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

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SPECIAL RESEARCH RESOURCE ANNUAL REPORT

Grant Number FR-00311-03

ACME

August 1, 1968 to July 31, 1969

Joshua Lederberg, Ph. D., Principal Investigator

Stanford University School of Medicine

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

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Report Period: (same as current 12-month budget period) From: August 1, 1968 To: July 31, 1969		Grant No. FR 00311-03
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Principal Investigator Lederberg, Joshua	Title Professor	Academic Dept. Genetics
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Computer Policy Committee

Membership of Special Research Resource Advisory Committee
(Indicate Chairman)

Name	Title	Department	Institution

see next page

Typed Name and Title of Principal Investigator	Signature	Date
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Annual Report

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General Description of Resource Operation

Most of this third and final year of the original ACME grant period has been spent implementing changes and adjustments required to make the ACME system a useful and productive unit for the Stanford Medical School. Currently ACME service hours, whenever feasible, are 7:00 a.m. to 5:00 p.m., and 6:30 p.m. until midnight. Hardware reliability since the last report has improved significantly. We are, however, still experiencing an average of two hardware failures a week and are further implementing recovery procedures for all hardware errors where even a minimal chance exists of achieving proper recovery. Changes have been made by IBM in both the 270X and 270Y data-acquisition hardware and in the 1800 subsidiary computer's interface hardware to the 360. The changes, together with a better understanding of the data-acquisition devices, have resulted in a reliability comparable to that of the files and the central processing unit. The current bottleneck in the overall system is the speed of the large-core memories (8 miscrosecond cycle time). This could be improved, without any software changes by providing more high-speed memory. The shortage of fast-core memory has been aggravated by changing options within the IBM operating system. To obtain greater reliability, we have shifted to the MVT option of OS/360. Studies and discussions with IBM have led us to believe we will have fewer errors in using MVT. The last three months of operation of the MVT-based system have proven this judgement to be correct; we have had few failures of OS interrupt processing and partitioning. These are the areas of IBM's operating system upon which we rely most heavily. Our experience with the processors, such as the Fortran compiler under the operating system, are not that favorable.

Hardware changes: We added a second 2314 disk unit in December; this second unit is now already 50 per cent filled with user data. This means that our user file capacity has grown from approximately 127 million bytes to 263.6 million bytes with a corresponding--and sometimes too rapid--increase in usage.

We also added slowspeed paper tape equipment on the 1800 in order to service instrumentation needs when data rate and duty cycle make an experiment impractical for on-line data acquisition.

The 1800 can now timeshare 16 user lines; this is generally sufficient for four to five users' data moving simultaneously over the lines. We are experimenting to determine how much the load-factor can be increased without affecting our capability to provide reliable service.

The 270Y and 2701 service has been successfully provided to remote sites with a 20,000 sample-per-second transmission speed. The data path, that is the size of a sample, on the 1800 and the 2701 is 16 bits wide; the data path on the 270Y is 8 bits wide.

More need for 1800 facilities seems to exist and can be handled within the current software design by increasing the amount of core memory storage available in the 1800. Currently a limitation of about 6000 samples per second aggregate net-data rate exists in the communication interface from the 1800 to the 360.

Software developments:

Implementation of "external procedures". This permits programs and subroutines to be shared by users in a modular way and also removes the limit on program size in the ACME system other than that of total hardware core and file size. Of course practical limitations due to the speed of the processor remain.

The direct input/output facility of PL/I has been implemented and enables users to write significant information retrieval and patient-record programs without excessive search time. Organization of these files is a problem for which professional assistance is frequently required. Regina Frey, of the ACME staff, is available to assist with the design and layout of problems of this nature.

PROTECT FILE statements have been implemented to provide data-set protection to users who wish it.

A non-PL form of file has been implemented--the text file--which provides for convenient editing of reports, memorandum, and programs themselves under full program control.

A number of major internal changes were made to the file system. The first change eliminated the necessity for copying the index of a file into a temporary location on a disk when the file is opened. This saved space on the disks, removed the limitation on the number of files which could be opened simultaneously, and greatly reduced the time required to open and close files. A change to the hardware format of the file blocks allows checking the ownership of a block in the channel program without reading the block into core. As a result the channel time required to write a block was reduced by one-half (see ACME Note FIO appended to this section).

The computational facilities of the system have been increased by providing double precision arithmetic. The seven-digit precision of the IBM 360 is generally adequate, but a few users were seriously hampered by the lack of more precision in the ACME system. Double precision provides about 16-digit precision for these users.

Improvements to the PL/ACME language include the INITIAL attribute and the capability to write mutiple statements on one line. Both these facilities can decrease program writing time and program compile time.

FREE and ALLOCATE statements pertaining to arrays were implemented to give the user program control over the amount of memory he is using. This provides him a tool to minimize charges based on the amount of memory used, yet permits him to take advantage of the very large potential memory capability inherent in the ACME system.

A number of new string functions round out the facilities provided in PL/I and some work has been done to speed up the processing of string operators, although much remains to be done in this area.

A number of new programs now make it possible to do much file maintenance while the system is on-line without interfering with users. This has enhanced our capability to respond to errors due to either software or hardware problems.

We have continued our emphasis on guaranteeing all files stored on disk. File integrity has been maintained through continued use of software redundancy checks and by a number of analyzer and restoration utility programs. Backup files are created by nightly dumps of the disks to tape.

Our backing up of file storage has proven to be most useful. No loss of data occurred during the last year. Four potentially disastrous failures did happen. Twice loss was prevented by the interlocks in the file system. The other two times the damage was due to operator error, but full recovery was possible from the backup files.

Maintenance and development work on the library programs has had to be retrenched, and is now going on at a somewhat lower level than we feel would be beneficial to the Stanford Medical School. A list of the library routines is appended to this report. Most of these are statistical in nature; a few provide program editing and translation features.

Our engineering group has installed and maintains 22 laboratory interfaces. The group is occasionally engaged in the design of specialized instrumentation

to service specific medical requirements. A new terminal switchboard has been installed in the computer room to cope with the larger frequency of user calls and active terminals.

We have been engaged in circuit and software development to make storage displays manufactured by Tektronix and Hewlett-Packard easily interfaceable for ACME users.

A small effort is underway to evaluate the cost and benefits of making a continuous system modelling program (CSMP) available on ACME. It appears that model builders at Stanford would be greatly aided by an interactive facility. Compatibility with batch versions will be important since ACME is not suitable for large simulations.

An assembler for the 1800 has been produced with PL/ACME. We expect to cancel the card equipment presently on the 1800 and load the machine through the 360. This assembly concept is being studied to determine the methods and benefits of providing assembler services for small computers that are connected to ACME. This could increase their research duty cycle and make smaller configuration feasible. A more unified assembly language could also be an aid in obtaining greater independence from a particular manufacturer by increasing software transparency.

A fair amount of effort has gone into the accounting programs in order to prepare for the new recharge policy.

Operating Policies and Procedures

System reliability has become the primary goal during the last year. This is especially important since some of our users collect instrumentation data on a real-time basis and have no protective backup device. Detailed records are kept of the systems operation. Every failure-software, hardware, or power--is

logged, analyzed, and discussed in the weekly staff meeting in an effort to devise means of preventing recurrence. Five backup systems are kept at all times in order to prevent errors being introduced during development of software which might affect daily operations.

Flexibility is the key to success to operations in a research computer environment. This is especially true at ACME. The system is constantly upgraded (both software and hardware--including computer input/output devices and in-house designed and built interface equipment).

We have established an enforced system backup to protect user data and system disk packs. All user data packs are dumped to tape three times a week. Two sets of daily tapes are rotated each week; seven weekly sets are rotated every month. The first set of weekly tapes each month is saved permanently, and replaced with a new set of tapes.

All operating procedures are documented by ACME Notes which are distributed to the ACME staff.

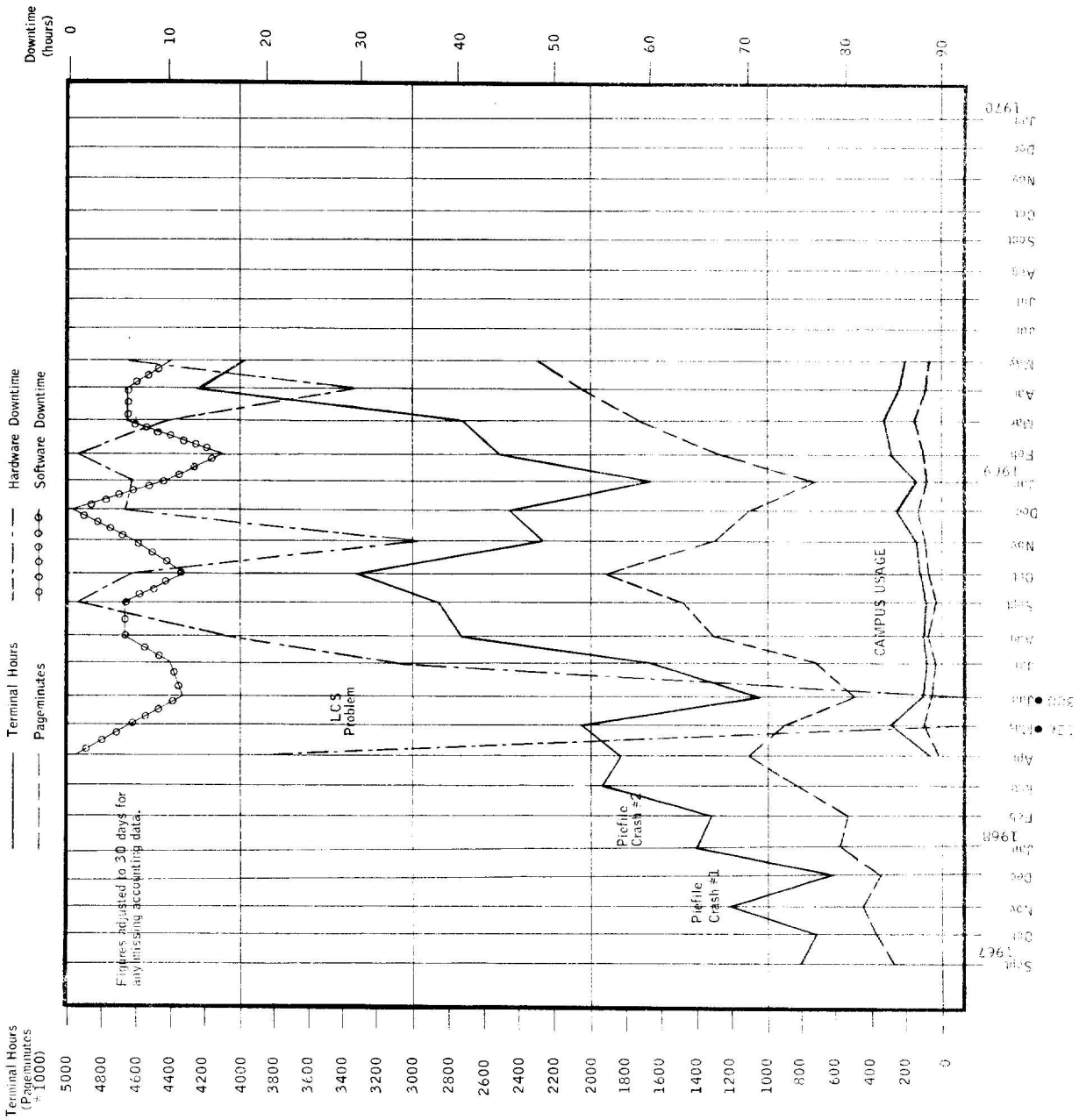
The graph showing hardware and software downtime is presented on the next page. This graph shows utilization. Although considerable detail of this utilization is given in Section I-B of this report, it is appropriate at this point to note some of the highlights of utilization of the ACME system. There has been an uptrend ever since the basic software was stabilized enough to present meaningful statistics. After the sharp dips in utilization as the result of hardware difficulties toward the end of the previous budget year, the rate of increase climbed more rapidly as the user community gained confidence in the system's reliability. The dip at the end of calendar year 1968 resulted from the announcement of user charges as well as seasonal factors of the end of quarter and year-end holidays.

