

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



965-5555

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

Resource Title Advanced Computer for Medical Research (ACME)	Resource Address Stanford University School of Medicine Palo Alto, California	Resource Tel. No. (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)

<u>Name</u>	<u>Title</u>	<u>Department</u>	<u>Institution</u>
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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

<u>Name</u>	<u>Title</u>	<u>Department</u>	<u>Institution</u>
* 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

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Annual Report

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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 implementation 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 deadline 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-acquisition 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 direction 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 Description of Core Research Activities 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 processes 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 accommodate 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 reliability. 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

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	4/16/70
	<u>Rate Per Page Minute</u>	
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 antici- pated; 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 antici- pated; ACME staff	No Charge

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

SUMMARY OF COMPUTER RESOURCE USAGE
CORE RESEARCH PROJECTS
Period Covered 4/21/69 - 4/16/70

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) at .1 cent per pageminute (full credit)	Block Storage(K) at .10 cents per block (full credit)
						7	ACME staff		
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	Text 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.									

SUMMARY OF COMPUTER RESOURCE USAGE
INDIVIDUAL USER PROJECTS
Period Covered 4/11/69 - 4/16/70

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) at .1 cent per pageminute (full credit)	Block Storage(K) at .10 cents per block (full credit)
						7	ACME staff	1,221	346
Matous, J.	ACME	Daily operations.	*RRO0311	NIH		7			
Miller, J.	ACME	Assembler development.	*RRO0311	NIH		7		644	381
Miller, J.	ACME	File development.	*RRO0311	NIH		7		477	1,690
Miller, S.	ACME	System development.	*RRO0311	NIH		7		22,865	498
Montgomery, R.	Computation Center	Text editing.	*RRO0311	NIH		7		0	6
Morris, M.	Genetics	Departmental service routines.	*RRO0311	NIH		7		49,064	8,029
Osborne, D.	ACME	System tests.	*RRO0311	NIH		7		18,485	388
Osterby, O.	ACME	System development.	*RRO0311	NIH		7		6,753	69
Plasch, G.	ACME	Text editing.	*RRO0311	NIH		7		21,505	2,617
Public, J.Q.	ACME	Development and storage of PUBLIC files.	*RRO0311	NIH		7		50,563	6,429
Rieman, J.	ACME	Daily operations.	*RRO0311	NIH		7		4,708	218
Salisbury, J.	ACME	System development.	*RRO0311	NIH		7		23,969	1,366
Sanders, G.	ACME	User consultation.	*RRO0311	NIH		7		11,603	1,251
Sanders, W.	ACME	Hardware and software development.	*RRO0311	NIH		7		13,219	2,698
Sandoval, C.	ACME	Daily operations.	*RRO0311	NIH		7		12,736	21
Schlumberger, M.	ACME	System development.	*RRO0311	NIH		7		0	1
Smith, P.	ACME	System tests by IBM system engineer.	*RRO0311	NIH		7		11,527	738
Sutter, J.	ACME	Daily operations.	*RRO0311	NIH		7		140,088	419
User, A.	ACME	Programming aid for users.	*RRO0311	NIH		7		4,403	41
Van Tassel, J.	ACME	Daily operations.	*RRO0311	NIH		7		157,309	357
Whitner, J.	ACME	Statistical program development.	*RRO0311	NIH		7		66,819	184
Wiederhold, G.	ACME	Developing continuing system modeling program.	*RRO0311	NIH		7		2,041	3,987
Wiederhold, G.	ACME	Demonstrations for visitors to ACME.	*RRO0311	NIH		7		22,205	1,786
Wiederhold, G.	ACME	System testing to make sure it meets old and new specifications.	*RRO0311	NIH		7		59,188	3,934
Wiederhold, G.	ACME	Usage statistics, accounting, and yearly reports.	*RRO0311	NIH		7		56,162	9,374
Wiederhold, V.	ACME	Editing the PL/ACME manual.	*RRO0311	NIH		7		11,981	962
Wilson, D.	ACME	Development of real-time medical procedures.	*RRO0311	NIH		7		0	5
							TOTAL	5,100,935	129,659

* Grant supporting more than one user.

SUMMARY OF COMPUTER RESOURCE USAGE
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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)
Anderson, D.	Genetics	Instrumentation and control of mass spectrometer.	*NSG8160	NASA	\$459,717.50	1	Biomedical research service - real time	at .01/2 cent per pageminute 39,653	at .10 cents per block 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.	*NGRO5020	NASA	54,783.20	1		10,274	12,773
Kennedy, D.	Biological Sciences	Analysis of neurophysiological data.	NBC2944	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.	*NGRO5020	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.	NBC7631	NIH	61,364.44	1		768	982
Yguerabide, J.	Biochemistry	Electronic energy transfer; structure of macromolecules; protein structure and function.	*NGRO5020	NASA	54,783.20	1		30	37
Zwick, M.	Biochemistry	Theoretical techniques for solving protein crystal structures.	*NGRO5020	NASA	54,783.20	1		1	152
SUB-TOTAL								1,495,412	77,390

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			Identification Number	Agency	Current Annual Amt.			Pageminutes(K)	Block Storage(K)
Atkinson, M.	Stanford Medical School - Admissions Committee	Assist Admissions Committee in selecting new Medical School classes.	None	University Funds	University Operating Account	2	Biomedical research service - routine terminals	at .1 cent per pageminute	at .10 cents per block
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.	GML2527	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 Tobacco 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

