.

Name: Stillman, R. A.   Project: DRAFT

Department: Chemistry

Project Description: The purpose of this project can be summarized as
    follows: (A) The taking of high rate data transmission to write
    experimental analysis programs so as to develop programs for the
    routine analysis and finished output of mass spectra. The trans-
    mission is through the 270Y-270X channel. The project plans to
    develop this interface to service two mass spectrometers (ALTAS CH4
    and AEI MS9). The taken spectra are then to be fed to the Artificial
    Intelligence group under the supervision of Joshua Lederberg and
    Edward Feigenbaum to be used in their investigations. (B) Another
    use of data transmission through the 270Y is to take spectropolorimeter
    measurements and then analyze these spectra for form, bandwidths, and
    similarities between derivatives for theoretical projections. (C)
    The project mentioned also includes a battery of utility programs
    for metastable analysis, chemical rate analysis, C13 substitution
    ratios, and other routine analyses that the chemists wished programmed.

Name: Trudell, J.   Project: MASS SPE

Department: Chemistry

Project Description: I am working on computerized interpretation of mass
    spectroscopy. At present, information is visually taken from strip chart
    recordings and entered into the computer through a keyboard terminal.
    The computer then assimilates the data and presents the results in tabular
    form.

    In the near future the data will be acquired on-line using the 270X-Y
    system.

Category 6

Name: Bernfield, M.   Project: TRNA

Department: Pediatrics

Project Description: The ACME system is used by our lab to handle two tasks
    that would ordinarily take many hours of routine effort. (1) The program
    we have written takes the radioactivity found as aminoacyl tRNA at
    several points in time and computes the least square best fit to the log
    of the radioactivity left, and also gives the rate constant for the decay
    and the half time. (2) Some column and paper separation techniques used
    in our lab involve over 100 fractions, each double labelled. The program
    for this task takes the data generated by the scintillation counter and
    subtracts background and interference (cross talk) between the two isotopes.
    This data is then presented in graphic and tabular form as percent of the
    respective isotope by fraction number.

Name: Cann, H.   Project: GUAT

Department: Pediatrics

Project Description: Same project description as for project DTS.

Name: Cann, H.   Project: DTS

Department: Pediatrics

Project Description: This research project is investigating factors which
    affect frequencies of genes controlling various human heritable char-
    acters. The extent to which selection, genetic drift, and migration
    affect frequencies of certain human genes is being assessed and specific
    selective factors are being sought. Environmental, cultural, and his-
    torical conditions favorable for this type of study have been found in
    settlements of Mayan Indian descendents in the Lake Atitlan Basin of
    southwest Guatemala. The local microgeography and mating patterns ap-
    pear to enforce a high degree of genetic isolation for each of a num-
    ber of Indian towns and villages ringing Lake Atitlan. These high
    mortality populations provide the opportunity to study selective ef-
    fects of human genetic polymorphisms. Studies of gene frequencies,
    segregation analysis of polymorphisms and demographic characterization
    of these sub-populations are being undertaken.

    This project will also contribute information on the genetic taxonomy
    of the American Indian. Families of large size, characteristic of the
    study population, will afford excellent opportunities for medical gene-
    tic investigation of inherited diseases encountered in our field activi-
    ties and for studies of genetic linkage.

    Two communities on the east shore of the lake are being studied, and we
    are about to initiate studies in another Indian lake shore community.
    A pilot project involving 300 inhabitants of two Indian communities on
    the south shore of the lake was completed prior to undertaking the
    present investigation.

Name: Champoux, J.   Project: BIOK

Department: Biochemistry

Project Description: Write programs to do multiple calculations with many
    sets of data from analytical ultracentrifuge experiments and double label
    counting experiments.

Name: Chase, R.   Project: CPGRAC

Department: Surgery

Project Description: Obtain statistical information from measurements of
    cephalometric film. This information is to be used to evaluate facial
    growth in cleft palate children and to assess velopharyngeal competence.

Name: Clayton, R.   Project: SEXBRAIN

Department: Psychiatry

Project Description: The purpose of our project is to determine the effects
    of steroids and hormones of RNA activity on the brain. We inject live
    rats with radioactive tritriated uridine. The rats are then killed
    and processed in the regular histological procedure. Radioactive
    element reduces silver grains and slides are made from which the grains
    in the brain cell are counted. From the number of grains, we determine
    the area of RNA incorporation in the brain, the brain cell, and other
    tissues. The level of RNA incorporation is also determined. Experimental
    and control groups are compared by ACME. Our data analysis time is
    greatly reduced by using ACME.

Name: Cooper, J.   Project: SEXDIFF

Department: Psychiatry

Project Description: At present I am using ACME for two purposes: 1) com-
     parison of 2 sets of data by means of the t-test and 2) calculation of
     sample radioactivity together with standard deviation thereof. I do
     not envisage expansion of this work.

     My project lies essentially in investigation of biochemical correlates
     of neonatal sercual differentiation in rats: such as androgen metabolism.

Name: Doering, C.   Project: DESMOLAS

Department: Psychiatry

Project Description: In a mammalian system, one of the responses to a stress
     is the secretion of certain steroid hormones by the adrenal gland.
     Another response very often is a distinct pattern of behavior. We are
     investigating the causal connections, on a biochemical level, between
     hormones and behavior in stress. We use inbred strains of mice that
     differ in their response to stress in terms of behavior, adrenal hor-
     mones, and in other biochemical parameters. By genetic analysis, cor-
     relations among these parameters can be tested.

     ACME is used for a variety of computations in this study. Data from the
     extensive use of radioactive chemicals have to be converted from the
     raw output of a liquid-scintillation-counter to their final form. The
     output of a gas-liquid-chromatograph has to be compared to a plot de-
     rived from standards and recalculated to another form. And perhaps
     most important, all results have to be analyzed statistically. At
     this time, the computer saves us a great deal of time.

     Some programs are adapted from earlier work under this project name;
     some are new. The statistical programs are adapted from ACME's program
     library.

Name: Doherty, R.   Project: SEXCHROM

Department: Pediatrics

Project Description: I am currently using ACME for: 1) statistical evaluation
    of experimental data, and 2) calculation of random fields to obtain
    random sampling of cells dispersed on microscope slides. Sex chromatin
    body counts are being obtained on the random cell sample by visual search.

Name: Efron, B.   Project: BIOBRAD

Department: Community & Preventive Medicine

Project Description: Theoretical and applied research in biostatistics.

Name: Folk, W.   Project: GRS

Department: Biochemistry

Project Description: My ACME use will primarily involve the calculation of
    rough data dealing with work I am doing on mitants of Ecali having
    altered activating enzymes (amino acyl TRNA synthetases). The calculations
    will primarily be of an arithmetical nature - taking data from sanhillahran
    counting and laboratory assays and computing various variables from
    this data.

Name: Fries, J.   Project: DXARTH

Department: Medicine - Immunology

Project Description: Presenting projects involving computer diagnosis of
     rheumatic disease are partly designed to increase our familiarity with
     the ACME system. Beginning in late Spring 1969 we will start work on a
     large-scale data file entry, storage, and retrieval system for clinical
     information about rheumatic diseases. This system has exciting pos-
     sibilities for improving quality of clinical research, quality of
     medical care, accuracy of diagnosis, extension of the medical school
     influence into the community, etc.

Name: Hahn, G.   Project: RADIATE

Department: Radiology

Project Description: Simulation of time and dose fractionation studies of
     radiochemotherapy of mammalian cell cultures.

Name: Herzenberg, L.   Project: LAB

Department: Genetics

Project Description: Our studies in immunology, genetics, and maternal fetal
    immunologic relationship's in the mouse require the colation of many
    experimental observations on a given serum sample or individual. Since
    such data is accumulated over long periods of time, frequent interim
    reviews must be made to determine new directions, etc. Currently, most
    data collation in our laboratory is done by hand incompletely, inadequately
    and infrequently, thus hampering the process of the research. To over-
    come these difficulties we have begun the process of changing our data
    storage procedures to utilize the ACME capabilities. For example, all
    breeding records for the inbred nucleus of our mouse colony are stored
    in ACME. Approximately once a month ACME is called upon to draw updated
    pedigree charges, so that breeding decisions may be made.

    Presently we are working on programs to collate multiple immunoglobulin
    level determinations done on individual serum samples, returning histories
    of immunoglobulin level changes with time in treated animals. Eventually
    we hope also to be able to use ACME to store data and direct antiserum
    production in the laboratory.

    In addition to the data storage aspects of ACME, the computer is used in
    this laboratory for a number of routine calculations on data sets, e.g.,
    per cent antigen precipitated, geometric means of plaque events, etc.