ACME Note

AU-11
Gio Wiederhold/Charles Class
May 23, 1969

Monthly Usage at ACME

Absolute maxima of terminal hours per month: 10,170 (30 lines, 30 days, 11.5 hours per day). Absolute maxima of terminal page minutes per month: 7,866,000 (380 pages, 30 days, 11.5 hours per day).



Revision of AU-10 dated April 24, 1969.
Dist: Staff/All

Utilization as expressed in page minutes reached an all time high of 2,260,596 in the accounting period April 17, 1969 through May 16, 1969. Only 269,364 page minutes were used by the ACME staff and users accounted for almost two million. Approximately half of the two million was used by researchers with NIH grants which are presently exempt from users charges because they have non-competing renewal grants.

To maintain a cooperative relationship that is conducive to an effective operation, constant communication with the user is vital. The lightbox on the users' terminals provide both system and operations information to him. Daily messages at the time of log on inform him of changes in system and schedule; special broadcasts announce current system events that may affect users. An informed user is a happy user.

New features not yet documented in the manual are described in ACME User Notes.

ACME hours are from 7:00 a.m. to 5:00 p.m. and 6:30 p.m. to midnight, daily. General system development work and file maintenance, and four hours a week of IBM preventive maintenance, cover the remainder of the 24-hour-day operation. Exceptions may be made to use the period from 3:30 to 5:00 p.m. and 10:00 p.m. to midnight when urgent system work requires it.

When a shortage of terminal lines develops, the following priorities are observed:

First Priority: Users signed up for realtime experiments.

Second Priority: All other known users, queued in first-in, first-out order.

Third Priority: "Unknown" users (i.e., medical student terminals), only if there are free terminal lines.

The ACME TV display is scheduled by a separate sign-up sheet.

The operator has control over real-time usage to insure that the required response rates are not impacted by excessive usage. An effort is being made to train our own operators, including recruits from the local community.

A Sanders 720 graphic display unit (provided by the Genetics Department) allows the computer operator to obtain a list of users on the system at any given moment. It has increased our access to user status over the IBM typewriter terminal by a 15-to-1 ratio (from 150-second access to 10-second access).

Our new switchboard has semi-automated the connecting of user terminals to ACME. Formerly the user would telephone the computer room and request that a 2702 port be connected to his terminal. Our new board requires the user only to press the button on the lightbox. When the operator plugs an available port into the user's outlet, the indicator lights turn off.

Administrative Changes

In this third year of the ACME project Joshua Lederberg, Ph.D., Professor, and Chairman, Department of Genetics, continued as Principal Investigator. The ACME Policy Committee is drawn principally from the community of users in the Medical School. ACME is administered technically as a facility of the Stanford Computation Center.

During the year covered in this Report, Paul Armer succeeded Edward Feigenbaum as Director of the Stanford Computation Center. Professor Feigenbaum is concentrating on his teaching and research in the Computer Science Department, but continues to serve ACME as an advisor for computing techniques. Gio Wiederhold continued as Associate Director of the ACME Facility.

During the early months of the current year the trial period of the Stanford Computation Center Campus Facility attempting to market ACME service

to non-Medical School users at Stanford was completed. Since this service offering did not attract enough utilization to offset the costs to the Campus Facility, their sharing of ACME costs was reduced substantially at the end of November, 1968. This support was reduced to the incremental cost of the bulk core for the balance of ACME's third year. This reduced support caused substantial rebudgeting of ACME funds as will be evident in the financial section of this Report.

User charging based on page minute utilization and file storage was implemented in April, 1969. The users were first notified of the impending charges in the Fall of 1968 and a first schedule of rates proposed to the Special Research Resource Board in November, but it took until April to work out the details of the charging mechanism. It is too early to assess the full impact of this policy change; but in general the Medical School Researchers are being quite cooperative in coping with the additional paper work necessary to obtain the administrative approvals and to request supplemental funding. As might be expected with the prospect of having to use their own research funds for computation, the users are devoting considerable attention to improving the efficiency of their program - especially in the use of disc storage. We feel this is important. The users are urged to consult with the ACME staff. With more efficient user programs ACME will be able to continue to serve promptly a growing number of users.

The following ACME schedule of rates for service was approved by SRRB by Dr. Raub's letter of April 8, 1969:

Effective Date	MARCH 21, 1969

Computer Services:
Memory utilization of IBM 360/50 system:

1. Research Service-Real Time, high interaction rate	1¢ per page minute
2. Research Service-routine terminals	2¢ per page minute
3. Administrative and patient care services, services to non-research users	3¢ per page minute
File space utilization of IBM 2314 direct Access Storage Facility	10¢ per block of disk storage per month
Consulting and Programming Services-ACME staff	no charge

ACME Education

ACME offers a beginning and an advanced course in PL/ACME programming. The beginning course describes the ACME system, the use of the terminal, and the PL/ACME statements for terminal input and output, calculation, and filing. The advanced course describes variation and options. Real-time (1800) use is not covered.

A beginning or advanced course requires three sessions of 1-1/2 hours. There are about ten students in a class. Of the 130 beginning students taught since July, 1968, 25 percent have been physicians, 30 percent students (medical, graduate, undergraduate, and some high school students), 25 percent lab technicians and secretaries, and 20 percent other researchers, administrators and others. Since the teaching program began in 1966, there have been 742 students (594 beginning, 148 advanced).

The current students generally plan to use ACME for statistical studies on large groups of patients and for processing laboratory data. Most realtime users took the course sometime earlier.

The response to the course is gratifying. Beginners discover that they can use a powerful machine. Many sign up for the advanced course and recommend the courses to their associates. Even students (particularly medical students) who do not program after the course feel that they have seen how a computer can help them later in their careers.

ACME PROGRAM LIBRARY--ON PUBLIC FILE

AH-1	ACME Program Library HELP: Information on ACME Keywords (G. Sanders) May 24, 1968
BLY-1	Clinic Patient Scheduling (Crouse) June 23, 1967
BQC-1	Questionnaire Program (Sanders) Apr. 15, 1968
DDA-1	Pediatrics Project--Routine No. 1 (Drew) Aug. 8, 1967
EAM-4	ACME Program Library LACKFIT: Test for Linearity of Regression (Schach) Feb. 7, 1969
EAN-4	ACME Program Library MULT: Multiple Regression (Moore/Schach) Feb. 17, 1969
EAP-3	ACME Program Library GENCORR: Correlation Coefficients--Missing Data (Kraemer) Feb. 7, 1969
EBD-3	ACME Program Library WEIGTREG: Weighted Linear Regression (Schach) Feb. 7, 1969
EBE-2	ACME Program Library LINREG: Linear Regression (Schach/Liere) Feb. 17, 1969
EBH-1	ACME Program Library ONCALL: Scheduling Program for Residents on Call (Moore) Jan. 8, 1968
EBI-3	ACME Program Library PCPLOT: Frequency Plot (Moore) Feb. 7, 1969
EBK-3	ACME Program Library POLY: Polynomial Regression (Moore) Feb. 7, 1969
EBL-2	ACME Program Library RUNGK_1: Runge-Kutta Solution of First-Order Ordinary Differential Equation (Liebes) Aug. 21, 1968
EBM-3	ACME Program Library ZEROFIT: Least-Squares Line through Origin (Schach) Feb. 27, 1969
EBN-2	ACME Program Library BSORT: Sorting (Liere) Sept. 18, 1968
EBO-2	ACME Program Library PEEL: Exponential Curve Fitting (Slimick/G. Sanders) Feb. 17, 1969
EBP-2	ACME Program Library KWTEST: Non-Parametric Analysis of Variance--One-Way (Kraemer) Jan. 12, 1969
* EBQ-4	ACME Program Library PLOT: Scatter Plotting (Liere) Mar. 27, 1969
EBR-3	ACME Program Library SCHUSTER: Schuster Periodogram (Schach) Feb. 7, 1969
EBS-2	ACME Program Library RUNGA6: Runge-Kutta Integration (G. Sanders) May 2, 1968
EBU-1	ACME Program Library TIMESER: Spectral Analysis (Schach) June 19, 1968
EBV-1	ACME Program Library GOODFIT: Test for Goodness of Fit (Schach) June 24, 1968
EBW-2	ACME Program Library DISCRIM2: Discriminant Analysis for Two Groups (Schach) Feb. 7, 1969
EBX-2	ACME Program Library TSQUARE: Hotelling's T Square (Schach) Feb. 7, 1969
EBY-2	ACME Program Library CHI_2by2: Chi-Square Statistic with Continuity Correction (Schach) Feb. 7, 1969
EDA-1	ACME Program Library MAPIT: Mapping Bacterial Chromosomes (Nye) Aug. 5, 1968
EDB-2	ACME Program Library DATAPROG: Writing a Data File Into a Program File (Liere) Sept. 17, 1968

EDC-1 ACME Program Library FOURIER: Fourier Analysis (Liere)
Aug. 5, 1968

EDD-1 ACME Program Library HEXARITH: Hexadecimal Arithmetic Routines (Feinberg)
Aug. 3, 1968

EDE-2 ACME Program Library JUSTIFY: Text Justification (Emmons/Liere)
Jan. 12, 1969

* EDF-2 ACME Program Library RUNGK_2: Runge-Kutta Solution of Second-Order Ordinary Differential Equations (Liebes)
Apr. 18, 1969

EDG-1 ACME Program Library POWELL: Fitting Program for Nonlinear Functions (G. Sanders)
Jan. 17, 1969

EDH-1 ACME Program Library LISTER: Listing the User's Program (Liebes)
Sept. 19, 1968

EDI-2 ACME Program Library MATCH: Matching Donors to Recipients for Transplants (Bauriedel/Liere)
Feb. 17, 1969

EDJ-1 ACME Program Library LINSYS: Solution of Simultaneous Equations (Jones)
Sept. 13, 1968

EDK-2 ACME Program Library ANOVATWO: Two-Way Analysis of Variance--Unequal Cell Frequencies (Brast)
Feb. 7, 1969

EDL-1 ACME Program Library EDITER: Converting a Program to a Standard Format (Liebes)
Nov. 14, 1968

EDN-2 ACME Program Library BALTHREE: Analysis of Variance for a Balanced Three-Way Design (Kraemer)
Feb. 7, 1969

* EDP-2 ACME Program Library COPIER: Reproducing a Complete or Partial Program Data Set (Bassett)
Jan. 8, 1969

EFA-1 Translating FORTRAN Programs to PL/ACME Using DATAPROC, UNEKEVAR and TRANSLATE (Emmons)
Sept. 23, 1968

EFC-1 ACME Program Library UNEKEVAR: Unique Variables (Emmons)
Sept. 30, 1968

EFD-1 ACME Program Library TRANSLATE: Translation of FORTRAN Programs to PL/ACME (Emmons)
Sept. 30, 1968

TR-1 Respiratory Project on the 1800 (Hintz)
Mar. 21, 1967

TRA-1 Interfacing a Packard 3314 Scintillation Counter to ACME (Morris)
Feb. 5, 1968. Summarized briefly in ACME Note BAE.