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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)
Kountz, S.	University of Cali- fornia - San Fran- cisco - Surgery	Select recipients for renal homotransplanta- tion; measure hemodynamic changes in trans- plant patients.	AML1290	NIH	\$199,088.00	2	Biomedical research service - routine terminals	at .1 cent per pageminute	at .10 cents per block
Kraemer, H.	Psychiatry	Biostatistical analysis of various psycho- logical data.	None	University Funds	University Operating Account	2		231,172	2,588
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 trans- port.	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 & Pre- ventive Medicine	Strabismus statistical evaluation.	RRO0241	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	Presbyter- ian Medical Center, San Francisco	100.00	2		0	785
Nye, W.	Medicine - Micro- biology	Immunochemistry statistical calculations and bibliography compilations.	*AIO8211	NIH	127,454.83	2		30,584	649
Petralli, J.	Medicine - Infec- tious 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 instru- mentation.	*NSG8160	NASA	459,717.50	2		1,552	3,131

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			Identification Number	Agency	Current Annual Amt.			Pageminutes(K)	Block Storage(K)
Rosenberg, L.	Medicine - Micro- biology	Levels of serum complement in mice of diverse pedigree.	*AI08211	NIH	\$127,454.83	2	Biomedical research service - routine terminals	at .1 cent per pageminute	at .10 cents per block
Schneiderman, L.	Medicine - Ambula- tory	Clinical research data indexing.	None	University Funds	University Operating Account	2		8,795	1,216
Sforza, L.	Genetics	Simulation of population genetics studies.	GB7785	NSF	51,528.00	2		177,070	11,250
Smallwood, R.	Medical Facilities Planning	Design of Stanford Medical Care Facilities.	None	University Funds	University Operating Account	2		61,065	1,962
Smith, P.	Anesthesia	Mechanical ventilation influences in newborns having respiratory failure.	*None	Hartford Foundation	154,715.98	2		168,560	14,405
Solomon, G.	Psychiatry	Relationship of stress and environmental man- ipulation to immunity.	None	Research Foundation	4,893.54	2		0	192
Stuedeman, D.	Genetics	Capital equipment inventory.	*NSG8160	NASA	459,717.50	2		0	228
Weissman, I.	Pathology	Statistical analysis and data handling.	AI09072	NIH	12,792.03	2		2,154	2,314
Whitcher, C.	Anesthesia	Establishing anesthesia staff call schedule.	None	University Funds	University Operating Account	2		21,428	358
Zackheim, H.	Dermatology	Determination of serum copper and cerulo- plasmin levels in psoriasis patients.	None	Hartford Foundation	86,585.73	2		14,222	644
SUB-TOTAL								3,501	172
								2,991,740	152,070

Clemes, H.	Mental Research Institute			U. S. Medi- cal Research and Devel- opment Com- mand		3	Non-Stanford, medical	at .2 cents per pageminute	at .10 cents per block
Daughters, G.	Palo Alto Medical Research Foundation			Foundation Funds		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
Ingels, N.	Palo Alto Medical Research Foundation			Foundation Funds		3		4,806	181
Stewart, L.	Palo Alto Medical Research Foundation			Foundation Funds		3		52,828	1,563
				Foundation Funds		3		0	24

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			Identification Number	Agency			Current Annual Amt.	Pageminutes(K)
Tickner, E.	Palo Alto Medical Research Foundation			Foundation Funds	3	Non-Stanford, medical	at .2 cents per pageminute	at .10 cents per block
					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.	*RRO0311	NIH	4		113	426
Brast, N.	Medical Student	Calculating descriptive and inferential statistics on experimental data.	*RRO0311	NIH	4		42,888	1,859
Britt, R.	Medical Student	Auditory pathway responses to acoustic stimuli.	*RRO0311	NIH	4		0	698
Brody, W.	Medical Student	Information processing in sensory systems.	*RRO0311	NIH	4		918	2,173
Brody, W.	Medical Student	History taking and formulation of differential diagnoses.	*RRO0311	NIH	4		32,911	306
Brown, B.	Medical Student	Serum levels of therapeutic agents and analyzing assay data.	*RRO0311	NIH	4		45,237	4,544
Buchanan, B.	Medical Student	Determine whether medical students can learn statistical concepts by computer simulation.	*RRO0311	NIH	4		45,702	1,321
Buchanan, B.	Medical Student	Determine whether medical students can learn statistical concepts by computer simulation.	*RRO0311	NIH	4		6,818	13
Buchholz, W.	Medical Student	Investigation of time perspective, temporal relationships, and social function in para and quadraplegics.	*RRO0311	NIH	4		0	29
Calvert, J.	Medical Student	Devising mathematical models to be used for public administration.	*RRO0311	NIH	4		11,070	483
Edwards, D.	Medical Student	Effects of hormones on the alpha rhythm and temporal perception.	*RRO0311	NIH	4		0	131
Enzmann, D.	Medical Student	Determination of secondary peristalsis of the esophagus.	*RRO0311	NIH	4		108,120	12,875
Gamel, J.	Medical Student	Indicator dilution techniques for measuring pulmonary blood flow and lung transfer function.	*RRO0311	NIH	4		97,928	3,853
Gelfand, M.	Medical Student	On-line analysis of cardiac catheterization data.	*RRO0311	NIH	4		93,732	6,985
Gleason, C.	Medical Student	Self-education: how to use computers in electrophysiological research.	*RRO0311	NIH	4		13,880	737
Hahn, P.	Medical Student	Interpretation, quantification, and systematic retrieval of information from gel electrophoreses.	*RRO0311	NIH	4		18,578	406

* Grant supporting more than one individual user.