Name: Herzenberg, L.   Project: PIGGY

Department: Genetics

Project Description: Same project description as for project LAB.

Name: Herzenberg, L.   Project: STORE

Department: Genetics

Project Description: Same project description as for project LAB.

Name: Laipis, P.   Project: LIGASE

Department: Genetics

Project Description: The computer is being used for statistical and mathe-
matical reduction of data from experiments connected with my graduate
research, principly those experiments involving sucrose and cesium
chloride gradients in the ultracentrifuge.

Name: Pearson, M.   Project: CTCOR

Department: Biochemistry

Project Description: The program is used to compute normalized chromatographic
elution profiles of viral SRNA. We have found that induction of lysogenic
bacteria results in the formation of a set of small molecular weight
ordered RNA's coded by phage λ DNA. These RNA's have physical character-
istics similar to transfer RNA and may be intimately involved in genetic
control. The set of viral RNA's can be fractionated on benzoylated deae
columns. The computer normalizes the elution profiles of viral RNA's
to a constant total output RNA, allowing comparison of the relative amount
of each viral RNA from one column run to the next.

It is anticipated that future programs will be used to calculate quench-
corrected values of radioisotope activity in double-label experiments,
using data from a liquid scintillation counter.

Name: Robertson, W.   Project: UGAG

Department: Pediatrics

Project Description: (1) Data on urinary analyses of glycosaminoglycans
both on patients and normal individuals will be entered. The curve
relating concentrations to age in normal children will be developed. The
values of groups of children with different diseases will then be compared
with normals to discover which diseases lead to abnormal excretion.

(2) Analytical data on immunoglobulin concentrations in sera from patients
with a variety of immunologic diseases will be entered and correlations
developed with the clinical state of the patient and therapy.

(3) Data on the binding of ligands to macromolecules, e.g., cortisol to
hyaluronic acid will be used to determine association constants.

Name: Saunders, A.   Project: MASTCELL

Department: Pathology

Project Description: Multiple numerical parameters are determined for single
cells under varying conditions of staining and animal pre-treatment.
Analysis of results lead to conclusions on the type and quantity of poly-
anion in the mast cells under study (once thought to be just hepanin).

Hence the project involves the chemistry of Hepanin type substances at
the single cell level, the maturation and biology of the mast cell in
rats and people, and development of methodology, mostly centering on
fluoresence microscopy.

Name: Saunders, A.   Project: SPHERES

Department: Pathology

Project Description: Cells measured by a rapid sensor system. Data collected
on tape and records will be transformed from a LINK to ACME for storage
and analysis.

Name: Savageau, M.   Project: KINET

Department: Cardiology

Project Description: I am concerned with the kinetic behavior of systems of
    enzyme catalyzed reactions. During the coming year I expect to use the
    ACME computer in three ways. First, I will use it to store and process
    experimental data from enzyme systems. Second, a nonlinear curve fitting
    procedure will be implemented to estimate the kinetic parameters for the
    mechanisms yielding the experimental data. Third, the solution of the
    system of differential equations will be simulated to obtain the temporal
    behavior of these enzyme systems.

Category 10

Name: Butler, E.   Project: UROLOGY

Department: Urology

Project Description: ACME is used to study the dynamics of the urinary tract.
The following real-time measurements are made: 1) electromyographs of
the ureteral smooth muscle, 2) urine flow rate, and 3) blood pressure/
fluid load/bladder pressure. Macroscopic analysis of these is made at
the end of every 30 minute experiment with a graphical output typed out
on the 2741 terminal. This provides feedback for the next 30 minute
run. 10-15 such runs are made per complete experiment.

Microscopic analysis is made of item (1) off-line on the effect of
drugs on the waveform which necessitates use of the TV display console.
Digital filtering, histogram plotting, averaging, and autocorrelation
is performed. Data files are kept of the reduced data points. Several
of the standard statistical subroutines are used, e.g., Fourier analysis,
spectral analysis, and frequency plots.

Name: Constantinou, C.   Project: METHODS

Department: Urology

Project Description: Study the ureteral electrophysiology action potentials
as recorded from microelectrodes from the smooth muscle of ureters in
anesthetized dogs. The ACME system will be used for analogue to digital
conversion and digital to analogue output for an on-line XY plotter,
digital filtering, Fourier analysis, and waveform averaging.

Name: DeGrazia, J.   Project: RADIOGAS

Department: Nuclear Medicine

Project Description: The project is a pilot study of the clinical or investi-
gative potential of a relatively new tool for assessing in vivo human
biochemistry. It is based upon the simple assumption that the measure-
ment of $^{14}CO_2$ release into a patient's breath following the administra-
tion of appropriately labeled compounds (radiorespirometry) can be of
considerable value in assessing the in vivo rate of oxidation of those
compounds. Pilot studies of the feasibility of this approach indicate
it is possible to study the specific alteration of metabolism associated
with a disease state. Such studies have shown that this information is
useful both as a means for diagnosis as well as for the evaluation of
therapy. The relative simplicity of this technique makes the survey of
large patient populations possible. This leads to the accumulation of
a large volume of data. We have now begun a pilot project for the com-
puter handling of this data and hope to thus speed our calculations as
well as to further our understanding of the clinical significance of
the kinetic aspect of this data. Although a relatively simple program
is adequate for the moment, it is anticipated that with further develop-
ment and modification of this technique the complexity of this data
handling will increase considerably. It is hoped that a practical
clinical demonstration of the coordinated use of the computer for the
direct in vivo evaluation of human biochemistry will result from this
work and that it will become a routine tool for the determination of
the diagnosis or adequacy of the therapy of the patient.

Name: MacPherson, L.   Project: META

Department: Psychiatry

Project Description: In this laboratory, studies are in progress on the
comparison of EEG responses evoked by visual stimuli incorporating
a direction component in dyslexic and normal children. The subjects
observe a series of arrows that point either upwards, left, or right.
These stimuli last 100 msec and occur every few seconds in random
sequence. In each experiment the subject is asked to respond to one
of the groups of arrows by pushing a button; measurement of the stimulus-
response interval is also under investigation.

Project META is now mainly concerned with the provision of programs
and operational methods in this laboratory as required by the dyslexia
experiments. Many of these methods and programs are also applicable
to the AROGUESS project in the same laboratory.

Name: Ridges, J.   Project: VOLUMES

Department: Cardiology

Project Description: Analysis of cardiac catheterization data by the
    computer. One of the projects involves development of a program
    for analysis of atrial pressure contours. Simultaneous atrial pres-
    sure and electrocardiogram will be digitized from the cardiac cathet-
    erization lab and stored. This data will then be analyzed for wave
    pressure valves and descent rates using the electrocardiogram as a
    marker for definition of search areas in the pattern recognition.
    The analysis will be documented using valves obtained by routine
    hand measurements of the data.

A second project involves the analysis of ventricular function during
angiographic procedures in the catheterization laboratory. Simultan-
eous pressure, syringe excursion, cine-shutter marker and electro-
cardiogram analog signals will be digitized from the laboratory dur-
ing dye injection. The digitized volumes, obtained through the Ames
Research Center at NASA will be merged with the pressure and ECG data.
The merged data will then be analyzed for pressure volume relation-
ships in order to evaluate ventricular function.

Name: Sanchez, J.   Project: RADIOREN

Department: Radiology

Project Description: Develop radioisotope techniques for the evaluation of differential kidney function. In this project we plan to use a four-probe detector system with analog tape recorder. With this equipment we will compare the excretion and possibly the metabolism of an intravenously administered isotope by each kidney with the appearance of the isotope in the bladder and with its removal rate from the blood. In phase one of this project a program will be written to calculate the data from the four probes and to record the data upon an X-Y plotter. We will next conduct double isotope studies initially using I-131 hippuran and I-131 albumin. From the data obtained in serial studies with the same patient using these two isotopes a correction for hippuran distribution and retention in renal blood pools will be made. If successful, this clinically applicable "corrected" radioisotope renogram will be made a standard test for renal function. It is expected that these studies will lead to an improved means for the clinical evaluation of renal function, and it is hoped that they will also serve as a model for other studies with new isotopes, particularly those with a very short half-life in the near future.

Name: Sherwood, S.   Project: BRAINWAV

Department: Neurology

Project Description: This project is designed to advance the understanding of electroencephalographic phenomena. It is proposed to obtain records, suitably amplified, on magnetic tape from patients and normal subjects through different electrode arrays and placements and analyze the ratio of amplitude to wave-length of different waveforms. This is intended to be a first step; further mathematical methods are hoped to shed more light on the nature of the EEG in later stages, without interfering with the brain itself.