WTX-1 Text Processing Routines (Wiederhold)
Not dated.

ACME File Input/Output

The ACME file system provides in a time-sharing mode all the I/O facilities of the PL/I language with a few exceptions [1]. For ease of access and flexibility, the file is composed of system data sets and user data sets:

(1) System Data Sets

These data sets are accessed by direct block addressing rather than using the index facility. They include system information such as the catalog of user NAMEs and PROJECTs, the available space on each storage unit, and the directory indices pointing to a directory record for each cataloged data set.

(2) User Data Sets.

These data sets are composed of the collection of information--data or programs--manipulated by the users. Each data set is assigned a qualified name (User NAME. PROJECT. data set) by the cataloging facility and referenced through the use of an index and of a directory.

PHYSICAL FILE ORGANIZATION

System and user data sets are currently residing on eleven 2316 disk packs (Two IBM 2314 units). The present equipment would provide for 14 disk packs of data storage.

Disk Organization [2]

The IBM 2316 disk pack is composed of 11 disks and provides 20 surfaces on which data can be recorded. It is divided into 203 concentric cylinders numbered from 000 (outermost cylinder) to 202 (innermost cylinder), with 20 tracks per cylinder (00 to 19). Tracks in Cylinders 200 through 202 are alternate tracks that can be used if any tracks in Cylinders 000 through 199 should become defective.

Data Format

Each storage module is divided into fixed-length blocks (2000 bytes), three per track, except for tracks 0 through 5 of Cylinder 000 which are used by the Operating System. A module has a storage capacity of 3,994 tracks or 11,982 blocks, or 23,964,000 bytes.

Track Format

Figure 1 shows the track format.

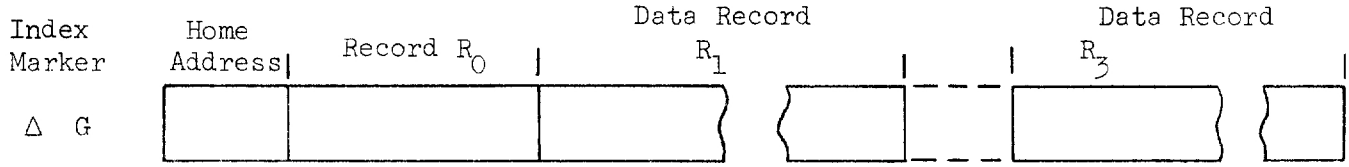


Figure 1. Track Format.

Track Format Subfields:

Index Marker: The beginning of a track is signalled when the index marker is detected. All tracks on a disk pack are synchronized by the same index marker (there is only one index marker per disk pack).

Gaps (G): Gaps separate areas on tracks and contain no data. Gap lengths vary depending upon location within a record and the record length. They permit switching from reading to writing between fields.

Home Address (7 bytes): The home address defines the condition and location of the track (Figure 2).

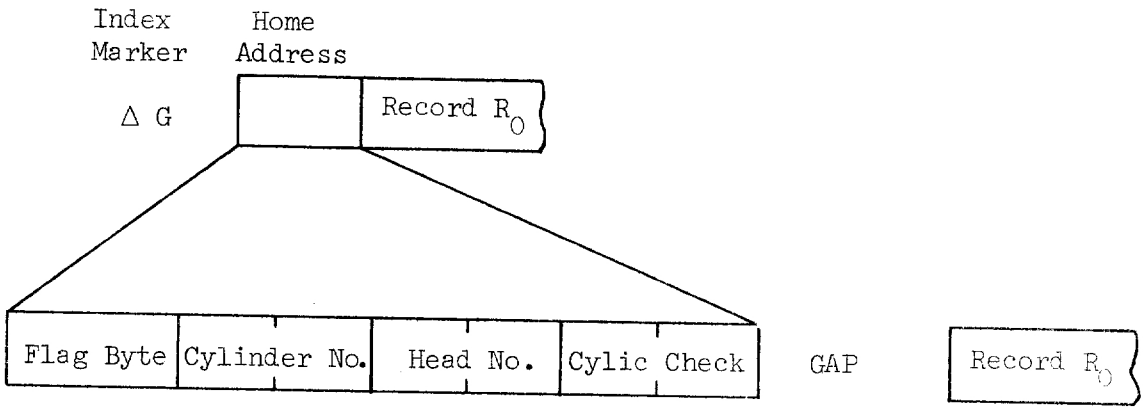


Figure 2. Home Address Format.

Track Descriptor Record (R_0): This is the first record following the home address, on each track. It is used by IBM programming systems to move the entire content of a track to alternate tracks if a portion of the primary track becomes defective. R_0 is divided into the same fields as data records except that it is not preceded by an address marker. It has a length of 21 bytes.

ACME data Records (R_1-R_3): These three data blocks are used by ACME data sets; all the other fields are initialized and used by IBM programming systems. Figure 3 gives the record format.

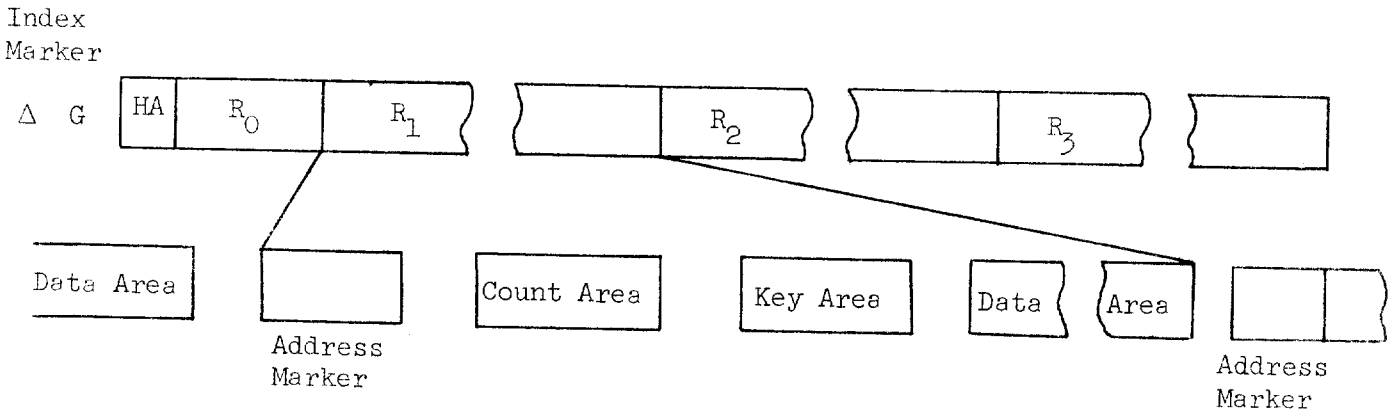


Figure 3. ACME Data Record Format.

Address Marker: This area indicates the beginning of each record. It is supplied by the 2314 control unit when the pack is initialized and contains a bit configuration that can be detected by the 2314 as the area preceding a count field.

Count Area (11 bytes): This field is divided into seven subfields (Figure 4).

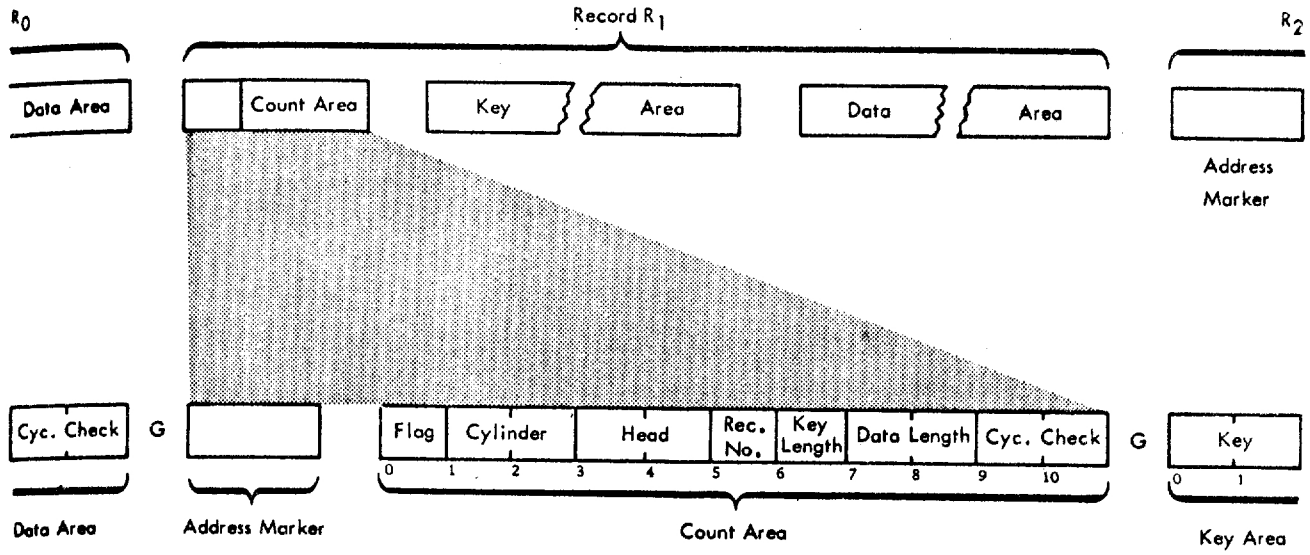


Figure 4. Count Area Format.

Count Area Subfields:

Flag (1 byte): Generated by the 2314 control unit as each record is initialized. If has information on the record number (odd or even), on the track condition, and on overflow records.

Cylinder (2 bytes): Byte 1 is set to zero. Byte 2 has the cylinder number from zero to 202.

Head (2 bytes): Byte 3 is set to zero. Byte 4 has the READ/WRITE head number (0 to 19) for the disk surface on which the record is stored.

Record Number (1 byte): Sequential number of the record on the track (1 to 3).