SUMMARY OF COMPUTER RESOURCE USAGE
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 Period Covered 4/21/69 - 4/26/70

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT			User Cate- gory	General Description	COMPUTER EQUIPMENT	
			Identification Number	Agency	Current Annual Amt.			Pageminutes(K)	Block Storage(K)
Harris, R.	Medical Student	Correlation between human emotions and their appraisals of their environment.	*RRO0311	NIH		4	Student education, Medical School	at .1 cent per pageminute (full credit) 5,776	at .10 cents per block (full credit) 204
Helikson, M.	Medical Student	Evaluating liver blood flow with radioactive isotopes.	*RRO0311	NIH		4		105,576	10,178
Jan, W.	Medical Student	Statistical tests on data from laboratory experiments.	*RRO0311	NIH		4		68,645	1,273
Levine, R.	Medical Student	Evaluate and process data obtained during biochemical assays.	*RRO0311	NIH		4		7,174	320
Lipp, M.	Medical Student	Survey of medical students and graduate physicians regarding their experience with and opinions of marihuana.	*RRO0311	NIH		4		12,680	26
Miller, S.	Medical Student	Analysis of data from an ANGER scintillation camera in connection with kidney blood flow studies.	*RRO0311	NIH		4		52,512	5,502
Monnin, L.	Medical Student	Relationship of articulation and identification abilities of normal and speech defective children.	*RRO0311	NIH		4		3,375	140
Nestor, L.	Medical Student	Establishment of computer-based program aimed at differential diagnosis.	*RRO0311	NIH		4		8,333	181
Nola, G.	Medical Student	Perform statistical analysis of hemodynamic parameters.	*RRO0311	NIH		4		0	14
Nowack, W.	Medical Student	Behavioral effects on catecholamine metabolism in the brain.	*RRO0311	NIH		4		2,251	33
Peters, J.	Medical Student	Evaluation of residuals and outliers in parallel line assays.	*RRO0311	NIH		4		44,914	323
Pope, S.	Medical Student	Statistical analysis of data sets of cardiovascular function parameters of various pharmacologic agents.	*RRO0311	NIH		4		2,568	185
Portlock, C.	Medical Student	Study of motivations for pregnancy.	*RRO0311	NIH		4		0	8
Propper, R.	Medical Student	Study of inter-relationship of angiogenesis and glucomedogenesis in the perfused kidney.	*RRO0311	NIH		4		2,637	139
Raybin, D.	Medical Student	Calculate results of assays and to handle other data calculations, statistics, etc.	*RRO0311	NIH		4		1,210	3
Rosenfeld, R.	Medical Student	Studying the psychophysiological adaptation of male patients to the Coronary Care Unit.	*RRO0311	NIH		4		0	9
Rosenthal, W.	Medical Student	Speech and language pathology; normal speech perception.	*RRO0311	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.	*RRO0311	NIH		4		7,523	938
* Grant supporting more than one individual user.									

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INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT			User Cate- gory	General Description	COMPUTER EQUIPMENT	
			Identification Number	Agency	Current Annual Amt.			Pageminutes(K)	Block Storage(K)
Schwartz, B.	Medical Student	Statistical modeling of the growth, develop- ment, and ultimate senescence of cultured human fibroblasts.	*RRO0311	NIH		4	Student education, Medical School	at .1 cent per pageminute (full credit) 487	at .10 cents per block (full credit) 19
Sethi, S.	Medical Student	Understand the replication of rhinoviruses.	*RRO0311	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.	*RRO0311	NIH		4		4,445	332
Smith, R.	Medical Student	Experimental study of family structure; socio-physiological studies of kidney trans- plant patients.	*RRO0311	NIH		4		3,379	1,133
Swanson, G.	Medical Student	Interpret therapeutic drug action on respira- tory control.	*RRO0311	NIH		4		177,595	10,134
							SUB-TOTAL	1,040,215	68,546

Bellville, J.	Anesthesia	Respiratory control mechanisms.	*GML2527	NIH	\$243,415.35	5	NIH grants not eligi- ble to be charged - real time	at .01/2 cent per pageminute (full credit) 97	at .10 cents per block (full credit) 158
Bellville, J.	Anesthesia	Pharmacology of anesthetics and related agents.	*GML2527	NIH	243,415.35	5		506,090	9,816
Bunnenberg, E.	Chemistry	Analysis of mass spectra and spectropolori- meter spectra; routine chemical analysis.	*GML2173	NIH	26,211.17	5		97,392	3,933
Bunnenberg, E.	Chemistry	Analysis of mass spectra and spectropolori- meter spectra; routine chemical analysis.	*GML2173	NIH	26,211.17	5		178,264	2,296
Bunnenberg, E.	Chemistry	Analysis of mass spectra and spectropolori- meter spectra; routine chemical analysis.	*GML2173	NIH	26,211.17	5		133,860	5,360
Bunnenberg, E.	Chemistry	Analysis of mass spectra and spectropolori- meter spectra; routine chemical analysis.	*GML2173	NIH	26,211.17	5		3,349	61
Duffield, A.	Chemistry	Analysis of mass spectra and spectropolori- meter spectra; routine chemical analysis.	*GML2173	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 de- synchronization distinguishing arousal pro- duced by emotional stimuli.	*MH11028	NIMH	90,936.37	5		82,604	2,924
Stillman, R.	Chemistry	Analysis of mass spectra and spectropolori- meter 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.									