Name: Sussman, H.   Project: LABSYS

Department: Pathology

Project Description: The purpose of this project is to establish a modern
system of handling the data flow in the clinical laboratory. This will be
the initial step in a larger program to set up an automated, systems oriented,
clinical laboratory center at Stanford University Medical Center. There is an
immediate need for improvement in this area at Stanford for the present facil-
ities to be capable of meeting the expected, progressive demands for laboratory
services. The specific aims of the project are to establish a means for order-
ing tests and reporting test results in semi-automated, machine-retrievable way.
This will aid in (1) the ability to provide prompt and reliable reporting of
data to physicians, (2) will reduce the billing costs which will be of benefit
to the Hospital and to the patient, and (3) should increase the effectiveness
of using this laboratory's findings in the care of patients with disease and in
monitoring the progress of disease in response to therapy.

Category 11

Name: Alway, R.   Project: FIB

Department: Pediatrics

Project Description: We have data on various aspects of illness behavior
     in families collected from 60 families over the past year. Our main
     aim is to compare various types of information we have on family
     structure, attitudes, and previous illness histories with symptom data
     collected monthly from family members over 2-3 month spans of time.
     We are particularly interested in predicting from both the family as
     a whole and individual members of the family to general illness symp-
     tomatology, frequency, duration of symptoms, and family responses to
     symptoms. Our computational needs involve some correlational analysis
     where we have ratio scale data and some analysis of means where we
     are simply describing categories of persons or families against symp-
     tom frequency data.

Name: Butler, E.   Project: UROSTATS

Department: Urology

Project Description: The Residency Review Committee of the American Medical
     Association has imposed increasingly detailed statistical records of
     residency training programs as a requirement for continuing accredita-
     tion. The Division of Urology maintains residency training affiliations
     at five major hospitals. The statistical burden has become so great
     during the past year that we have undertaken the development of a com-
     puter based system of information collection, storage, and retrieval.
     If we can demonstrate a real usefulness of computers in the sphere of
     medical education, then the potential for development of such programs
     on a wider scale appears unlimited.

Name: Doering, C.   Project: INDEXV15

Department: Psychiatry

Project Description: A comprehensive author and subject index is to be
    prepared for a 700-page (approximately) volume, Methods of Enzymology,
    Sterols and Steroids, Volume XV, edited by Dr. R. B. Clayton and to be
    published by Academic Press. ACME is to be used to store all entries
    with page numbers. ACME can then produce a listing of all entries in
    alphabetical order.

Name: Enlander, D.   Project: cases

Department: Pathology

Project Description: I am endeavoring to devise a system whereby medical
    diagnoses can be filed in disc storage in coded form. The coding is
    automatically derived from a thesaurus file by matching key words,
    which will conserve both file space and enable synonymous diagnoses to
    be retrieved efficiently.

    The basic thesaurus and code is based on the common S.N.O.P. (Standard
    Nomenclature of Pathology) on account of its wide usage and comprehensive
    modern terminology.

Name: Enlander, D.   Project: snop

Department: Pathology

Project Description: Same project description as for project cases.

Name: Enlander, D.   Project: PIPIC

Department: Pathology

Project Description: Same project description as for project cases.

Name: Friedland, G.   Project: SLING_FI

Department: Radiology

Project Description: Determine the function of the gastric sling fibers. The
     gastric sling fibers are a muscle band lying internal to the other muscle
     layers, which hook around the notch between distal esophagus and gastric
     fundus and then traverse the stomach anteriorly and posteriorly parallel
     to the lesser curvature. Feline sling fibers have been marked by insert-
     ing tantalum wire strips into them through a needle. Simultaneous bi-
     plane radiographs have been exposed at 1 frame/second for 1 minute before,
     during and following deglutition. The purpose of this approach is to in-
     vestigate the possibility of extracting quantitative information by measur-
     ing the marker's position on the films. The measurement of the relative
     position of the markers in each plane is added vectorially utilizing the
     computer. A spatial representation of these points is projected on the
     digital television screen, frame by frame, in the same sequence as the
     roentgenograms. Measurements are then abstracted from the digital tele-
     vision and stored into data files. This information is to be utilized
     to determine the applicability of this method to conduct meaningful
     experiments employing our present roentgenographic framing rate.

Name: Henry, P.   Project: SLEEP

Department: Psychiatry

Project Description: Develope routines for processing hand staged sleep
    and wakefulness EEG data printing out summary statistics and graphics.
    Also, develop and test programs for the automatic staging of sleep
    EEG data and develop pattern recognition subroutines to identify and
    count monophasic sharp waves recorded from the lateral geniculate
    during sleep.

Name: Hillman, R.   Project: THERAPY

Department: Psychiatry

Project Description: Study to construct computerized psychiatric "patient."
    Ultimately aim at a teaching and research device capable of appropri-
    ately responding to therapist's comments. Computer will respond to
    limited types of responses (modifying statements, interpretations, etc.)
    with random comments (resistance, denial, insight, etc.). Built into
    the system will be: 1) teaching comments, 2) statistical analysis of
    "routes" taken, 3) ability to retreat to a prior stage in the interview
    and take a different course, and 4) positive and negative correlation
    between the therapist's comment and the computer's response. Advan-
    tages of the program are: 1) reproducible data, 2) availability of
    specific diagnostic entity, and 3) learning to do interviews without
    traumatizing real patients.

Name: Korn, D.   Project: SNOP

Department: Pathology

Project Description: The endeavor is to devise a system whereby diagnoses
    can be filed in disc storage in coded form. The coding is automatically
    derived from an internal thesaurus file by matching key words. This
    will both conserve file space and enable synonymous diagnoses to be
    retrieved efficiently. The basic thesaurus and code are based on
    S.N.O.P. (Systemized Nomenclature of Pathology) because of its wide
    usage and comprehensive modern terminology.

Name: Lamb, E.   Project: EMPIRE

Department: Gynecology - Obstetrics

Project Description: Calculation of relative potency and confidence limits
    for total gonadotropin bioassay. Used primarily for research but will
    also be used ($\subseteq$ 1 assay per month) for calculations involved in service
    work--even these assays may be used in a research project.

Name: Lederberg, J.   Project: GENBWT

Department: Genetics

Project Description: Study of characteristics of unusually high birthweight
    relative to IQ, diseases, parent income, educational background, parity,
    and sex of child.

Name: McGann, L.   Project: HOSPCOST

Department: Community & Preventive Medicine

Project Description: Tabulate the results of a sample survey of Stanford
    Medical Center hospital charges for the aged. The purpose of the
    study is to compare 1968 costs and sources of financing with parallel
    results of a 1962 study in the Stanford Medical Center.

Name: Mesel, E.   Project: CLINIC

Department: Pediatrics

Project Description: The object of this project is to store patient identi-
    fication information and diagnoses obtained at each step in the course
    of illness (clinical - OPD or IPD, cardiac catheterization, surgery, and
    autopsy) in the ACME files. This work is patient-service oriented but
    has several experimental aspects such as the structuring of the filing
    schemes to permit rapid access (while conserving the amount of file
    space utilized) and the utilization of the stored information for hos-
    pital planning purposes, evaluation of patient survival with different
    modes of therapy, etc.

Name: Mesel, E.   Project: WFR

Department: Pediatrics

Project Description: Investigation of mathematical modeling techniques
    applicable to medical diagrams. The plan is ultimately to apply the
    cause-effect modeling techniques developed in an environment that
    allows on-line interaction between physician and computer model.

    Though a program has been written to implement the cause-effect modeling
    techniques using a Burroughs B5500 computer, adapting even that program
    to ACME will require considerable effort as the program depends heavily
    on the nearly unique ability of the B5500 to efficiently handle re-
    cursion and treat overlay automatically. It is felt that the ability
    to experiment with the models constructed in a way available only in
    an on-line system and that the increased interest and criticism that
    will result from testing the models produced in a clinical environment
    justify the effort.

    Currently programmed is the congenital heart disease model of Warner
    and his collaborators.

Name: Morrell, L.   Project: EEG

Department: Neurology

Project Description: The initial project will be multivariate statistical
    evaluation of data relating electroencephalographic measures to motor
    behavior. The data to be entered in ACME have already been partly
    processed with a LINC computer; period analysis of spontaneous EEG
    and also amplitude analysis are used as predictive variables for sub-
    sequent performance by the human subject. Analysis will be reiterated
    to afford comparison of electrocortical activity at various regions.

    Other uses will be analysis of averaged cortical evoked responses to
    sensory input, and averaged cortical activity preceding and following
    voluntary action, including speech production. Statistical evaluation
    of such data as recorded simultaneously from a variety of electrode
    locations is planned.