Key Length (1 byte): Number of bytes excluding cyclic check bytes in the key area: 8

Data Length (2 bytes): Number of bytes excluding cyclic check bytes in the data area: 2000.

Cyclic check (2 bytes): Used for cyclic checking information in the count area.

Key Area (10 bytes): This field contains part of the count field information (cylinder, head, record number), the data set number of the data set to which the

block is assigned, and cyclic check information. (Figure 5). This field is essentially used for block identification in addition to the standard information provided by the count field.

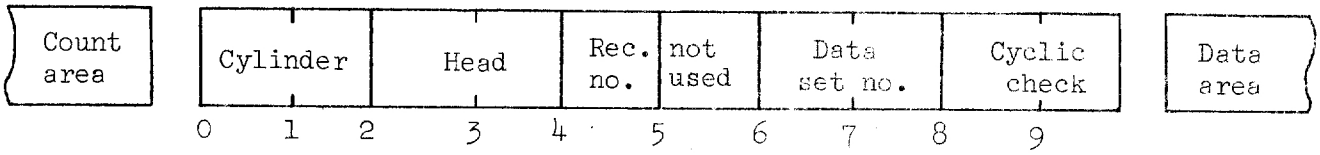


Figure 5. Key Area Format.

Data Area (2002 bytes): The data block is the smallest unit of space that can be assigned to a data set. It has a fixed length of 2000 bytes plus 2 bytes of cyclic information provided by IBM programming systems (Figure 6). Variable-length header and trailer contain several flags for differentiation purposes (system or user blocks), a data set number, a block address, and record length [3], [4].

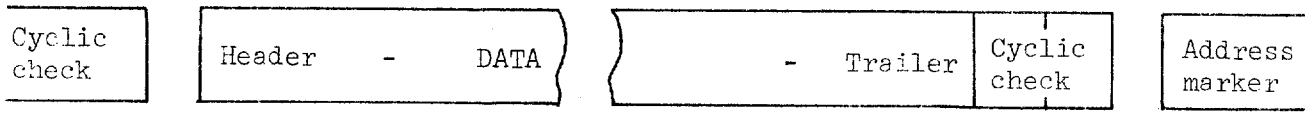


Figure 6. Data Area Format.

ACCESS METHOD

The ACME file I/O system uses the execute channel program (EXCP) macro-instruction to read or write data blocks [5]. This low-level access method provides the system with greater control over the I/O operations than the standard access methods. The EXCP macro-instruction uses the Operating System functions that provide for scheduling and queuing I/O requests, interruption procedures, error recognition, and retry. It passes control information to the I/O supervisor regarding a channel program to be executed. The file I/O system is only concerned with setting up a sequence of channel commands for the desired I/O operation

Block Addressing

Reading or writing a data block requires a positioning of the access mechanism (2314 unit) of the selected pack to the proper cylinder, track, and record on the track. Each block is assigned a number from 0 to 11,981 (maximum pack capacity), and in order to locate a block it is only necessary to specify a 32-bit address. (Figure 7).

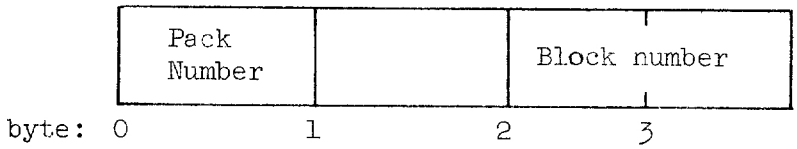


Figure 7. Block Address.

From this information a simple conversion gives the hardware address in terms of pack, cylinder, head, and record number.

Space Management

When a new storage unit (2316 disk pack) is being added to the file system, an initializing program formats all the blocks in the pack with the proper count and key field information and writes zeros in the data area. Block addresses in the form of block numbers are then stored in the space data sets. When creating new data sets or expanding existing ones, a routine picks up available blocks from the space data sets and assigns them. When data sets are deleted, the freed blocks are returned to the space list either on-line or by a stand-alone file analyzer.

A block with the available status has a data set number in its key field equal to the space data set number. An efficient data protection is achieved by testing this information in the channel program prior to writing records in the data field.

Input/Output Operations

Three types of I/O operations are required in the ACME file system. Each of them leads to the coding of a different channel program. The operating system handles the positioning of the access mechanism to the proper cylinder on a pack and the selection of the desired head. Upon a successful completion of this SEEK command, control is passed to the supplied channel program. Its first command is a search identifier (SEARCH ID): a comparison is made between 5 bytes of data from CPU storage (cylinder, head, and record number) and the 5-byte record identifier portion of a count area from the storage unit. Since a track has three data blocks, it may be necessary to reissue this command until a match occurs (Transfer In Channel command).

Writing a Block. A WRITE operation is always preceded by a test on the key area (SEARCH KEY EQUAL command). In this case the block must be available and the data set number in its key area reflects this status. If no match occurs an error is signalled and the block is not written. With a successful match, additional commands reposition the writing head by disk rotation after the count field and write the key and data area from the user buffer. The data set number in the key field is written as the data set number of the data set to which the block is assigned. Appendix A gives an example of the sequence of commands.

Reading a Block. After positioning of the access mechanism, the key and data fields are read into a buffer in the user region. No testing is made on the key field since a data protection on a READ operation is not necessary. A check for valid information in the buffer is made before data transmission to the user.

Rewriting a Block. This operation is similar to writing a block except that they key field of the data record is not modified. Data protection is achieved by comparing the key field with the key in the buffer from which the block is rewritten.

Appendages

These routines are entered by the I/O Supervisor upon successful completion of a channel program or detection of an error.

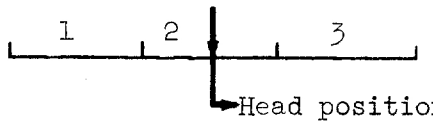
Normal End Appendage. This routine signals a normal completion of an I/O operation to the ACME system posting table. Control can then be given to the user.

Abnormal End Appendage. This routine is entered twice whenever an error is detected during execution of a channel program. The first time entered, the file system checks for two types of errors: NO MATCHING KEY which can occur on a WRITE or REWRITE operation, and NO MATCHING ID which can occur during any I/O operation. With other types of errors (DATA CHECK, OVERRUN, etc.) the IBM-supplied error recovery routines attempt to restart the channel program several times. If the error is permanent, the appendage is entered a second time and the ACME system posting table is posted with the permanent error condition, which is signalled to the user when he receives control. Errors like NO MATCHING KEY can be caused by the ACME system for instance when a block supposedly available is in fact used by a data set. No automatic error recovery is attempted in this case because of the overhead involved; instead system programmers can patch the damaged information with a file fixer program while the ACME system is in operation.

PERFORMANCE

Most of the time required to service an I/O request is spent in mechanical motions. Access time varies from 135 ms for a SEEK between the extreme inner and outer cylinders to 25 ms for a SEEK between adjacent cylinders. Figure 8 shows the minimum and maximum time spent in mechanical motion for a WRITE operation, with 25 ms per disk revolution [2].

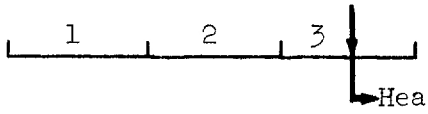
The minimum time occurs when the selected read/write head is positioned just before the address marker of the searched record (Figure 9a).



Head position
Searched record : 3
Number of rotations for a WRITE Operation : 1 1/3

Firgure 9a: Head Position When Minimum Time is Spent for a WRITE Operation.

The maximum time is spent when the head has just passed the address marker:



Head position
Searched record : 3
Number of rotations for a WRITE Operation : 2 1/3

Figure 9b: Head Position When Maximum Time is Spent for a WRITE Operation.

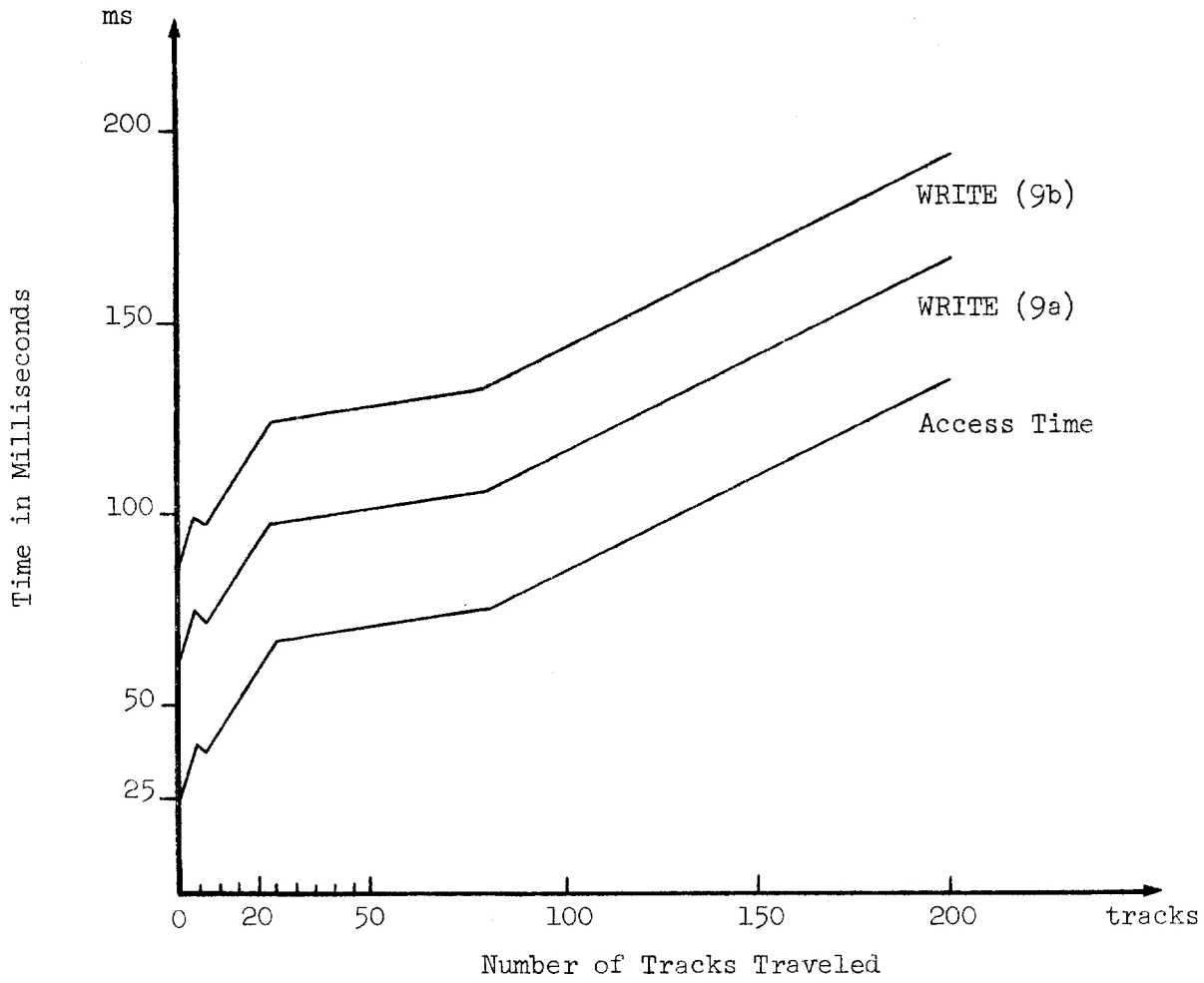


Figure 8. Mechanical Motion Time for a WRITE Operation.