Grant No. RRO0311-0*
Section II B

SUMMARY OF COMPUTER RESOURCE USAGE
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			Identification Number	Agency	Current Annual Amt.			Pageminutes(K)	Block Storage(K)
Bernfield, M.	Pediatrics	Biochemistry in birth defects.	*HD02147	NIH	\$257,700.07	6	NIH grants not eligi- ble to be charged - routine terminals	at .1 cent per pageminute (full credit) 29,059	at .10 cents per block (full credit) 655
Cann, H.	Pediatrics	Frequencies of genes controlling human herit- able characters.	*GM15593	NIH	107,013.84	6		262,376	58,129
Cann, H.	Pediatrics	Frequencies of genes controlling human herit- able characters.	GML5593	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 child- ren and to assess velopharyngeal competence.	DR02803	NIH	21,046.71	6	17,809	329	
Clayton, R.	Psychiatry	Effects of steroids and hormones of RNA ac- tivity 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 be- havior in stress.	*HD00801	NIH	40,068.56	6	11,585	2,561	
Doherty, R.	Pediatrics	Random sampling of cells; statistical evalua- tions of data.	*HD02147	NIH	257,700.07	6	4,608	204	
Efron, B.	Community & Preven- tive Medicine	Theoretical and applied research in biosta- tistics.	GML4554	NIH	30,268.39	6	8,896	569	
Folk, W.	Biochemistry	Mitrants of Ecali, having altered activating enzymes.	GML3235	NIH	94,669.41	6	292	75	
Fries, J.	Medicine - Immun- ology	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 choloxide gradients in the ultra- centrifuge.	GML4108	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.

SUMMARY OF COMPUTER RESOURCE USAGE
INDIVIDUAL USER PROJECTS
Period Covered 4/21/69 - 4/16/70

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)
Alway, R.	Pediatrics	Compare information on family structure, attitudes, etc. in order to predict general illness symptomatology.	*RR00311	NIH		11	Non-funded user; pilot project: routine terminals	at .1 cent per pageminute (full credit) 0	at .10 cents per block (full credit) 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.

Grant No. FRO0311-04
Section II B

SUMMARY OF COMPUTER RESOURCE USAGE
INDIVIDUAL USER PROJECTS
Period Covered 4/21/69 - 4/16/70

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)
Angel, R.	Neurology	Movement patterns, limb displacement and velocity, and electromyography.	*RRO0311	NIH		<u>12</u>	Non-funded user; funding anticipated real time	at .01/2 cent per pageminute (full credit) 54,566	at .10 cents per block (full credit) 23,255
Constantinou, C.	Urology	Study of the electrophysiology of the ureter.	*RRO0311	NIH		12		121,869	3,651
Duffield, A.	Chemistry	Analysis of mass spectra and spectropolorimeter spectra; routine chemical analyses.	*RRO0311	NIH		12		4,088	122
Gersch, W.	Neurology	Research in application of time series methods to problems in neurophysiology and medicine.	*RRO0311	NIH		12		342,121	49,491
Reynolds, W.	Genetics	Analysis of mass spectra and spectropolorimeter spectra; routine chemical analyses.	*RRO0311	NIH		12		522,499	7,737
Ross, R.	Chemistry	Analysis of mass spectra and spectropolorimeter spectra; routine chemical analyses.	*RRO0311	NIH		12		157,929	3,538
Stillman, R.	Chemistry	Analysis of mass spectra and spectropolorimeter spectra; routine chemical analyses.	*RRO0311	NIH		12		331,568	7,824
SUB-TOTAL								1,534,640	95,618

Assaykeen, T.	Urology	Control of renin secretion.	*RRO0311	NIH		<u>13</u>	Non-funded user; funding anticipated routine terminals	at .1 cent per pageminute (full credit) 12,682	at .10 cents per block (full credit) 160
Cohen, S.	Pharmacology	Establishment of computer-based program aimed at preventing undersirable drug interactions.	*RRO0311	NIH		13		0	12
DeNardo, G.	Nuclear Medicine	Using radioactive methods to assess regional distribution of ventilation and pulmonary blood flow.	*RRO0311	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.	*RRO0311	NIH		13		45,705	840
Govan, D.	Urology	Clinical management and follow-up of patients with neurologic dysfunction of the bladder.	*RRO0311	NIH		13		88,190	1,462
Kakihana, R.	Psychiatry	Effects of alcohol on the CNS of rodents.	*RRO0311	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.	*RRO0311	NIH		13		59,343	1,478
SUB-TOTAL								223,987	5,359

* Grant supporting more than one individual user.									