Name: Noble, E.   Project: ALCOHOL

Department: Psychiatry

Project Description: We have been studying the effects of alcohol on the
     central nervous system of rodents. A study of alcohol's effect on the
     pituitary adrenal system is being studied in various inbred mouse strains.
     We are also studying the effects of central nervous system lesions on
     alcohol preference phenomenon in mice. Finally, the mechanism of cen-
     tral nervous system adaptation to alcohol and other stressors is being
     considered.

Name: Whitcher, C.   Project: spctrm

Department: Anesthesia

Project Description: Spectral analysis of blood pressure sounds. Determine
     why blood pressure sounds are difficult to hear under adverse circum-
     stances.

Category 12

Name: Angel, R.   Project: ERCORECT

Department: Neurology

Project Description: Data reduction and statistical analysis of movement pat-
    terns, limb displacement, limb velocity, and electromyography in relation
    to both normal subjects and neurologically impaired patients.

Name: Constantinou, C.   Project: UROL

Department: Urology

Project Description: ACME will be used for research in the Division of
    Urology for real-time data acquisition and feedback.

    Analogue data collected from anesthetized animals in surgery will
    be transmitted via the interface box to the 1800 and 2741 output re-
    ceived in the operating room during the experiment.

    There are four input channels now for parameter input such as action
    potentials from ureteral smooth muscle, peristetic pressure waves,
    urine flow rate, EKG or blood pressure. The analogue output is used
    for driving the XY plotter and providing a reference for servomechani-
    cal pump. During experiments data files are written from the analogue
    inputs for long-term storage and also for short term (up to two weeks)
    before data reduction.

    ACME will also be used for statistical analysis of the experimental
    work and the TV for display of waveforms and graphs.

Name: Duffield, A.   Project: CHEM

Department: Chemistry

Project Description: The purpose of this project can be summarized as
    follows: (A) The taking of high rate data transmission to write
    experimental analysis programs so as to develop programs for the
    routine analysis and finished output of mass spectra. The trans-
    mission is through the 270Y-270X channel. The project plans to
    develop this interface to service two mass spectrometers (ALTAS CH4
    and AEI MS9). The taken spectra are then to be fed to the Artificial
    Intelligence group under the supervision of Joshua Lederberg and
    Edward Feigenbaum to be used in their investigations. (B) Another
    use of data transmission through the 270Y is to take spectropolorimeter
    measurements and then analyze these spectra for form, bandwidths, and
    similarities between derivatives for theoretical projections. (C)
    The project mentioned also includes a battery of utility programs
    for metastable analysis, chemical rate analysis, C13 substitution
    ratios, and other routine analyses that the chemists wished programmed.

Name: Gersch, W.   Project: SYNTHESI

Department: Neurology

Project Description: Research in the application of time series methods to
    problems in neurophysiology and medicine.

    1) Development and application of new multidimensional autoregressive
    representation methods of spectral analysis to EEG analysis.

    2) Development and application of a time series analysis technique to
    locate the anatomical site of epileptic focus from data taken from deep
    brain site implanted bipolar electrodes during generalized epileptic
    seizure activity.

    3) Research on modeling feedback paths in the cat's visual system. Ex-
    perimental data taken in the laboratory of Dr. K. L. Chow.

    4) A critical computer analysis of a long standing model of vagus con-
    trol of heart rate.

    5) Development of a novel Markov chain-symbol pattern recognition pro-
    cedure applied to recognition of cardiac arrhythmias using R-R interval
    data.

Name: Reynolds, W.   Project: DREAMS

Department: Genetics

Project Description: The purpose of this project can be summarized as
    follows: (A) The taking of high rate data transmission to write
    experimental analysis programs so as to develop programs for the
    routine analysis and finished output of mass spectra. The trans-
    mission is through the 270Y-270X channel. The project plans to
    develop this interface to service two mass spectrometers (ALTAS CH4
    and AEI MS9). The taken spectra are then to be fed to the Artificial
    Intelligence group under the supervision of Joshua Lederberg and
    Edward Feigenbaum to be used in their investigations. (B) Another
    use of data transmission through the 270Y is to take spectropolorimeter
    measurements and then analyze these spectra for form, bandwidths, and
    similarities between derivatives for theoretical projections. (C)
    The project mentioned also includes a battery of utility programs
    for metastable analysis, chemical rate analysis, C13 substitution
    ratios, and other routine analyses that the chemists wished programmed.

Name: Ross, R.   Project: CHEM

Department: Chemistry

Project Description: The purpose of this project can be summarized as
    follows: (A) The taking of high rate data transmission to write
    experimental analysis programs so as to develop programs for the
    routine analysis and finished output of mass spectra. The trans-
    mission is through the 270Y-270X channel. The project plans to
    develop this interface to service two mass spectrometers (ALTAS CH4
    and AEI MS9). The taken spectra are then to be fed to the Artificial
    Intelligence group under the supervision of Joshua Lederberg and
    Edward Feigenbaum to be used in their investigations. (B) Another
    use of data transmission through the 270Y is to take spectropolorimeter
    measurements and then analyze these spectra for form, bandwidths, and
    similarities between derivatives for theoretical projections. (C)
    The project mentioned also includes a battery of utility programs
    for metastable analysis, chemical rate analysis, C13 substitution
    ratios, and other routine analyses that the chemists wished programmed.

Name: Stillman, R. A.   Project: DREAMS

Department: Chemistry

Project Description: The purpose of this project can be summarized as follows:
    (A) The taking of high rate data transmission to write experimental an-
    alysis programs so as to develop programs for the routine analysis and
    finished output of mass spectra. The transmission is through the 270Y-
    270X channel. The project plans to develop this interface to service two
    mass spectrometers (ALTAS CH4 and AEI MS9). The taken spectra are then
    to be fed to the Artificial Intelligence group under the supervision of
    Joshua Lederberg and Edward Feigenbaum to be used in their investigations.
    (B) Another use of data transmission through the 270Y is to take spectro-
    polorimeter measurements and then analyze these spectra for form, band-
    widths, and similarities between derivatives for theoretical projections.
    (C) The project mentioned also includes a battery of utility programs
    for metastable analysis, chemical rate analysis, C13 substitution ratios,
    and other routine analyses that the chemists wished programmed.

Category 13

Name: Assaykeen, T.   Project: RENIN

Department: Urology

Project Description: We have previously reported that in dogs insulin-
    induced hypoglycemia significantly increases plasma renin levels.
    We would like to continue these studies in order to attempt to deter-
    mine what the stimulus to renin secretion is under these conditions
    and how this stimulus is transmitted to the juxtaglomerular cells.

    There is good evidence that the sympathetic nervous system can in-
    fluence renin secretion but how this occurs is not known. We would
    like to establish whether catecholamines stimulate renin secretion
    through alpha or beta receptors, whether cyclic 3', 5'-AMP is in-
    volved and whether the effects of the catecholamines on renin se-
    cretion can be separated from the effects of these compounds on
    renal hemodynamics and function.

    The results of such studies may lend support to existing theories
    regarding the control of renin secretion or may give new insight
    concerning the physiologic control of this important endocrine
    system.

Name: Cohen, S.   Project: DRUGALRT

Department: Pharmacology

Project Description: The project involves the establishment of a computer-
    based program aimed at preventing undesireable drug interaction and
    reducing drug toxicity at the Stanford University Medical Center. A
    data bank utilizing already available information from the pharmacologi-
    cal literature will be compiled dealing with drug interactions of clini-
    cal significance. When prescriptions are billed by the Stanford phar-
    macists, they would type the name of the drug and the dosage regimen
    into a terminal located in the Hospital pharmacy. When a new drug
    added to a patient's regimen interacted with any one of the several
    drugs a patient may already be receiving, the computer would print out
    an appropriate alert accompanied by a literature reference, which would
    be sent to the nursing unit by the pharmacist--together with the drug.
    Prior to administering a drug accompanied by such an "alert", the nurse
    would contact the physician in charge, who would take the patient's
    total clinical condition into account in deciding whether or not the
    drug should be administered. This program would provide considerable
    teaching benefits to students and house staff, in addition to providing
    benefits of major importance to patient care. In addition, it would be
    possible to assess the impact of providing physicians with drug inter-
    action information in such a direct fashion, and also to learn in a
    prospective way about the clinical effects of incompatible drug com-
    binations that are administered for one reason or another despite the
    alert.

Name: DeNardo, G.   Project: XENON133

Department: Nuclear Medicine

Project Description: This project involves the use of radioactive methods to
    assess the regional distribution of ventilation and pulmonary blood
    flow in normal subjects and subjects with disease. A scintillation camera
    and special purpose computer are used to generate positimal and quantitive
    information for subjegnent processing by ACME. Studies in upright man
    have revealed that the distribution of ventilation is determined by the
    pre-inspiratory and inspiratory volumes.