APPENDIX A

Channel Program for a WRITE Operation

```
     SEARCH ID
     TIC * -8
     SEARCH KEY EQUAL
(a)  TIC * -16
(b)  READ DATA
     SEARCH ID
     TIC * -8
     WRITE KEY and DATA
```

(a) This Transfer In Channel command to another TIC will generate a program check in case no match occurs in comparing the KEY field immediately following the COUNT field of the searched record with the supplied KEY data. The error condition is detected in the Abnormal End Appendage.

(b) This is a dummy READ required by the control unit operations when SEARCHing on the same track more than once.

FOOTNOTES

1. Miller, Jerry, "The ACME File System," ACME Note FY-1, February 27, 1969.

2. IBM System 360 Component Descriptions--2314 Direct-Access Storage Facility and 2844 Auxiliary Storage Control, A26-3599.

3. Miller, Jerry, "ACME File System--Data Sets," ACME Note FA-5, September 27, 1968.

4. Frey, Regina, "ACME File System--Codes," ACME Note FC-2, August 5, 1968.

5. IBM System/360 Operating System. System Programmer's Guide, C28-6550.

6. Girardi, Serge, and Jerry Miller, "ACME File System--Control Block Formats," ACME Note FB-3, March 31, 1969.

Dist: Prog/All

SUMMARY OF RESOURCE USAGE

Month and Days	Daily Scheduled Service	Account Records	
		Console Hours	Pageminutes
Apr 21 to May 20	700-1530 1830-2200	2,075	947,000
May 21 to June 20	700-1530 1830-2200	1,003	467,009
June 21 to July 20	700-1530 1830-2200	1,626	712,514
July 21 to Aug 20	700-1530 1830-2200	2,761	1,313,940
Aug 21 to Sept 20	700-1530 1830-2200	2,856	1,481,671
Sept 21 to Oct 20	700-1700 1830-2400	3,330	1,955,295
Oct 21 to Nov 20	700-1700 1830-2400	2,262	1,281,133
Nov 21 to Dec 20	700-1700 1830-2400	2,461	1,190,110
Dec 21 to Jan 20	700-1700 1830-2400	1,639	738,048
Jan 21 to Feb 20	700-1700 1830-2400	2,521	1,213,289
Feb 21 to Mar 20	700-1700 1830-2400	2,757	1,714,973
Mar 21 to Apr 20	700-1700 1830-2400	4,108	2,010,110

USER BY ACME STAFF (CROSS PROJECTS)

project	department	account	runs	hours	pageminutes(K)	blockmonths(K)	months (1)	months (2)
[illegible]_.T124LAHN	(*SCC	) T124-7	1	:14	0.068	0.060	7	6
BLDASSET.ACMECONS	(*ACME	) L001-7	353	395:12	168.389	3.43200	7	6
BEEBE,RJ RJBEEBE_.T177TRLL	(*SCC	) T177-7	43	19:53	7.92300	.151000	12	6
BERNS,RI RIBERNS_.T178BERN	(*SCC	) T178-7	100	40: 0	21.2400	.200000	12	6
BREITBARD,G G_BREITB.ACME	(*ACME	) L002-7	330	147:51	42.3350	.339000	12	6
CLASS,C C_CLASS_.ACME	(*ACME	) L004-7	1093	1959: 9	508.040	.634000	12	6
CROUSE,L L_CROUSE.CATH_LAB	(*ACME	) L005-7	110	127:48	55.8120	8.62900	12	6
CUMMINS,D D_CUMMIN.DOMESTIC	(*ACME	) L006-7	85	42:42	10.5130	.187000	12	6
DELAROCA,D D_DELARO.IBM1800	(*ACME	) L007-7	110	108:45	88.6000	.848000	10	6
EMMONS,K K_EMMONS.ACME	(*ACME STAFF	) ....-7	246	256:44	119.463	0.000	7	0
FEINBERG,DA DAFEINBE.ACME	(*ACME	) ....-7	91	17:50	6.23900	0.000	7	0
FREY,R r_frey__.acme	(*ACME STAFF	) L008-7	192	102:46	43.8210	4.09510	6	6
FREY,R r_frey__.null	(*ACME	) L008-7	188	89:33	25.7030	0.000	12	0
GILMAN,J J_GILMAN.ACME	(*ACME	) ....-7	3	1: 1	.209000	0.000	7	0

(1) number of months using system

(2) number of months with accounting data

Project	Department	account	runs	hours	processing(K)	blackmonths(K)	months
[illegible],S S_[illegible].acme	(*ACME	) L009-7	103	37:11	10.2160	.310000	(6, 6)
GIRARDI,S S_GIRARD.ACME	(*ACME	) ....-7	155	82: 5	32.1180	0.000	(8, 0)
GODWIN,D D_GODWIN.ACME	(*ACME	) L010-7	126	46:23	10.3060	.124000	(11, 6)
GRANIERI,C C_GRANIE.EXTERNAL	(*ACME	) L012-7	74	55:11	21.4420	.301000	(9, 6)
GRANIERI,C C_GRANIE.ACME	(*ACME	) L011-7	234	120:41	20.6350	.769000	(12, 6)
GRAY,R R_GRAY__.ACME	(*ACME	) L013-7	5	7:19	1.31700	0.012	(10, 6)
HUNDLEY,L L_HUNDLE.ACME	(*ACME	) L014-7	300	203:19	59.6920	1.33400	(12, 6)
IBM ENGINEERS I_CE____.TERMDIAG	(*ACME	) L003-7	135	44:21	10.8840	0.000	(12, 6)
KELLEY,E E_KELLEY.ACME	(*ACME	) L015-7	35	28:16	7.22500	0.000	(9, 6)
KORTZEBORN,B B_KORTZE.DISASTER	(*ACME	) ....-7	6	:26	0.093	0.000	(7, 0)
LEDERBERG,J J_LEDERB.TESTS	(*GENETICS	) L017-7	10	1:39	.330000	.330000	(12, 6)
LEDERBERG,J J_LEDERB.MEMOPAD	(*GENETICS	) L018-7	180	152:28	37.5440	1.57900	(12, 6)
LEDERBERG,J A_Commit.news	(*ACME	) ....-7	1	1.66: 1	0.003	0.000	(7, 0)

project	department	account	runs	hours	pageminutes(K)	blockmonths(K)	months
LIEBE,R R_LIEBE_.KORNER__	(*ACME	) ....-7	37	13:23	5.98500	.189000	(5, 3)
LIEBE,R R_LIEBE_.STATTEST	(*ACME	) L020-7	33	11:33	7.35800	.402000	(10, 6)
LIEBE,R R_LIEBE_.ACME	(*ACME	) L019-7	255	142:36	124.789	1.70000	(12, 6)
MATOUS,J J_MATOUS.GET	(*ACME	) L022-7	54	20:32	6.20200	.375000	(12, 6)
MEEK,J J_MEEK__.REST	(*ACME	) ....-7	129	74:29	23.1030	0.000	(8, 0)
MILLER,J j_miller.asm	(*ACME	) L038-7	5	5: 8	3.04400	.115000	(3, 3)
MILLER,J j_miller.pie	(*ACME	) L023-7	134	46: 7	33.4640	1.03500	(12, 6)
MILLER,J J_Miller.pie	(*ACME	) ....-7	2	1.66: 1	0.004	0.000	(4, 0)
MOORE,M m_moore_.stat	(*ACME	) ....-7	6	:20	0.087	0.000	(7, 0)
MORRIS,M M_MORRIS.MISC	(*GENETICS	) L021-7	120	100:40	28.5600	2.42300	(12, 6)
NELSON,G G_NELSON.ACME	(*ACME	) ....-7	42	24:32	14.6150	0.000	(7, 0)
OSBORNE,D D_OSBORN.TECH	(*ACME	) L024-7	150	22:40	5.65000	.142000	(12, 6)
PLASCH,C C_PLASCH.ACME	(*ACME	) L025-7	69	63:20	15.2530	.854000	(12, 6)
PUBLIC PROGRAM JOPUBLIC.ACME	(*ACME LIBRARY	) L026-7	262	105:55	33.5520	2.67400	(12, 6)

project	department	account	runs	hours	pageminutes(K)	blockmonths(K)	months
BIEMAN,J J_BIEMAN.VAT	(*ACME	) L027-7	23	11:45	2.56600	0.072	(12, 6)
SANDERS,G J_SANDER.CONSULT	(*ACME	) ....-7	1	1.66: 1	0.001	0.020	(2, 2)
SANDERS,G G_SANDER.CONSULT	(*ACME	) L028-7	58	35: 0	14.0450	.588000	(12, 6)
SANDERS,WJ wjsander.asdfg	(*ACME	) L029-7	197	118:37	42.4960	1.21700	(12, 6)
SCHACH,E E_SCHACH.medcomp	(*ACME	) ....-7	12	2:26	.779000	0.000	(5, 0)
SCHACH,E e_schach.medcomp	(*ACME	) ....-7	30	16:20	5.66900	0.000	(11, 0)
SCHACH,E E_SCHACH.MEDCOMP	(*ACME	) ....-7	98	76:59	31.6780	0.000	(7, 0)
SMITH,P P_SMITH_.ACME1BM	(*ACME	) L037-7	54	44: 7	11.8960	0.083	(3, 3)
VANTASSEL,J J_VANTAS.TEST	(*ACME	) L036-7	78	369:27	39.3180	.147000	(6, 3)
WIEDERHOLD,G G_Wieder.USAGE	(*ACME	) L034-7	34	35: 6	21.8070	3.21700	(12, 6)
WIEDERHOLD,V V_Wieder.Manual	(*ACME	) L035-7	55	34:45	7.74600	.747000	(12, 6)
WIEDERHOLD,V V_WIEDER.CLASS	(*ACME	) ....-7	14	3:22	.737000	0.000	(7, 0)

project	department	account	runs	hours	pageminutes(K)	blockmonths(K)	months
WIEDERHOLD,G G_Wieder.test	(*ACME	) L032-7	177	101:56	34.5600	1.51100	(12, 6)
WIEDERHOLD,G G_Wieder.demo	(*ACME	) L031-7	210	159: 5	51.1940	1.40600	(12, 6)
WIEDERHOLD,G G_Wieder.CSMP	(*ACME	) L033-7	27	8:45	3.59400	1.04100	(12, 6)
totals for group	2		57	2164	5571:49	1940.09	40.5178	

[illegible] BY [illegible]