SUMMARY OF COMPUTER RESOURCE USAGE
INDIVIDUAL USER PROJECTS
Period Covered 4/21/69 - 4/16/70

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT			User Cate- gory	General Description	COMPUTER EQUIPMENT	
			Identification Number	Agency	Current Annual Amt.			Pageminutes(K)	Block Storage(K)
Dong, E.	Cardiovascular Surgery	Effects of heart transplants; white cell cor- relations; pulmonary data collection.	*PH436711	NIH	\$ 86,696.30	14	Suspended pending in- dividual Institute approval - real time	at .01/2 cent per pageminute	at .10 cents per block
Dong, E.	Cardiovascular Surgery	Develop a controller for an artificial heart.	*PH436711	NIH	86,696.30	14		595,813	34,664
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.	*GMO0295	NIH	122,628.87	14		39,142	689
Smith, N.	Anesthesia	Calculating cardiovascular data from normal patients.	*GML2527	NIH	243,415.35	14		4,623	1,082
Smith, N.	Anesthesia	Data file storage; statistical analyses.	*GML2527	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

Aronow, L.	Pharmacology	Laboratory data analysis related to anti- cancer drugs.	CA05672	NIH	39,591.45	15	Suspended pending in- dividual Institute approval - routine terminals	at .1 cent per pageminute	at .10 cents per block
Bagshaw, M.	Radiology	Classify and retrieve patient data from the tumor registration.	*CA05838	NIH	670,523.17	15		8,114	212
Baldwin, R.	Biochemistry	Characterization and helix of short DNA helices.	AM04763	NIH	65,319.15	15		478,452	9,875
Bausek, G.	Medicine - Infec- tious Diseases	Radiotherapeutic treatment of lymphomas.	*CA05838	NIH	670,523.17	15		10,113	1,057
Beard, R.	Community & Prev- entive Medicine	Behavioral responses and influences of in- haling CO.	U100852	NIH	93,333.19	15		132,797	2,703
Bodmer, W.	Genetics	Human white blood cells and population genetics.	GML4650	NIH	54,840.84	15		238	60
Brutlag, D.	Biochemistry	Computer application to medical research.	*GMO7581	NIH	218,562.12	15		1,786,136	222,623
Cady, P.	Psychiatry	Study of endocrine function and behavior.	MH14528	NIMH	32,007.19	15		81,984	1,526
Collins, K.	Biochemistry	Compare model compounds with experimental spectra; analyze chromatograms; ultracentri- fugation.	*GML1788	NIH	36,111.63	15		58,106	1,039
									3,224

* Grant supporting more than one individual user.

SUMMARY OF COMPUTER RESOURCE USAGE
 INDIVIDUAL USER PROJECTS
 Period Covered 4/21/69 - 4/16/70

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT			User Cate- gory	General Description	COMPUTER EQUIPMENT	
			Identification Number	Agency	Current Annual Amt.			Pageminutes(K)	Block Storage(K)
						15	Suspended pending in- dividual Institute approval - routine terminals	at .1 cent per pageminute	at .10 cents per block
Conner, R.	Psychiatry	Relating neuroendocrine function to behavior.	H002881	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
Glatcke, T.	Otolaryngology	Collecting and processing ANS data; patient categorization.	NB05582	NIH	28,159.32	15		0	55
Goldstein, A.	Pharmacology	Drug-induced mouse activity.	*MHL3963	NIH	122,801.54	15		17,459	1,319
Goldstein, D.	Pharmacology	Biochemical action of barbital.	*MHL3963	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.	*MHL1028	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 drosophela pseudoscutura.	MHL4364	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.	H002636	NIMH	81,859.15	15		21,099	3,073
Luetscher, J.	Medicine - Meta- bolic 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 & Prev- entive Medicine	Biostatistical consulting to Stanford Medical Center.	GM02511	NIH	92,129.00	15		44,237	786
Miller, R.	Community & Prev- entive Medicine	Biostatistics research and/or education.	*GM00025	NIH	86,423.87	15		0	10
Miller, R.	Community & Prev- entive 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.

SUMMARY OF COMPUTER RESOURCE USAGE
INDIVIDUAL USER PROJECTS
Period Covered 4/1/69 - 4/30/69

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT			User Cate- gory	General Description	COMPUTER EQUIPMENT	
			Identification Number	Agency	Current Annual Amt.			Pageminutes(K) at .1 cent per pageminute	Block Storage(K) at .10 cents per block
Payne, R.	Medicine - Hematology	Extending leukocyte and/or tissue antigen classification by serologic and genetic analysis.	H803365	NIH	\$ 40,659.31	15	Suspended pending individual Institute approval - routine terminals	213,302	25,678
Porter, R.	Biochemistry	Steady-state kinetics of aspartate transcarbamylase.	*GML1788	NIH	36,111.63	15		21,057	1,470
Reaven, G.	Medicine - Lipid Research	Relationship between glucose, insulin, and triglyceride kinetics and diabetes mellitus and atherosclerosis.	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.	*H808506	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.	*H808506	NIH	38,509.29	15	15,399	340	
Reitan, J.	Anesthesia	Processing cardiac interval timing to monitor contractile state under varying loads and drugs.	*GMO0862	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 amygdalotomy 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.	*GML1788	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.