    We propose to study pulmonary embolism with these radioactive methods
    and compare the results with those obtained from conventional pulmonary
    function studies.

Name: Fries, J.   Project: DATABANK

Department: Medicine-Immunology

Project Description: Concerned with the problem of establishing significant
      clinical, pathologic, and laboratory correlations in the immunologic
      diseases, and assessing these correlations in regard to classification,
      pathogenesis, prognosis, and response to therapy. These diseases are
      characterized by involvement of a large number of organ systems, a large
      variety of associated laboratory abnormalities and a course prolonged in
      duration and punctuated with periodic exacerbations and remissions. A
      massive amount of data is thus generated by each patient and meaningful
      correlations may be obscure to the clinician and inaccessible to the
      clinical researcher. The data cannot be well-handled retrospectively
      or manually.

      We have evolved an ordered, comprehensive method of recording patient
      data structured with respect to time. We propose to establish a compu-
      ter data bank for storage of this structured information and to develop
      programs for searching the data bank in a variety of ways to provide
      the desired correlations and statistical analyses.

Name: Govan, D.   Project: PARAQUAD

Department: Urology

Project Description: The Division of Urology at Stanford is currently res-
      ponsible for the urologic evaluation management and clinical follow-up
      of nearly 300 patients with spinal cord injury or disease. Utilizing
      the ACME Computer Facility between July 1967 through the present time,
      we have developed a method of information storage and retrieval which
      promises to be of considerable assistance to us in the overall manage-
      ment of this group of patients.

Name: Kakihana, R.   Project: ETHANOL

Department: Psychiatry

Project Description: We have been studying the effects of alcohol on the
    central nervous system of rodents. A study of alcohol's effect on the
    pituitary adrenal system is being studied in various inbred mouse
    strains. We are also studying the effects of central nervous system
    lesions on alcohol preference phenomenon in mice. Finally, the mechan-
    ism of central nervous system adaptation to alcohol and other stressors
    is being considered.

Name: Kriss, J.   Project: ASSAY

Department: Nuclear Medicine

Project Description: This program is used to calculate the results of a
    bioassay for the long-acting thyroid stimulator, (LATS), to calculate
    the statistical significance of these results, and to calculate the
    results of radioimmunoassays for TSH, FSH, LH, growth hormone, anti-
    sperm antibody, anti-thyroglobulin, anti-microsomal antibody, and
    LATS. These data are being acquired as part of a study on the patho-
    genesis of Graves' disease, the effects of X-ray therapy upon thyroid
    function, and the pathogensis of other endocrine disorders associated
    with autoimmunity.

Category 14

Name: Dong, E.   Project: heart

Department: Cardiovascular Surgery

Project Description: Study effects of heart transplantation. Collecting
     data on blood volume, heart rate, rhythm, and blood pressures. Also,
     developing relationships between white cell types--correlations and
     negative correlations.

Name: Dong, E.   Project: MARG1

Department: Cardiovascular Surgery

Project Description: The purpose of our project is to develop a controller
     for an artificial heart. We are attempting to do this by using a trans-
     fer function between arterial pressure and heart rate. The project is
     a joint concern between the Department of Cardiovascular Surgery and
     the Stanford Electronics Laboratory.

     At the present time, we are recording three channels of analog data from
     an auto-transplanted dog. This data is processed using the ACME 1800
     system. The data are converted to digital data using the 1800 and stored
     in the 360/50. It is then processed and six channels of data are calculated.
     The digital data is then converted to analog signals using the 1800 and
     printed out on an offner strip chart in the laboratory.

     We also have a PDP-8-360/50 interface which we use to store PDP-8 data
     on the ACME system.

Name: Mesel, E.   Project: VSD

Department: Pediatrics

Project Description: This project is concerned with blood flow through
    ventricular septal defects (VSD) surgically produced in dogs. Two
    major sets of comparisons are made: the pattern of flow through the
    VSD is compared with the pattern of differential pressure between the
    left and right ventricles and with the electrocardiogram (ECG); and
    flow measured by an electromagnetic flow probe (which we consider a
    primary standard) is compared with flow measured by other techniques
    used on people (Fick dye dilution).

    During the experiment VSD flow, left and right ventricular pressures,
    and the ECG are recorded on tape. The more interesting data are selected
    for A to D conversion and for computation of the differential pressure
    by program WORKHORSE. Program LISTING lists digitized data, which,
    when graphed, permits comparison of the pattern of flow with the pat-
    tern of differential pressure. As might be expected, we have found that
    these patterns are very similar even under varying conditions (e.g.,
    ectopic beats), with flow slightly delayed with respect to pressure.
    Program cathlog produces a file which summarizes all our VSD experiments.

    Future effort will be directed towards the incorporation and use of
    programs developed in project carcat for pattern recognition of pres-
    sure and flow contours.

Name: Morris, S.   Project: EXPT4

Department: Genetics

Project Description: I am using the 1800 to interface a Packard liquid
    scintillation counter to the 360. This allows me to feed raw data
    directly into the 360 where it can later be retrieved and digested.
    ACME will be used to analyze the incorporation of radiolabeled
    amino acids into brain proteins.

Name: Smith, N.   Project: MAC

Department: Anesthesia

Project Description: This project involves calculation of cardiovascular
    data from variables obtained in normal volunteer subjects and patients.
    No statistical analyses are performed through this program; rather they
    are performed separately using standard programs.

Name: Smith, N.   Project: BABOONS

Department: Anesthesia

Project Description: This project involves transfer of manually obtained and
    calculated data into ACME files. Multiple regression and correlation
    analyses are then performed on these data. Data obtained by destructive
    methods (thoracotomy, catheter placement, etc.) are compared to those
    obtained by nondestructive methods (microphones, accelerometers, etc.).
    It is hoped to replace the former with the latter.

Name: Thathachari, Y.   Project: DOPA

Department: Dermatology

Project Description: Structure of melanins. Melanin is a polymeric pigment
    widely distributed throughout the plant and animal kingdoms. It has
    unusual physical and chemical properties. Using ACME as a real-time
    terminal, models of the molecular structure of melanins were generated
    starting with the known shape of the subunits and using various criteria
    for the linking of adjacent units. By watching the output periodically,
    the flow of the computation could be directed at will. For these genera-
    ted models, various measurable physical data were computed and compared
    with the experimentally derived values. Programs were especially written
    for these calculations and were found to be very promising and fruitful.
    Some of the results have been published and presented at conferences
    and more publications are under way. In view of the success of the
    techniques, the work is being continued.

    Radioactive tracer techniques for the detection and therapy of melanomas--
    improvement on the conventional scanning techniques, making more efficient
    use of observations with a real-time feed back between the collection of
    data and their processing. Simulated experiments using ACME as a real-
    time terminal are under way to make a choice between alternate techniques.
    When the choice is made, we plan to commission the equipment and the
    interfacing with ACME.

Name: Warrick, G.   Project: STEROID

Department: Psychiatry

Project Description: The present research in our psychophysiological labora-
    tory revolves around the "averaged evoked response." We record a con-
    tinuous EEG on magnetic tape when presenting selected stimuli. After-
    words it is necessary to take out the EEG from the recording for certain
    time periods after each stimulus and average from 25 to 100 curves. When
    more than one kind of stimulus is shown the EEG must be distributed
    according to specific stimuli and several averages calculated simultan-
    eously.

    ACME supplies us with 3 analog input lines for reading of the EEG and
    corresponding signals. Our sampling rate is 4 msec and by reading 100
    curves for 500 msec or 25 curves for 4 sec, we use a storage space of
    25000. After the curves are selected and averaged, they are returned
    through an analog output line and plotted on our X-Y plotter. The
    curves are also stored in digital form in the ACME file system.

    We are presently having a second output line installed to give us a
    time base for the x-axis on the plotter.

    The two output lines will be connected for more systematic results.

Name: Wittner, W.   Project: AROGUESS

Department: Psychiatry

Project Description: (AROGUESS) The influence of correctly and incorrectly
      guessed visual patterns on visual averaged evoked response. This study
      deals with changes in the electroencephalogram (EEG) of human subjects
      under conditions of various "mental states." The EEG associated with
      certain visual stimuli in certain "mental states" will be averaged to
      obtain the so-called averaged evoked response (AER). The shape of the
      AER waveform reflects brain activity beyond the purely sensory-receptive
      component. For instance, the AER is influenced by such variables as
      attention, conditioning, and habituation.

      In this study, young healthy males will be presented with a sequence of
      two types of visual stimuli which will alternate randomly. One pres-
      entation will consist of a cueing flash, an arrow pointing left, and a
      test flash. The other visual stimulus presentation will consist of a
      cueing flash, an arrow pointing right, and a test flash. Prior to each
      presentation, the subject will make a guess as to the type of upcoming
      presentation by pressing either a left-handed or a right-handed button.