[illegible]	department	account	runs	hours	pageminutes(K)	blockmonths(K)	months (1) (2)
ADLER,S S_ADLER_.SERANAL	(*GENETICS	) ....-3	3	: 7	0.025	0.000	(7, 0)
AMKRAUT,A A_AMKRAU.MAGIC	(*MED MICRO	) ....-3	22	11:24	2.81400	.153000	(9, 3)
ARONOW,L L_ARONOW.LCELL	(*PHARMACOLOGY	) L101-5	82	22: 6	6.06700	0.093	(12, 6)
ATKINSON,M M_ATKINS.FLYHIGH	(*NEUROLOGY	) L216-5	123	57:58	34.1290	.332000	(7, 6)
BALDWIN,RL RLBALDWI.OLIGOMER	(*BIOCHEM	) L102-5	34	23:45	16.8620	.496000	(6, 6)
BAUSEK,G G_BAUSEK.HOPPAT	(*MED INFEC DIS	) L103-5	69	62:58	39.2050	.195000	(7, 6)
BAYLEY,P P_BAYLEY.FLU	(*BIOCHEMISTRY	) ....-3	10	10:17	2.26100	0.000	(7, 0)
BEARD,R P_BEARD_.PREVMED	(*PREVENTIVE MEDI	) L217-5	39	4:59	1.72200	0.046	(7, 6)
BEATRICE,ES ESBEATRI.LASER	(*PATHOLOGY	) ....-3	15	4:12	1.09600	.142000	(8, 2)
BECKETT,L L_BECKET.GATES_AH	(*OBSTETRICS	) ....-3	9	2:57	.971000	0.000	(5, 0)
BELLVILLE,JW J_BELLVI.RESPIRAT	(*ANESTHESIA	) L243-5	159	216: 2	132.024	1.91400	(7, 6)
BELLVILLE,JW J_BELLVI.PROBABIL	(*ANESTHESIA	) L242-5	3	:16	0.054	.234000	(7, 6)
BELLVILLE,E E_BELLVI.RESPIRAT	(*ANESTHESIA	) ....-3	163	152:39	58.4020	0.000	(7, 0)
BELLVILLE,E B_BELLFO.PROB	(*ANESTHESIA	) ....-3	15	2:21	.555000	0.000	(7, 0)

(1) number of months using system

(2) number of months of file accounting data

project	department	account	runs	hours	pageminutes(K)	blockmonths(K)	months (1)	months (2)
BERNFIELD,M M_BERNFI.TRNA	(*PEDIATRICS	) L104-5	101	62:29	23.3180	.571000	(12,	6)
BODMER,W W_BODMER.POPGEN	(*GENETICS	) L105-5	911	1440:41	1212.42	68.8200	(12,	6)
BOLTON,G G_BOLTON.SCOPE	(*ANESTHESIA	) ....-3	2	5.00: 3	0.009	0.000	(7,	0)
BRAST,N N_BRAST_.S_SQUARE	(*MED STUDENT	) ....-4	196	244:27	161.262	.772000	(9,	3)
BRAST,N N_BRAST_.RODENTS	(*MED STUDENT	) L107-4	121	59:53	24.2670	.522000	(12,	6)
BRAST,N N_BRAST_.CATALOG	(*MED STUDENT	) L106-4	11	4:37	1.02700	.193000	(12,	6)
BRIDGES,JC JCBRIDGE.JOY	(*GENETICS	) L241-1	73	61:10	15.0980	0.091	(3,	3)
BRITT,R R_BRITT_.STAPR	(*NEUROLOGY	) L108-5	38	39:43	16.9950	3.25600	(12,	6)
BRODY,B B_BRODY_.DIAGNOSI	(*MED STU YEAR 3	) L235-4	61	18:48	0.02300	0.033	(3,	3)
BRODY,B B_BRODY_.FLYHIGH	(*MED STUDENT	) L109-4	134	121:21	34.8620	.761000	(12,	6)
BROWN,BN BNBROWN_.PROTEIN	(*MED STUDENT	) L110-5	121	81:53	20.6610	.557000	(12,	6)
BRUCE,J J_BRUCE_.CAL	(*LIPID RESEARCH	) ....-3	5	: 6	0.021	0.004	(2,	2)
BRUTLAG,D D_BRUTLA.ULTRA	(*BIOCHEMISTRY	) L111-4	61	28:51	8.49200	.331000	(7,	6)
BUCHANAN,B B_BUCHAN.STAT	(*GENETICS	) L256-4	135	58:16	13.7040	.130000	(3,	2)

(1) number of months using system

(2) number of months of file accounting data

project	department	account	runs	hours	pageminutes(K)	blockmonths(K)	months
BUCHHOLZ,W WBUCHHO.SPINJ	(*MED STUDENT	) L218-5	1	1.90: 1	0.001	.174000	(6, 6)
BUNNENBURG,E E_BUNNEN.CHEM	(*CHEMISTRY	) L112-5	72	51: 3	37.8530	1.33600	(12, 6)
BUTLER,E E_BUTLER.UROLOGY	(*UROLOGY	) L113-1	815	962:11	504.723	17.7080	(12, 6)
CADY,R R_CADY__.THYROID	(*PSYCHIATRY	) L259-2	4	4:36	1.50800	0.029	(3, 1)
CANN,H H_CANN__.LINKAGE	(*PEDIATRICS	) ....-3	40	20:16	15.0270	0.000	(7, 0)
CANN,H H_CANN__.QUAT	(*PEDIATRICS	) L114-5	421	489:17	200.840	21.8080	(12, 6)
CASTELANO,R R_CASTEL.SCHEDULE	(*RADIOLOGY	) ....-3	2	:23	.134000	0.015	(9, 3)
CAVALLI-SFORZA L_SFORZA.PAVIA	(*GENETICS	) L189-6	102	185:32	139.889	1.05500	(7, 6)
CAVE,P P_cave__.ventl	(*ANESTHESIOLOGY	) ....-3	4	1: 2	.217000	0.000	(7, 0)
CAVE,P P_CAVE__.PREMIES	(*ANESTHESIOLOGY	) ....-3	51	19:39	9.0	0.000	(8, 0)
CLAYTON,RB RBCLAYTO.SEXBRAIN	(*PSYCHIATRY	) L237-5	84	56:45	17.5090	1.30600	(10, 6)
CLOSE,VA VACLOSE_.GAME	(*GENETICS	) L115-1	7	1:42	1.18200	0.055	(6, 6)
COLLINS,K K_COLLIN.ATCase	(*BIOCHEMISTRY	) L116-5	78	36:28	28.7000	.500000	(12, 6)
CONNELLY,T T_CONNEL.CBO	(*CLINIC BUS OFF	) L219-8	92	288:14	214.658	22.1430	(5, 4)

professor	department	account	runs	hours	pageminutes(K)	blockmonths(K)	months
CONNELLY,T							
T_CONNEL.A518CBO	(*CLINIC BUS OFF)	A518-3	43	93:37	84.6710	15.2350	(3, 3)
CONNER,RL							
RLCONNER.RATRACE	(*PSYCHIATRY)	L117-5	48	45:17	10.6570	.551000	(6, 6)
CONSTANTINO,C							
C_CONSTA.AP	(*UROLOGY)	....-3	2	5.00: 3	0.012	0.004	(8, 2)
COOPER,JM							
JMCOOPER.SEXDIFF	(*PSCHIATRY)	L118-5	74	43:10	13.6200	.220000	(6, 6)
DAUGHTERS,G							
G_DAUGHT.SECURITY	(*PA MED CLIN)	L252-2	71	87:35	24.2280	2.85400	(3, 2)
DAUGHTERS,G							
G_DAUGHT.PLAYTIME	(*PA MED CLIN)	L120-4	267	185:10	51.7580	.458000	(8, 6)
DAUGHTERS,G							
G_DAUGHT.LABCHECK	(*PA MED CLIN)	L119-3	46	19:32	7.78000	0.090	(11, 6)
DENARDO,G							
G_DENARD.XENON133	(*NUC MED)	L248-6	21	18: 4	6.98500	.319000	(5, 5)
DOBIE,R							
R_DOBIE_.LISTEN	(*SPEECH & HEAR)	....-3	18	6:13	1.28400	0.040	(10, 5)
DOERING,CH							
CHDOERIN.INDEXV15	(*PSYCHIATRY)	L220-2	86	60:33	18.7600	1.88000	(5, 4)
DOERING,CH							
CHDOERIN.DESMOLAS	(*PSYCHIATRY)	L121-5	174	115:10	38.7140	1.30100	(12, 6)
DOHERTY,RA							
RADOHERT.SEXCHROM	(*PEDIATRICS)	L122-5	2	1: 8	.238000	0.050	(6, 6)
DONG,E							
E_DONG__.MARG1	(*SURG-CARDIOVAS)	L222-5	288	518:12	639.121	10.4290	(11, 5)
DONG,E							
E_DONG__.heart	(*SURG-CARDIOVAS)	L221-5	228	242:23	126.012	12.6590	(11, 5)

project	department	account	runs	hours	pageminutes(X)	clockmonths(X)	months
BONG,E E_BONG__.DATA	(*SURG-CARDIOVAS	) ....-3	11	2:37	.567000	0.000	(8, 2)
DURBRIDGE,T T_DURBRI.LASER	(*PATHOLOGY	) ....-3	5	1:21	.357000	0.001	(2, 1)
DURBRIDGE,T T_DURBRI.ROOT	(*PATHOLOGY	) L223-2	88	68:15	22.7150	.188000	(12, 6)
DURBRIDGE,T T_DURBRI.DEADMAN	(*PATHOLOGY	) ....-3	22	22:50	8.01500	0.004	(8, 2)
EDWARD,D D_EDWARD.STRESS	(*MED STUDENT	) L124-4	35	13:52	2.93400	.126000	(12, 6)
ENGLUND,P P_ENGLUN.ENZYME	(*ANESTHESIA	) ....-3	11	4:42	1.04100	0.000	(7, 0)
ENLANDER,D d_enland.PIPIC	(*PATHOLOGY	) L126-6	111	148:37	66.6150	11.5430	(6, 6)
ENLANDER,D d_enland.snop	(*PATHOLOGY	) L127-6	116	162:53	64.3810	1.09800	(10, 6)
ENLANDER,D a_path__.cases	(* PATHOLOGY	) ....-3	53	24:45	6.68300	0.000	(5, 0)
ENLANDER,D d_enland.cases	(*PATHOLOGY	) L125-6	51	58:17	15.6870	2.42500	(12, 6)
FLETCHER,G G_FLETCH.HARTFORD	(*ANESTHESIA	) L224-5	150	81: 2	27.7840	.364000	(8, 5)
FOLK,B B_FOLK__.GRS	(*BIOCHEMISTRY	) L128-5	16	10:46	2.68100	0.048	(3, 5)
FORREST,B B_FORRES.PROBABIL	(*ANESTHESIOLOGY	) ....-3	1	8.33: 5	0.012	0.000	(7, 0)
FORREST,B B_FOREST.PROBABIL	(*ANESTHESIA	) ....-3	1	1.66: 1	0.004	0.000	(7, 0)
FORREST,W W_FORRES.DATA	(*ANESTHESIA	) L130-5	13	3:41	.406000	15.2000	(6, 6)