SUMMARY OF COMPUTER RESOURCE USAGE
 OTHER USE (Non-health related use)
 Period Covered 4/21/69 - 4/16/70

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT			User Cate- gory	General Description	COMPUTER EQUIPMENT	
			Identification Number	Agency	Current Annual Amt.			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

SUMMARY OF COMPUTER RESOURCE USAGE
 OTHER USE (Non-health related use)
 Period Covered 4/1/69 - 4/16/70

INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	DIRECT GRANT OR CONTRACT SUPPORT			User Cate- gory	General Description	COMPUTER EQUIPMENT	
			Identification Number	Agency	Current Annual Amt.			Pageminutes(K)	Block Storage(K)
Ritson, D.	Physics					9	Stanford Non-Medical School and Non-Bio- medical Research	at .2-1/2 cents per pageminute	at .10 cents per block
Saal, H.	Stanford Linear Accelerator Center					9		53,644	2,027
Schawlow, A.	Physics					9		41,436	1,908
Schrader, G.	INDEX					9		3,696	244
Wiederhold, G.	INDEX					9		6,135	138
Wiederhold, G.	MASCOR					9		48,225	2,182
Winfield, E.	Center for Materials Research					9		21,571	49
								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				<u>227</u>	<u>26,068,048</u>	<u>1,415,234</u>

GRANT NO. FRO0311-04
Section IIC

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 ACCESS STGE		"	4-12-68	5,250.00	20	1,050.00	210.00	4,410.00	10
01	2314-12326	DIR ACCESS 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
360/50 CONFIGURATION TOTAL						39,691.00		12,271.70	1,370.97	28,790.27	

ACCOUNT CODE	DISTRIBUTION ACCOUNT NO.	AMOUNT
10	0-KKG-041-92635	28,790.27

GRANT NO. FRO0311-04
Section IIC

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

<u>Description</u>	<u>Manufacturer</u>	<u>Model No.</u>	<u>Rental Start Date</u>	<u>Annual Rent</u>
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

<u>Equipment</u>						
<u>Description / Identification</u>	<u>Manufac-turer</u>	<u>Model No.</u>	<u>Date In-stalled</u>	<u>Date Accepted</u>	<u>Purchase Price</u>	<u>Source of Funds</u>
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 Other 22,414. Fed. Agency

(1) Fabricated and assembled by ACME staff.

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SUMMARY OF RESOURCE EXPENDITURES

	SRR Allocation (when applicable)			Total Resource Expenditures		
	Actual		Estimate	Actual		Estimate
	Previous Budget Period	Current Budget Period	Next Budget Period	Previous Budget Period	Current Budget Period	Next Budget Period
1. Personnel:						
a. Salaries & Wages	163,738	200,309	260,358	175,318	204,574	260,358
b. Fringe Benefits	<u>18,871</u>	<u>23,959</u>	<u>35,842</u>	<u>20,082</u>	<u>24,484</u>	<u>35,842</u>
Subtotal	<u>182,609</u>	<u>224,268</u>	<u>296,200</u>	<u>195,400</u>	<u>229,058</u>	<u>296,200</u>
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	<u>17,382</u>	<u>21,167</u>	<u>23,944</u>	<u>21,667</u>	<u>21,167</u>	<u>23,944</u>
d. Equipment Maintenance	<u>3,113</u>	<u>3,218</u>	<u>4,000</u>	<u>3,218</u>	<u>3,218</u>	<u>4,000</u>
Subtotal	<u>313,902</u>	<u>419,782</u>	<u>468,275</u>	<u>376,686</u>	<u>419,782</u>	<u>468,275</u>
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	<u>8,518</u>	<u>18,850</u>	<u>34,100</u>	<u>8,742</u>	<u>18,850</u>	<u>34,100</u>
Subtotal	<u>12,767</u>	<u>28,850</u>	<u>44,100</u>	<u>12,991</u>	<u>28,850</u>	<u>44,100</u>
9. Subtotal - Direct Costs	<u>538,840</u>	<u>700,000</u>	<u>840,000</u>	<u>615,678</u>	<u>704,790</u>	<u>840,000</u>
10. Indirect Costs	<u>93,221</u>	<u>118,182</u>	<u>153,611</u>	<u>98,026</u>	<u>120,699</u>	<u>153,611</u>
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	<u>12,462</u>	<u>12,462</u>	<u>12,500</u>	<u>12,500</u>
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	<u>23,959</u>	<u>24,484</u>	<u>32,106</u>	<u>32,106</u>
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)	<u>10,214</u>	<u>10,214</u>	<u>12,257</u>	<u>12,257</u>
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	<u>- - -</u>	<u>- - -</u>	<u>1,373</u>	<u>1,373</u>
	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	<u>- - -</u>	<u>- - -</u>	<u>318</u>	<u>318</u>
	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	<u>- - -</u>	<u>- - -</u>	<u>2,977</u>	<u>2,977</u>
Subtotal Leased Equipment	377,480	377,480	403,675	403,675
<u>Purchased Equipment</u>				
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	<u>23,324</u>	<u>23,324</u>	<u>- - -</u>	<u>- - -</u>
Subtotal Purchased Equipment	39,084	39,084	16,000	16,000
Maintenance	<u>3,218</u>	<u>3,218</u>	<u>4,000</u>	<u>4,000</u>
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	<u>12,000</u>	<u>12,000</u>	<u>13,402</u>	<u>13,402</u>
	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	<u>500</u>	<u>500</u>	<u>500</u>	<u>500</u>
Total Other Expenditures	8,350	8,350	8,600	8,600
11. IBM S.E. service, program products, and staff train- ing	<u>1,000</u>	<u>1,000</u>	<u>1,500</u>	<u>1,500</u>
GRAND TOTAL DIRECT COSTS	700,000	704,790	750,000	750,000