      On the basis of results of related studies by other investigators, it
      is assumed that the evoked response to correctly guessed arrows will
      differ from that evoked by incorrectly guessed arrows. One purpose of
      the study will be to ascertain whether indeed this is so. Furthermore,
      it is hypothesized that the AER induced by flashes following incorrectly
      guessed arrows will differ in shape from the AER averaged on flashes
      following correctly guessed arrows. The assumption is made that guess-
      ing correctly produces a different "state of mind" than guessing in-
      correctly and that this "state of mind" persists long enough to alter
      the AER to a rapidly following neutral light stimulus. The various
      AERs will be differentially averaged to prove or disprove the stated
      hypotheses.

      The averaging of the EEG to obtain the AER will be done by the use of
      ACME computers. Once the various AERs are averaged, they will be anal-
      yzed and compared with each other, again by use of the ACME facility.
      Data (at various stages of analysis) will be stored in computer files.

      Should the hypotheses prove to be correct, further research will be
      conducted to investigate the effects of hormones on these parameters.

Category 15

Name: Aronow, L.   Project: LCEL

Department: Pharmacology

Project Description: Routine laboratory calculations, including statistical
     tests of significance, relating to the mechanism of action of anti-cancer
     drugs.

Name: Bagshaw, M.   Project: SUMMARY

Department: Radiology

Project Description: The project is designed for retrieval of cases and
     classification of cases from the tumor registration. The ACME Computer
     is used for:

     1. Gathering case histories and follow-up information from
         patients with tumors treated by radiation therapy.

     2. Generating reliable data for the therapist's use in either
         research work or patient treatment.

Name: Baldwin, R.   Project: OLIGOMER

Department: Biochemistry

Project Description: The project is characterization and helix -- forming
    properties (both kinetic and equilibrium properties) of short DNA helices
    formed by dAT oligomers of defined chain of lengths. dAT oligomers have
    the repeating and self-complementary base sequence ...ATAT... .

    They may form either hairpin helices or dimmer helices, depending on
    conditions.

    The aims of the project are: (1) characterization of loops in DNA
    helices, (2) measurement of the parameters controlling the cooperativity
    of DNA melting, and (3) measurement of the rates of the elementary steps
    of base pair opening and dosing in DNA helices.

Name: Bausek, G.   Project: HODPAT

Department: Medicine - Infectious Diseases

Project Description: Lymphoma data program (LDP). The radiotherapeutic
    treatment of lymphomas, particularly Hodgkin's disease, has been
    shown to be the most effective way of achieving high cure rates.
    However, many aspects of these malignancies are still puzzling. For
    example, in addition to the obvious truth that we are still in the
    dark regarding the origin of lymphatic cancer, there appear to be
    significant differences between the lymphomas in their methods of
    progression, both in the presence and absence of treatment. The LDP
    has as its initial goal the accumulation of data on many aspects of
    lymphoma patients in readily retrievable form. Items of importance
    are: results of physical exams of new patients, background information
    such as records of malignancies in the patients' families, early symp-
    toms of the disease, laboratory data, method of treatment, and follow-
    up data (recurrence, retreatment, etc.).

    From the analysis of such stored information, it is anticipated that
    inferences can be drawn regarding optimum treatment scheduling and the
    possible causes of these diseases.

Name: Beard, R.   Project: PREVMED

Department: Community & Preventive Medicine

Project Description: Making correlation computations. Analyzing behavioral
    responses and influences of inhaling carbon monoxide.

Name: Bodmer, W.   Project: POPGEN

Department: Genetics

Project Description: Our main use of ACME is for the analysis and interpretation
    of data on human white cell antigens. A secondary use is for the analysis
    and simulation of population genetic models. We have developed a series
    of programs to facilitate the storage of our data with appropriate editing
    at the time of input and to facilitate a read interaction between the
    experimental worker and the computer. This allows us, at short notice, to
    do small scale 2 x 2 analyses for serum characterization, selection of
    appropriate individuals for absorbtion and automatic typing according to
    complex patterns of serum reaction. These increased opportunities for
    interaction with the computer have been a great help in our day-to-day
    work and in establishing new relationships amongst our sera. Our future
    plans include the development of programs for the systematic analysis of
    family data.

Name: Brutlag, D.   Project: ULTRA

Department: Biochemistry

Project Description: During the past several months I have been studying the
      role of divalent metal ions in the reaction mechanism of the enzyme DNA
      polymerase. In this work I use ACME to perform nonlinear weighted re-
      gression analysis of the data I have in order to test various theoretical
      models which describe how the enzyme works. I also use ACME routinely
      as a general laboratory tool in the reduction of all of my experimental
      data. One program reduces data from enzymatic assays and prepares a writ-
      ten report. Another calculates binding constants from equilibrium dialysis
      experiments. I have also used ACME for calculating physical parameters of
      macromolecules from data obtained from the analytical ultracentrifuge.

Name: Cady, P.   Project: THYROID

Department: Psychiatry

Project Description: Thyroid function is being studied in human subjects
      of varying genetic backgrounds subjected to stress. Measures of
      thyroid function include iodine uptake, thyroidal iodine clearance,
      thyroxine turnover, free and total thyroxine, and thyroxine binding
      capacity. Psychological measures of stress include personality in-
      ventories, mood scales, I & E scales, coping scales, and scored psy-
      chiatric interviews. Biological measures of stress include cortisol
      levels, pulse, diastolic and systolic blood pressures, and auditory
      reaction times. Measures of genetic inheritability are made using
      Falconer's family incidence equations. The computer is clearly
      necessary to perform the analysis of variance with such a large
      number of variables.

Name: Collins, K.   Project: ATCase

Department: Biochemistry

Project Description: This file is used for three purposes. First, it is
    used in a variety of ways as a research tool. It has been used to
    compute the dissociation constants for an enzyme (ATCase) and some of
    its inhibitors. It will be used in the future to simulate difference
    from model compounds and compare these spectra with the experimental
    spectra and to analyze data from equilibrium dialysis studies of ATCase
    and its substrates and inhibitors.

    Second, it is used as a data processing facility for research-generated
    data. It is extensively and routinely used to process chromatograms
    from an amino acid analyzer; a long program stored in ACME provides a
    variety of different procedures that may be used on the data.

    Third, it is used as an education device. For instance, this file
    has been used to process data from a laboratory course in ultracen-
    trifugation.

Name: Conner, R.   Project: RATRACE

Department: Psychiatry

Project Description: There are approximately 15 individuals in this
    laboratory directly involved in experimentation relating neuroendocrine
    function to behavior. Information from animal testing chambers will soon
    be recorded on a high-speed paper-tape punch. The data on the paper-
    tapes will be dumped directly into ACME data files through a PDP-8 inter-
    face, or listed by the PDP-8 for keyboard terminal input to ACME. In
    either case, a program in the permanent ACME files will be written to
    sort the data from the several experiments recorded simultaneously on
    the paper-tape. Appropriate programs for the analysis of data from
    specific experiments will also be maintained in the permanent program
    files. In addition, we plan to use the ACME system to reduce and analyze
    data derived from experimentation which does not involve use of our
    paper-tape recording system, e.g., adrenocortical steroid levels of
    animals under various conditions and ACTH bioassay data.

Name: Fung, D.   Project: HARTFORD

Department: Anesthesia

Project Description: Study of acute ventilatary insufficiency, includes research
     in: 1) mechanics and gas exchange in patients with ventilatary insuffi-
     ciency, 2) clinical research in post-operative respiratory complication,
     3) cardio-pulmonary failure, 4) respiratory distress syndrome of newborn,
     5) drug intoxication, and 6) pulmonary blood flow and pulmonary hyper-
     tension. ACME is used in these studies for: 1) statistical analysis,
     2) program files for computation of physiological parameters from blood
     gas and other data, and 3) A-D conversion and processing of respiratory
     data in computation of cardiac output, and respiratory variables.

Name: Fung, D.   Project: RESPUNIT

Department: Anestheisa

Project Description: Objective: To determine the response of the pulmonary
     circulation to changes in inspired gas composition and intra-treacheal
     pressure. Progress to date: Apparatus has been set up for measuring
     pulmonary blood flow from exhaled gas composition and a program is al-
     ready available to compute the results. Current work: 1) Refinements
     are being made to improve the accuracy of the pulmonary blood flow
     measurement, and 2) a pilot study is being started to observe the ef-
     fect of a change in inspired gas composition on pulmonary artery pres-
     sure. Intended computer use: Computation results from data a) calibra-
     tion curves are computed, b) data is converted, c) results are computed,
     and d) statistical parameters are calculated.