project	department	account	runs	hours	pagemin utes(K)	clockmonths(K)	months
FORREST,W _FORRES.PROBABIL	(*ANESTHESIA	) ....-3	2	5.00: 3	0.014	0.007	(3, 2)
FORREST,W W_FORRES.ANALGESI	(*ANESTHESIA	) L129-5	688	925:37	880.632	11.9130	(12, 6)
FRIES,J J_FRIES_.DXARTH	(*MED IMMUNOLOGY	) L131-2	7	3:23	.977000	.132000	(6, 6)
GAMEL,J J_GAMEL_.CBF	(*MED STUDENT	) ....-4	45	64:10	48.1330	.195000	(4, 2)
GERSCH,W W_GERSCH.SYNTHESI	(*NEUROLOGY	) L132-6	529	232:54	148.350	8.76700	(11, 5)
GLATTKE,T T_GLATTK.ENG	(*ENT CLINIC	) L236-5	20	7:59	4.08000	0.063	(5, 5)
GLEASON,C C_GLEASO.CORTMEAS	(*NEUROLOGY	) L133-4	16	3:58	1.36200	.282000	(12, 6)
GLICK,D D_GLICK_.LASER1	(*PATHOLOGY	) ....-3	4	1:20	.318000	0.001	(1, 1)
GLICK,D D_GLICK_.LASER	(*PATHOLOGY	) L134-5	62	51:50	15.1660	.557000	(6, 5)
GODWIN,D D_GODWIN.ADRENAL	(*RADIOLOGY	) L135-5	178	173:21	145.355	1.40200	(7, 5)
GOLDSTEIN,DB DBGOLDST.BARB	(*PHARMACOLOGY	) L137-5	14	10:19	3.86200	0.012	(3, 3)
GOLDSTEIN,A A_GOLDST.PHA1	(*PHARMACOLOGY	) L136-5	128	55:20	17.9080	.504000	(12, 6)
GUTNICK,M M_GUTNIC.GERBRAIN	(*NEUROLOGY	) ....-3	37	17:30	8.45500	0.030	(3, 2)

user, proj	department	account	runs	hours	pageminutes(K)	blockmonths(K)	months
HACKNEY,J J_HACKNE.PHA1	(*PHARMACOLOGY	) L138-5	1	1.66: 1	0.002	0.012	(12, 6)
HAHN,G G_HAHN__.RADIATE	(*RADIOLOGY	) L139-5	19	2: 0	.404000	.186000	(12, 6)
HANCE,AJ AJHANCE_.MINOTAUR	(*PHARMACOLOGY	) ....-3	2	: 8	0.036	0.000	(7, 0)
HARDYCK,C C_HARDYC.EMG	(*U.C. BERK-PSYCH)	....-3	10	11: 2	5.12500	0.046	(8, 2)
HARRISON,DC DCHARRIS.CATH_LAB	(*CARDIOLOGY	) L140-6	395	346:33	292.207	2.18900	(7, 6)
HARRIS,RF R_HARRIS.PNP	(*MED STUDENT	) L225-5	12	6: 6	1.61500	0.085	(11, 5)
HELIKSON,M M_HELIKS.LBF	(*MED STUDENT	) L247-4	39	52:53	13.6090	2.24900	(5, 5)
HERZENBERG,L L_HERZEN.LAB	(*GENETICS	) L238-5	10	3:18	.863000	.134000	(6, 5)
HERZENBERG,L L_HERZEN.PIGGY	(*GENETICS	) L240-5	70	65:39	22.7760	1.49100	(7, 6)
HERZENBERG,L L_HERZERE.PIGGY	(*GENETICS	) ....-3	74	103:16	86.7820	0.000	(7, 0)
HERZENBERG,L L_HERZ__.LAB	(*GENETICS	) ....-3	12	2:57	.601000	0.000	(7, 0)
HILF,F F_HILF__.TESTA	(*PSYCHIATRY	) L142-5	124	81:25	57.0450	3.61900	(12, 6)
HILF,F F_HILF__.BLACKBOX	(*PSYCHIATRY	) L141-5	41	34: 3	18.1810	.855000	(12, 6)
HILL,C C_HILL__.MISSENSE	(* BIOCHEMISTRY	) ....-3	3	3:45	.704000	0.000	(7, 0)
HODGES,D D_HODGES.SWALLOW	(*RADIOLOGY	) L143-1	115	124:21	66.0450	3.18800	(6, 6)

[illegible]	[illegible]	account	time	hours	pagekminutes(K)	blockmonths(K)	months
HODGES,D D_HODGES.STOMACH	(*RADIOLOGY	) ....-3	48	20:31	11.4370	0.012	(2, 2)
HODGES,D D_HODGES.RADMED	(*RADIOLOGY	) ....-3	2	5.00: 3	0.009	0.007	(2, 2)
HODGES,D D_HODGES.PFZ	(*RADIOLOGY	) ....-3	9	4:29	2.14400	.108000	(2, 2)
HUBERMAN,J J_HUBERM.TEMPLATE	(*BIOCHEM	) L144-2	50	20:31	4.31700	0.078	(12, 6)
HUFF,J J_HUFF__.REPRINT	(*GENETICS	) ....-3	3	2:40	.558000	0.012	(12, 6)
HWANG,J J_HWANG_.BUTSTUDY	(*GENETICS	) L145-5	9	3: 3	1.21800	7.66700	(6, 6)
HWANG,J J_HWANG_.MKIRSCH	(*GENETICS	) ....-3	46	30:57	9.57800	0.000	(7, 0)
HWANG,J J_HWANG_.GENLIB1	(*GENETICS	) L146-5	72	63:38	24.1280	2.62000	(12, 6)
HWANG,J J_HWANG_.CROUT	(*GENETICS	) ....-3	55	52:12	32.2000	.162000	(8, 2)
INGELS,N N_INGELS.ASMSPJOB	(*PA MED RES FDN	) L147-5	209	168:48	35.6430	1.1[illegible]	(8, 6)
JANIS,K K_JANIS_.STAT	(*ANESTHESIA	) ....-3	80	13:30	3.37300	0.000	(7, 0)
JAN,W W_JAN___.NOMAN	(*MED STUDENT	) L254-4	79	28:41	6.44000	.132000	(3, 2)
JONES,D D_JONES_.FLU	(*BIOCHEMISTRY	) L148-1	240	497:40	537.658	19.5010	(12, 6)
KADIS,L L_KADIS_.INDIRECT	(*ANESTHESIA	) ....-3	75	94: 7	30.4730	0.050	(7, 0)

project	department	account	runs	hours	pagesminutes(K)	blockmonths(K)	months
KAKIHANA,R R_KAKIHA.ETHANOL	(*PSYCHIATRY	) L149-6	97	36:38	14.2100	.335000	(12, 6)
KAKIHANA,R R_KAKIHA.ANOVA1	(*PSYCHIATRY	) ....-3	36	10:57	2.47800	0.000	(7, 0)
KAPLAN,B B_KAPLAN.PSYCHOPH	(*PSYCHIATRY	) L150-5	194	118:11	33.7860	.511000	(12, 6)
KAPLAN,HP HPKAPLAN.BLDVOL1	(*NUC MED	) ....-3	5	1:38	.514000	0.000	(6, 0)
KESSLER,S S_KESSLE.MATSPEED	(*PSYCHIATRY	) L151-5	102	151:34	73.6300	1.39400	(12, 6)
KORN,D D_KORN__.PATH	(*PATHOLOGY	) ....-3	62	40:10	19.7620	0.002	(6, 1)
KOUNTZ,S S_KOUNTZ.TRANSPLA	(*SF MED CENT	) L234-5	408	307: 3	205.870	.670000	(12, 6)
KRAEMER,H H_KRAEME.PSYSTAT	(*PSYCHIATRY	) L152-2	230	178:26	101.873	1.08300	(12, 6)
KRISS,J J_KRISS_.ASSAY	(*NUC MED	) L153-5	168	62:22	18.8440	.282000	(12, 6)
LAIPIS,P P_LAIPIS.LIGASE	(*GENETICS	) L155-5	21	12:52	3.02100	0.038	(12, 6)
LAMB,EJ EJLAMB__.EMPIRE	(*GYN/OB	) L156-2	81	35: 1	12.1260	.404000	(6, 5)
LEDERBERG,J J_LEDERB.ICRO	(*GENETICS	) ....-3	301	286:48	120.520	0.000	(3, 0)
LEDERBERG,J J_LEDERB.DENDRAL	(*GENETICS	) L157-2	25	7: 0	2.31700	.686000	(12, 6)

project	department	account	runs	hours	pageminutes(K)	blockmonths(K)	months
LEIDERMAN,PH PHLEIDER.PREMIE	(*PSYCHIATRY	) L158-5	54	18:53	3.94700	.164000	(11, 6)
LEIFERT,A A_LEIFER.PREMI	(*PSYCHIATRY	) L159-2	3	1:19	.624000	0.018	(12, 6)
LEVINE,RL RLLEVINE.CPS	(*PEDIATRICS	) L160-5	79	64:20	22.0510	.205000	(10, 6)
LEVINTHAL,E E_LEVINT.MM71	(*GENETICS	) L161-2	3	:17	0.047	0.030	(6, 6)
LIEBES,S S_LIEBES.MS	(*GENETICS	) L162-1	279	294:45	127.533	4.45000	(12, 6)
LORENSON,M M_LORENS.PFK_1___	(*PHARMACOLOGY	) L163-5	42	55: 8	27.0130	0.066	(8, 6)
LUETSCHER,J J_LUETSC.Blood_pr	(*MED METABOL RES)	L164-5	365	291:28	105.486	3.81800	(12, 6)
LUMB,J J_LUMB__.C_TUMORS	(*MED MICRO	) L165-5	30	20: 6	4.72900	.807000	(12, 6)
LUTZKER,M M_LUTZKE.TORY	(*RADIO THERPHY	) ....-3	1	0.66: 4	0.014	0.007	(8, 2)
LUZATTI,L L_LUZZAT.GRAGSON	(*PEDIATRICS	) L166-6	292	166:52	60.4690	1.39500	(12, 6)
MACPHERSON,L L_MACPHE.META	(*PSYCHIATRY	) L249-5	70	20:51	4.99900	.154000	(12, 6)
MAFFLY,R R_MAFFLY.CO2	(*MED-LIPID RES	) L167-5	46	26: 7	10.4000	0.006	(12, 6)
MARICH,K K_MARICH.LASER	(*PATHOLOGY	) ....-3	3	:17	0.064	0.010	(8, 2)