SUMMARY OF RESOURCE FUNDING

	<u>BUDGET PERIODS</u>		
	Actual Previous Budget Period	Current Budget Period	Estimate Next Budget Period
<u>SOURCE OF FUNDS</u>			
<u>Service Charges</u> (when applicable): (Identify individual rates)	\$ 37,277	\$170,000	\$220,000
Consulting/Programming			
Peripheral Equipment			
Computer Equipment			
Other Service Charges			
Subtotal			
<u>Institution Funds</u>			
Other Support (identify source)			
1. Equipment Rent Refund	35,460		
Subtotal			
<u>SRR Support</u>			
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	<u>64,507</u>
2. ROE Adjustment			
Total SRR Support	_____	_____	_____
<u>TOTAL FUNDING</u>	\$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	<u>7,973</u>	<u>8,350</u>	<u>377</u>	<u>8,600</u>			<u>8,600</u>
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	<u>812,689</u>	<u>818,182</u>					<u>993,611</u>
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	<u>812,689</u>	<u>818,182</u>					<u>993,611</u>

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 expectations. 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 withdrawn:

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)	<u>2,915</u>
subtotal, salaries	27,141
Staff Benefits on Above	<u>3,736</u>
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 graveyard 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	<u>3,023</u>
	\$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	<u>5,000</u>
Sub Total Equipment	44,600
System Programmer six week course	<u>2,500</u>
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 capabilities 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 spectrometer 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 compensation 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 chromatograph 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 obtained 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 catheterization 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 program 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 fluorometer 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-Flight 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 spectrometers 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 resolution Bendix t-o-f, Finnigan quadrupoles, Atlas CH-4, and a high resolution 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 application 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 supported 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 fluorescence and phosphorescence emission from membranes and cells.

Name: Tucker, R.

Project: MS

Department: Genetics

Project Description: The project consists primarily of developing a computer system for the control of a quadrupole mass spectrometer-GLC apparatus and the collection, analysis, and presentation of the resulting 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 located 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 tabulation and graphical display, and 3) statistical treatment of the data, including visual display of the results. Further simulation and modeling 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 peptide 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 planning, 2) interstitial and intracavitary dose calculation, and 3) data accession 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: c1050937

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 sedative 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 syptomatically.

Name: Grindle, J.

Project: ROSAN

Department: Community & Preventive Medicine

Project Description: The purpose of this project is to correlate the laboratory and clinical findings in newborn infants with respiratory distress syndrome who have been treated with oxygen and mechanical ventilation. This is a new and unusual group of infants whose natural histories 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 histories, 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 discontinuous 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 computer is essential in extracting the most significant and useful information from this study of human patients.

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 calculations required to reduce the raw data obtained in equilibrium dialysis experiments to a meaningful form. I am performing equilibrium dialysis experiments with the enzyme, DNA polymerase, and various nucleotide 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 polymerase? How strongly do they bind? How many binding sites does each enzyme molecule have? The answers to these questions help in understanding 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 chronic hemodialysis 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 preserved 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 radioisotopes 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 antigens 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 applicable 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 particularly be directed toward the elucidation of the petrographic character 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 interpretation 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: PFK₁

Department: Pharmacology

Project Description: A portion of the research work carried out in this laboratory is on the sheep heart enzyme, phosphofructokinase. Investigations 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 equilibrated 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 radioactivity 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, CO₂ production, and C¹⁴O₂ 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 individual 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, eventually, a mathematical model representing the likely result of any combination 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 relationship 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 loosening muscles for strabismus. Numerous other linear correlations have not been immediately identified as important ones, but they and other parameters 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 effective 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 Department), 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 results 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 results 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 occasions. 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 information 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 understanding 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 individual 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 implementation 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: ventl

Department: Anesthesia

Project Description: This project is to find out if any parameter of mechanical 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" program 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 performing 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 quantitative aspects of in vivo cellular migration streams in the lymphoid system.

Name: Witcher, 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 professional 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 minimum 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 arrangement 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 connection 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, surface 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 potentials 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 hormones 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 spectral 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 $C_i(t)$ represents the dye concentrations in the right heart following injection of a bolus of dye at $t=0$ and $C_o(t)$ represents the concentration in the left heart, then the impulse response $h(t)$ is described by the equation:

$$C_o(t) = \int_{s=0}^{s=t} h(s)C_i(t-s)ds$$

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

$$C_o(n) = \sum_{i=0}^n h(i)C_i(n-i)$$

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

However, a simple straightforward 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 calculations 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 hypothesized 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 determinants 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 experimental 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 carbamyl 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 regarding their experience with and opinions of marihuana. We intend to distribute questionnaires to medical students at several medical schools (Stanford, Nebraska, Buffalo, and perhaps others), disguising the specific 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 anonymous.

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 identification 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 observed 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 pressure, 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 constants 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 pharmacologic 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-relationship of angiogenesis 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 morbidity and mortality of patients with acute myocardial infarctions. The patients on the Coronary Care Unit are under constant daily observation 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 fractions 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 photoelectric 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 intervals (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-testing, 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 (inspired CO_2 concentration, alveolar CO_2 concentration, alveolar ventilation, 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 predetermined time function, we hope to answer questions relating to chemoreceptor rate sensitivity and the role of peripheral chemoreceptors. Modern control theory will be applied to determine optimum respiratory 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 transmission 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 compounds; 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 microscopic 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 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 averaging 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 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 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, Cl₃ 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 characters. 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 historical 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 appear to enforce a high degree of genetic isolation for each of a number of Indian towns and villages ringing Lake Atitlan. These high mortality populations provide the opportunity to study selective effects 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 genetic investigation of inherited diseases encountered in our field activities 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: BIOD

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 tritiated 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) comparison 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 hormones, and in other biochemical parameters. By genetic analysis, correlations 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 derived 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 possibilities 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 collation 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 overcome 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 mathematical reduction of data from experiments connected with my graduate research, principally 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 characteristics 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 polyanion 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 fluorescence 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.