Name: Glattke, T.   Project: ENG

Department: Otolaryngology

Project Description: We are collecting data on an almost daily basis from
     a group of preparations with electrodes implanted in the auditory
     nervous system. Use of ACME for analyses requiring many replications
     of an operation (e.g., in auto-correlation) is advantageous.

     Over the next few months, we anticipate attempting a feasibility study
     to determine if ACME would be useful for patient categorization. Our
     general thinking is that files containing coded history and test find-
     ings would be updated on a daily basis, so that these might be avail-
     able for a trend analysis. (For example, the audiological examination
     on a given patient may incorporate as many as half-dozen tests. Patient
     selection for a given course of treatment or additional special testing
     would seem to be enhanced by the availability of such trend analyses.)

Name: Goldstein, A.   Project: PHA1

Department: Pharmacology

Project Description: All-purpose programs for statistical and curve-
     fitting procedures for laboratory studies on morphine, especially
     on development of tolerance and dependence.

Name: Goldstein, D.   Name: BARB

Department: Pharmacology

Project Description: Largely least-squares curve-fitting programs for
     establishing essential parameters for enzyme kinetics in inhibition
     of flavin enzymes by barbiturates.

Name: Hackney, J.   Project: PHA1

Department: Pharmacology

Project Description: All-purpose programs for statistical and curve-fitting
    procedures for laboratory studies on morphine, especially on develop-
    ment of tolerance and dependence.

Name: Hilf, F.   Project: TESTA

Department: Psychiatry

Project Description: Involves psychological testing of psychiatric patients
    using on-line interactive techniques in which the patient sits at the
    terminal and is asked questions and he gives the answers and is rein-
    forced by the computer. A bravity procedure is also incorporated in
    this program. The main purpose is to determine if paranoid psychiatric
    patients respond to feedback differently than a control group of other
    psychiatric patients.

Name: Hwang, J.   Project: BWTSTUDY

Department: Genetics

Project Description: Study of birth weight and IQ in relation to sex, parents,
    education, race, and income.

Name: Kaplan, B.   Project: PSYCHOPH

Department: Psychiatry

Project Description: The general nature of the project is the investigation
     of the relation of automatic nervous system (ANS) responses to attentional
     sets (thinking and environmental observation). In a recently completed
     study, which examined ANS changes as a function of verbalization and
     environmental attention and rejection, ACME was used to obtain heart rate
     and skin conductance values from raw data. This physiological data was
     then analyzed, using analysis of variance and other parametric statistical
     procedures. In addition, ACME was used for obtaining correlations between
     the physiological responses and personality variables.

     Future work will look at ANS responses in lactating and non-lactating
     human females and will investigate ANS correlates of attention and infor-
     mation processing. ACME will be used for transformation of the raw
     physiological data into meaningful units and the statistical analysis of
     this data.

Name: Kapp, D.   Project: CHBR

Department: Radiology

Project Description: Data analysis of sedimentation patterns of DNA
     following X-irradiation.

Name: Kessler, S.   Project: MATSPEED

Department: Psychiatry

Project Description: Will be analyzing mating speed experiments as previously,
     including use of linear regression and analysis of variance programs.

Name: Kriss, J.   Project: BLDVOL1

Department: Nuclear Medicine

Project Description: The program is being used to calculate plasma volume,
blood volume and red cell mass in patients who receive radioactive
tracer material. The determination is useful in the evaluation of
patients with anemia and polycythemia.

Name: Lederberg, J.   Project: GENLIB1

Department: Genetics

Project Description: This project contains the statistical and miscellaneous
programs used by the Genetics Department.

Statistical programs: General statistical analysis for the calculations
of sum, mean, standard deviation, the analysis of variance, chisquare and
probability of chisquare distribution, correlation and regression analysis,
the normal distribution with the same mean and standard deviation for
fitting a curve.

Plotting Programs: Plot bar graph in 100 positions, plot of percentage dis-
tribution, plot by function scaled to the range of 0 to 100, plot of
multivalued function allows the choice and supersition of several characters.
Flag is inserted on the chart when underflow or overflow occurred.

Sorting Programs: Sorting a vector in ascending order, sort array and
alphabetical informations.

Name: Leiderman, P.   Project: PREMIE

Department: Psychiatry

Project Description: Studies of maternal behavior in non-human mammals have
    suggested that the degree of interaction permitted between mother and
    infant in the postpartum period influences later maternal attachment
    and infant development.

    Assessments of each mother and her infant are made periodically during
    the time the infant is hospitalized and during the first two years at
    home. Three major areas are included in these assessments: 1) maternal
    attitudes regarding her relationship with the child as reflected in res-
    ponses to interviews and questionnaires, 2) maternal behavior observed
    during routine caretaking of the infant, and 3) the behavioral develop-
    ment of the infant.

    Analyses will be done comparing the different groups on various attitu-
    dinal and behavioral dimensions at specific points in time as well as
    changes within groups over the two year period. We will also examine
    the interrelationships between variables as well as the effects of
    birth order and sex of the infant on the variables of interest.

Name: Luetscher, J.   Project: Blood-pr

Department: Medicine - Metabolic Research

Project Description: Our research project deals with the secretion and metabolism
    of adrenal hormones. Various steroid hormones, catecholamines, and trophic
    hormones are measured under different conditions of sodium loading or sodium
    depletion. We attempt to define and relate groups of measurements which
    assist in the identification of curable forms of hypertension.

The ACME system is used in this project in several ways:

    (1) To assist in the calculation of laboratory data, involving
difficult procedures, such as the double isotope derivative method,
which requires solution of simultaneous equations.

    (2) Interpretation of data: (a) Simulation of complex systems
(for example, the study of reactions in which substrate and enzyme
concentrations are regulated by different systems and may vary inde-
pendently; or distribution and metabolism of hormones). (b) Statistical
analysis (comparison of mean and variance of different groups, or
correlations between different observations). (c) Analysis of clinical
information (the association between different observations, or the
effects of drugs, diets, etc.).

    (3) Data files are used to store information at various stages of
a sequential process, and for collection and analysis of the large
amount of clinical and laboratory data which accumulates during a long
investigation.

    (4) The computer has been used extensively in research training
of fellows and staff, first in principles and techniques of computer
use, and subsequently in practical applications.

Name: Melges, F.   Project: TEMPO

Department: Psychiatry

Project Description: Relating changes in temporal experience to changes in
    psychopathological symptoms such as depersonalization and delusions.
    Our plan is to discover how aberrations in temporal sequencing and dis-
    tinquishing memories from perceptions and expectations relate to the
    emergence of definable psychopathological processes. The overall notion
    for a number of sub-projects is: confusing past, present, and future
    underlies the central symptoms of psychosis.

    Sub-projects involve specific attention to drug-induced psychoses and
    certain symptoms of psychoses, especially depersonalization, changes
    in body image, paranoid delusions, and feelings of influence or alien
    control.

    Previous work has demonstrated that this approach is highly useful for
    understanding psychotic processes. Although aggregate data across sub-
    jects will be used, the usual approach will be the intensive study of
    single subjects as they change over time. This allows for the study of
    what changes with what over time. In other words, various processes,
    i.e. sequential relationships between changes, are discovered by this
    intensive approach.

Name: Miller, R.   Project: BIOSTOP

Department: Community & Preventive Medicine

Project Description: The Division of Biostatistics, Department of Community
    and Preventive Medicine, provides biostatistical consulting to persons
    doing medical research in the Stanford Medical Center and occasionally
    elsewhere, such as Presbyterian Hospital in San Francisco.

    Biostatistics also trains postdoctoral fellows and some graduate stu-
    dents in Statistics in biostatistical consulting. Investigations of
    statistical methods may also be done by the staff, postdoctoral fellows,
    or graduate students.

    The ACME computer is used in all these activities.

Name: Miller, R.   Project: THESES

Department: Community & Preventive Medicine

Project Description: This "project" will be used for computing done by or
    for graduate students in statistics and biostatistics as part of the
    research necessary for their theses, or otherwise connected with their
    education.

Name: Miller, R.   Project: COURSES

Department: Community & Preventive Medicine

Project Description: This "project" will be used for computing done by or
    for the staff in connection with the teaching of courses in biostatistics.

Name: Nelsen, T.   Project: ADRENAL

Department: Surgery

Project Description: Clinical cancer research record protocols and data for
    storage and analysis. Next step will be display routines.

Name: Payne, R.   Project: SERNAL

Department: Medicine - Hematology

Project Description: The research is concerned with extending and classi-
    fication of leukocyte and/or tissue antigens by serologic and genetic
    analysis of specific human antisera. In the computer programs, 1)
    donor-recipient pairs of individuals are selected for deliberate immuni-
    zation to produce antisera, and 2) the antisera are analyzed by comparing
    their reactions with test cells in 2 x 2 tables for associations between
    them. The significant associations are calculated, and the frequency of
    positive reactions are determined.

Name: Porter, R.   Project: ATC_KIN

Department: Biochemistry

Project Description: Project ATC_KIN has been used for data processing in
    the investigation of the steady-state kinetics of the enzyme, aspartate
    transcarbamylase. The programs were written for curve-fitting the data
    from different types of kinetics experiments. For example, program
    "DataFit" employs a simple linear least squares fit to calculate the
    initial rate of reaction from the raw data, measured as amount of
    radioactivity versus time of reaction, and converts the result to
    standard units of specific enzyme activity, using units of concentration.

    Other programs calculate the kinetic parameters using a linear least
    squares fit for the reciprocal transformation, due to Lineweaver and
    Burke, of the Michaelis-Menten equation. Another program, "Hyper-
    Fit", was written to fit the non-linear, hyperbolic function of the
    original Michaelis-Menten equation. The program employs a reiterative
    procedure of trial-and-error testing for optimal fit. Trial values
    for the two parameters of the Michaelis-Menten equation are tested for
    minimizing the residual, and the procedure is reiterated to give a close
    approximation of the best values.

    This computational procedure was refined and optimized for speed, and
    the program will compute the best values for the two parameters, to an
    accuracy exceeding that of the data, in less than ten seconds of
    computer time in a time-sharing environment. This approach proved to
    be so successful that it was adapted for curve-fitting other, more
    complex non-linear kinetic equations with more parameters. For example,
    the non-linear equation describing substrate inhibition, with three
    parameters, which does not give a simple linear reciprocal transformation,
    has been employed directly, using this trial-and-error technique. In
    addition, the family of hyperbolic curves described by the equation for
    competitive inhibition, with three parameters, has been employed
    successfully.

    The greatest success of this technique has been the use of equations with
    four parameters for curve-fitting, such as the equations describing non-
    competitive inhibition and parabolic competitive inhibition. With
    correspondingly longer times for calculation, these programs have pro-
    vided quantitative support for the existence of certain reaction inter-
    mediates in the pathway of this enzyme mechanism.

    These programs make special use of the on-line communication available
    with the ACME system, especially through the use of options and operator-
    controlled branchpoints in the programs.

Name: Reaven, G.   Project: DISPLAY

Department: Medicine - Metabolism

Project Description: 1) Derivation of a three compartment model describing
     disappearance of plasma insulin. 2) Evaluation of the dog as an experi-
     mental model for study of insulin distribution in man. 3) Digital on-line
     computer display to investigate the structure of metabolic systems. In-
     terested in developing models of glucose, insulin, and triglyceride kine-
     tics as related to diabetes mellitus and atherosclerosis. Clinical data
     obtained from tracer studies are analyzed by the ACME computer through
     five stages of development. The project DISPLAY includes the third and
     fourth stage. The third stage contains the program PEEL that automati-
     cally obtains the parameters for a linear sum of constant coefficients
     of a system of linear differential equations. The results are used for
     the fourth stage. In this phase, the parameters are used for calculation
     of a theoretical curve which is displayed on a CRT. It is then compared
     with data which also appears on the CRT. The results of PEEL and SKINNER
     enable us to change parameters until we obtain a satisfactory visual fit.
     In this phase, we used the programs RUNGCURV, DATA, TDATA, berman,
     RUNGPLOT, and RUNGFUN. We are now performing similar analysis with res-
     pect to triglyceride metabolism and are extending the insulin work. We
     expect to use the above procedures the entire year and expect to extend
     stage four and develop stage five for analysis of non-linear metabolic
     models.

162

Name: Reaven, G.   Project: FIT

Department: Medicine - Metabolism

Project Description: (See discussion in Project DISPLAY). The final phase
    is at the present being developed. The results of simulation in stage
    4 is to be statistically evaluated to see if the parameters obtained
    do not violate the statistical limitations of the data. At the moment,
    we are doing this in batch mode at the Computation Center. However,
    the most satisfactory results are obtained if the statistical evalua-
    tion is coupled to stage 4. We plan to use nonlinear regression
    techniques to evaluate these parameters. We have developed two pro-
    grams for this procedure; they are RUNGPOW and EXPOPOW, which call
    two programs, POWELL and COVARE, which are stored on public file.

Name: Reaven, G.   Project: PAT_DATA

Department: Medicine - Metabolism

Project Description: (See discussion in Project DISPLAY). This project
    includes stage 1 and stage 2. Stage 1 and stage 2 are support pro-
    grams for stages 3, 4, and 5. In stage 1, serum endogenous insulin
    is biologically assayed by the program INSULIN. The program TCCONRAD
    determines triglyceride concentration and the program DOUBLE estimates
    the relative weights of data for future statistical analysis. The
    second stage consists of statistical support programs for evaluation
    of the results of stage 1. The programs used in this phase are:
    TEATEST, RAT, CORL, REGRESS, DICK, TG DOSE, RANK, and YOUTEST.

    Our research activities also include procedures to determine weight
    patterns of patients. The program involved in this aspect is BODYCOMP.

Name: Reitan, J.   Project: INDIRECT

Department: Anesthesia

Project Description: We are processing cardiac internal timings collected by
    non-invasive, indirect techniques in order to monitor the contractile
    state of the heart under varying loads and drugs.

Name: Rosenberg, S.   Project: MEDONCOL

Department: Medicine-Oncology

Project Description: Patient and disease analysis - primarily to correlate
    drug responsiveness in cancer patients for educational and research
    purposes.

Name: Smith, P.   Project: PREMIES

Department: Pediatrics

Project Description: This data will be used in any study involving pre-
    mature or sick newborn infants cared for in the Stanford nurseries.
    Such items as birth weight, gestational age, system disease, etc.,
    will be correlated by pairs.

Name: Spevack, A.   Project: CONDIT

Department: Psychiatry

Project Description: Classical conditioning experiments of amygdalecto-
    myed and intact monkeys.

Name: Stark, G.   Project: CHAOS

Department: Biochemistry

Project Description: ACME serves two primary functions. First, it is used
    to analyze data generated from steady state kinetic experiments on
    enzymes, primarily aspartate transcarbamylase from Eschenchia coli.
    Second, it is used to process chromatograms generated by an amino
    acid analyzer. It is also used for various research and educational
    tasks by graduate students and medical students, such as analyzing
    the sedimentation velocity of proteins in the ultracentrifuge. Many
    of the kinetic experiments referred to above could not be done with-
    out the services of ACME, since they involve trial and error fitting
    of several parameters to complex functions. The routine processing
    of chromatograms on ACME introduces accuracy and dependability not
    otherwise available.

Name: Stillman, R.   Project: PSYGAME

Department: Psychiatry

Project Description: Our project involves the use of an interactive system
    for the interviewing and testing of psychiatric patients.

    We are attempting to use the computer and a peripheral CRT display for
    anticipated psychological testing. This includes terms from standard
    psychological tests and novel tests which the computer is especially
    suited for.

Name: Stocker, B.   Project: Stm

Department: Medicine - Micro

Project Description: Main project concerns genetics and physiology of
    Salmonella typhimurium - in particular somatic lipopolysaccharide,
    flagella and motility, and plasmids, especially R and colicine
    factors. I am co-investigator in Dr. Esther Lederberg's project,
    which concerns mainly recombination-deficient mutants in the same
    organism. Main ACME usage has been 1) in statistical analysis of
    data from experiments concerning mouse pathogenicity of lipopoly-
    saccharide mutants (estimations of LD50, rate constant for clearance
    of bacteria from blood stream, harmonic mean times-to-death, sig-
    nificance tests, etc.) and 2) for storage and analysis of extensive
    stock-culture data concerning strains with numerous genetic markers.

Name: Strickland, R.   Project: GASTRIC

Department: Medicine - G. I. Division

Project Description: I am involved in clinical research projects relating
    to gastric secretory function tests and have used the ACME Computer
    Facility over the past year for filing of data collected from these
    projects and for statistically analyzing the results obtained.

Name: Summerlin, W.

Project: BIOCHEM

Department: Dermatology

Project Description: To study biochemical control of collagen formation via proline/hydroxjproline (ratios).

Name: Vosti, K.

Project: VOSTI

Department: Medicine - Infectious Diseases

Project Description: Cross-tabulating variables associated with bacterial infections such as underlying disease, age, year, prior and contemporeneous antibiotics, steroids and immuno-suppressives, appropriateness of treatment, and outcome (survival, death).