Grant No. RR00311-04
Section IV

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 investigative potential of a relatively new tool for assessing in vivo human biochemistry. It is based upon the simple assumption that the measurement of $^{14}\text{CO}_2$ release into a patient's breath following the administration 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 computer 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 development 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 pressure and electrocardiogram will be digitized from the cardiac catheterization lab and stored. This data will then be analyzed for wave pressure values and descent rates using the electrocardiogram as a marker for definition of search areas in the pattern recognition. The analysis will be documented using values obtained by routine hand measurements of the data.

A second project involves the analysis of ventricular function during angiographic procedures in the catheterization laboratory. Simultaneous pressure, syringe excursion, cine-shutter marker and electrocardiogram analog signals will be digitized from the laboratory during 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 relationships 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 facilities to be capable of meeting the expected, progressive demands for laboratory services. The specific aims of the project are to establish a means for ordering 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 symptomatology, 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 symptom 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 accreditation. 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 computer 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 inserting 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 investigate the possibility of extracting quantitative information by measuring 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 television 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: Develop 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 appropriately 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. Advantages 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 (\leq 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 identification 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 hospital 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 recursion 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 subsequent 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 central nervous system adaptation to alcohol and other stressors is being considered.

Name: Witcher, C.

Project: spctrm

Department: Anesthesia

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

Category 12

Name: Angel, R.

Project: ERCORECT

Department: Neurology

Project Description: Data reduction and statistical analysis of movement patterns, 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 received in the operating room during the experiment.

There are four input channels now for parameter input such as action potentials from ureteral smooth muscle, peristaltic pressure waves, urine flow rate, EKG or blood pressure. The analogue output is used for driving the XY plotter and providing a reference for servomechanical 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 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 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. Experimental data taken in the laboratory of Dr. K. L. Chow.
- 4) A critical computer analysis of a long standing model of vagus control of heart rate.
- 5) Development of a novel Markov chain-symbol pattern recognition procedure 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 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 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 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 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 analysis 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 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.

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 determine 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 influence 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 involved and whether the effects of the catecholamines on renin secretion 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 undesirable drug interaction and reducing drug toxicity at the Stanford University Medical Center. A data bank utilizing already available information from the pharmacological literature will be compiled dealing with drug interactions of clinical significance. When prescriptions are billed by the Stanford pharmacists, 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 interaction information in such a direct fashion, and also to learn in a prospective way about the clinical effects of incompatible drug combinations 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 positron and quantitative information for subsequent 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 computer 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 responsible 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 management 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 mechanism 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 pathogenesis of Graves' disease, the effects of X-ray therapy upon thyroid function, and the pathogenesis 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 transfer 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 pattern 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 pressure 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 generated 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 laboratory revolves around the "averaged evoked response." We record a continuous EEG on magnetic tape when presenting selected stimuli. Afterwards 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 simultaneously.

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 presentation 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 guessing correctly produces a different "state of mind" than guessing incorrectly 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 analyzed 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 symptoms 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 absorption 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 regression 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 written 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 inventories, mood scales, I & E scales, coping scales, and scored psychiatric 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 ultracentrifugation.

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 interface, 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 ventilatory insufficiency, includes research in: 1) mechanics and gas exchange in patients with ventilatory insufficiency, 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 hypertension. 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 already 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 effect of a change in inspired gas composition on pulmonary artery pressure. Intended computer use: Computation results from data a) calibration curves are computed, b) data is converted, c) results are computed, and d) statistical parameters are calculated.

Name: Glattko, 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 findings would be updated on a daily basis, so that these might be available 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: PHAL

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: PHAL

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: 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 reinforced by the computer. A bravery 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 information 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: BLDVOLL

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 distribution, 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 responses to interviews and questionnaires, 2) maternal behavior observed during routine caretaking of the infant, and 3) the behavioral development of the infant.

Analyses will be done comparing the different groups on various attitudinal 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 independently; 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 distinguishing 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 subjects 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 students 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 classification 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 immunization 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 provided quantitative support for the existence of certain reaction intermediates 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 experimental model for study of insulin distribution in man. 3) Digital on-line computer display to investigate the structure of metabolic systems. Interested in developing models of glucose, insulin, and triglyceride kinetics 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 automatically 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, RUNG PLOT, and RUNG FUN. We are now performing similar analysis with respect 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.

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 evaluation is coupled to stage 4. We plan to use nonlinear regression techniques to evaluate these parameters. We have developed two programs 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 programs 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 amygdalectomyed 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 without 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 lipopolysaccharide mutants (estimations of LD50, rate constant for clearance of bacteria from blood stream, harmonic mean times-to-death, significance 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/hydroxyproline (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 contemporaneous antibiotics, steroids and immuno-suppressives, appropriateness of treatment, and outcome (survival, death).