MCKUANN,G G_MCKUAN.GSIDE	(*PEDIATRICS	) ....-3	6	1:30	.385000	.126000	(8, 3)
MORPHIE,R R_MORPHIE.RNASE	(*BIOCHEMISTRY	) ....-3	31	17: 5	7.12400	0.000	(7, 0)
MESEL,E e_mesel_.jan	(*PEDIATRICS	) L174-6	9	4: 3	.839000	0.083	(9, 6)
MESEL,E e_mesel_.clinic	(*PEDIATRICS	) L173-6	94	84:59	40.7790	5.48100	(9, 6)
MESEL,E e_mesel_.carcat	(*PEDIATRICS	) L172-1	236	209:23	122.761	6.90900	(12, 6)
MESEL,E E_MESEL_.WER	(*PEDIATRICS	) L168-6	30	23:36	8.31600	.844000	(12, 6)
MESEL,E E_MESEL_.VSD	(*PEDIATRICS	) L170-6	68	83: 3	45.9780	3.40500	(12, 6)
MESEL,E E_MESEL_.TV	(*PEDIATRICS	) L171-6	3	8.33: 5	0.018	0.017	(12, 6)
MESEL,E E_MESEL_.DOGLAB	(*PEDIATRICS	) L169-6	63	74:30	50.8560	.522000	(12, 6)
MEYER,S S_MEYER_.DOSE1	(*MED SCHOOL	) ....-3	13	9: 3	2.72500	0.05	(8, 2)
MILLER,DC DCMILLER.PHYSIO	(*MED STUDENT	) ....-4	1	1.66: 1	0.001	0.010	(8, 5)
MILLER,DC DCMILLER.LASER	(*MED STUDENT	) ....-4	32	42:58	15.7330	.203000	(3, 2)
MILLER,R R_MILLER.STRABIS	(*PREV MED	) L226-5	6	4:22	2.38500	.799000	(6, 5)
MILLER,R R_MILLER.BIOSTAT	(*PREV MED	) L215-2	445	327:10	140.113	1.72300	(12, 6)
MISC.USERS (no UNKNOWN .SCRATCH	(*ACME	) L016-4	4275	1557:48	388.177	0.012	(12, 6)

project	department	account	runs	hours	pageminutes(K)	blockmonths(K)	months
MONTIN,L L_MONTIN.DISCRIM	(*SPEECH & HEARIN)	L260-4	2	5.00: 3	0.006	0.000	(2, 0)
MORRIS,S S_MORRIS.EXPT4	(*GENETICS)	L175-5	35	17:45	4.47300	.143000	(12, 6)
MOSES,L S_DEPT__.DEVELOPE	(*STATISTICS)	....-3	22	6:26	1.42600	0.000	(7, 0)
NALL,L L_NALL__.MYCOSIS	(*DERMATOLOGY)	L261-2	75	57:12	14.8220	.879000	(11, 6)
NALL,L L_NALL__.PSORIASI	(*DERMATOLOGY)	L262-2	147	72:43	20.6000	3.50300	(12, 6)
NELSEN,T T_NELSEN.GASTRIC	(*SURGERY)	....-3	4	1: 3	.219000	0.004	(8, 2)
NOBLE,EP EPNOBLE_.ALCOHOL	(*PSYCHIALRY)	L176-6	36	19: 5	6.07700	1.48500	(7, 6)
NYE,W W_NYE___.STUDENT	(*MED MICRO)	L177-6	165	102:54	29.6000	.310000	(12, 6)
NYE,W W_NYE___.STRUCTUR	(*MICROBIOLOGY)	....-3	21	8:28	1.70000	0.000	(7, 0)
OKUN,L L_OKUN__.THESIS	(*GENETICS)	....-3	22	11:52	2.49400	0.000	(12, 6)
PAYNE,R R_PAYNE_.SERNAL	(*MED HEMATOLOGY)	L178-5	45	57:21	43.6260	8.10200	(6, 3)
PETRALLI,J J_PETRAL.MED_DATA	(*INFEC DIS)	L227-6	296	646:40	225.177	10.6000	(12, 6)
PORTER,RW RWPORTER.AIR	(*BIOCHEMISTRY)	L228-5	237	212:48	65.8350	.980000	(12, 6)
PRYOR,H H_PRYOR_.GROWTH	(*MED SCHOOL)	....-3	2	3.33: 2	0.007	0.000	(7, 0)

job	department	account	runs	hours	pageminutes(K)	blockmonths(K)	months
RABKIN,R							
R_RABKIN.SETUP	(*MED STUDENT)	....-4	1	1.66: 1	0.001	0.000	(7, 0)
REAVEN,G							
G_REAVEN.FIT	(*MED LIPID RESEA)	L231-5	51	35: 7	28.5140	.120000	(5, 4)
REAVEN,G							
G_REAVEN.DISPLAY	(*MED LIPID RESEA)	L229-5	34	15:32	7.72200	.127000	(5, 4)
REAVEN,G							
G_REAVEN.PAT_DATA	(*MED-LIPID RESEA)	L230-5	368	185:34	63.7820	.565000	(7, 6)
REYNOLDS,WE							
WEREYNOL.TEXTS	(*GENETICS)	L181-2	53	55:54	18.0810	1.92600	(12, 6)
REYNOLDS,WE							
WEREYNOL.S007	(*GENETICS)	L180-1	245	311:40	263.233	4.79800	(12, 6)
ROBERTSON,W							
W_ROBERT.UGAG	(*PEDIATRICS)	L251-5	6	5:59	2.14400	.137000	(3, 3)
ROSAN,R							
R_ROSAN_.OXYCEL	(*PATHOLOGY)	....-3	39	42:46	15.3490	0.002	(8, 1)
ROSENBERG,L							
L_ROSENB.ALEXINE	(*MED MICRO)	L182-6	64	21: 0	6.36400	.651000	(12, 6)
ROSENTHAL,W							
W_ROSENT.RESEARCH	(*SPEECH PATH)	L183-4	147	65:11	21.6330	.316000	(12, 6)
ROSS,R							
R_ROSS__.CHEM	(*CHEMISTRY)	L184-5	9	8:27	1.76500	0.000	(12, 5)
ROTH,W							
W_ROTH__.COMP	(*PSYCHIATRY)	L185-5	328	210:55	114.416	3.14800	(12, 6)
SAUNDERS,AM							
AMSAUNDE.SPHERES	(*PATHOLOGY)	L257-5	21	14:22	5.25600	.152000	(3, 1)
SAUNDERS,AM							
AMSAUNDE.MASTCELL	(*PATHOLOGY)	L187-5	157	180: 8	54.7310	2.25900	(12, 6)
SAVAGE,M							
M_SAVAGE.KINET	(*CARDIOLOGY)	L186-5	52	32:45	15.0410	.633000	(11, 6)

project	department	account	runs	hours	pageminutes(K)	blockmonths(K)	months
SCHNEIDERMAN,L							
L_SCHNEI.PATCHART	(*MED-AMBULATORY)	L188-6	138	100:21	42.4090	3.85700	(12, 6)
SCUDO,F							
F_SCUDO_.MIGRA	(*GENETICS)	....-3	10	4:40	1.91400	0.000	(7, 0)
SHEEFLER,IE							
IESCHEEF.OLIGOMER	(*BIOCHEMISTRY)	....-3	126	81:27	42.7020	0.000	(7, 0)
SILVERMAN,L							
L_SILVER.QUEM	(*PATHOLOGY)	....-3	9	3:36	.875000	0.004	(8, 2)
SILVERS,A							
L_RESEAR.PAT_DATA	(*LIPID RESEARCH)	....-3	519	314:22	120.423	0.000	(8, 0)
SMALLWOOD,R							
R_SMALLW.MEDIPLAN	(*MED FACIL PLAN)	L190-2	633	684:37	456.222	7.52700	(12, 6)
SMITH,NT							
NTSMITH_.BABOONS	(*ANESTHESIA)	L192-5	1	1.66: 1	0.002	.966000	(6, 6)
SMITH,NT							
NTSMITH_.MAC	(*ANESTHESIA)	L191-5	132	102:44	46.7400	.557000	(12, 6)
SMITH,P							
P_smith_.PREMIES	(*ANESTHESIA)	L194-5	24	19:18	5.34000	.373000	(7, 6)
SMITH,RC							
RCSMITH_.FAMILY	(*MED STUDENT)	L195-5	7	2:14	.535000	.573000	(7, 6)
SMITH,T							
T_SMITH_.BABOONS	(*ANESTHESIA)	....-3	87	71:43	33.2110	0.000	(7, 0)
SOLOMON,G							
G_SOLOMO.STRESS	(*PSYCHIATRY)	L190-2	9	5:30	1.76100	.114000	(12, 6)
SPARKS,R							
J_CLAPP1.A532SYNT	(*SYNTEX CORP)	A532-3	6	2:34	.806000	0.000	(2, 2)
STENSON,B							
B_CARDIO.CATH_LAB	(*CARDIOLOGY)	....-3	267	267:22	343.000	0.000	(7, 0)
STILLMAN,RA							
RASTILLM.DREAMS	(*CHEMISTRY)	L200-5	164	159:22	87.0000	3.05100	(7, 0)

project	department	account	runs	hours	pageminutes(K)	blockmonths(K)	months
STILLMAN,R R_STILLM.PSYGAME	(*PSYCHIATRY)	L198-5	38	25:19	7.50700	.707000	(12, 6)
STILLMAN,RA RASTILLM.DRAFT	(*CHEMISTRY)	L199-5	186	210:20	133.727	.401000	(12, 6)
STOCKER,B B_STOCKE.Stm	(*MED MICRO)	L201-6	90	65: 1	24.1360	.282000	(10, 6)
STRICK,R R_STRICK.GASTRIC	(*MED-G.I. DIVISI)	L202-5	46	11:32	2.38500	.429000	(12, 6)
STRYER,L L_STRYER.NANOS	(*BIOCHEMISTRY)	L203-1	68	71:54	18.2650	1.19000	(12, 6)
STUEDEMAN,D D_STUEDE.ADMIN	(*GENETICS)	L204-2	62	54:59	14.2710	1.41900	(12, 6)
SUMMERLIN,WT WTSUMMER.BIOCHEM	(*DERMATOLOGY)	L205-5	4	1:45	.754000	0.030	(11, 6)
THATHACHARI,YT YTTHATHA.DOPA	(*DERMATOLOGY)	L206-5	210	197:25	73.9770	1.01900	(12, 6)
TICKNER,EG EGTICKNE.MURMURS	(*PA MED RES FOUN)	L232-5	59	63:26	45.5050	.366000	(5, 4)
TRUDEL,J J_TRUDEL.MASS_SPE	(*CHEMISTRY)	L207-5	33	24: 3	7.15600	0.060	(12, 6)
TUCKER,RB RBTUCKER.MS	(*GENETICS)	L208-1	270	304:55	297.877	1.39400	(12, 6)
VONDER GROEBEN j_vonder.cardio	(*ANESTHESIA)	....-3	0	: 8	0.010	.312000	(6, 6)
VONDER GROEBEN j_vonder.larry2	(*ANESTHESIA)	....-3	4	:30	.119000	.150000	(12, 6)
VONDER GROEBEN j_vonder.larry1	(*ANESTHESIA)	....-3	4	2:13	1.27500	4.62600	(12, 6)
VONDER GROEBEN j_vonder.johnl	(*ANESTHESIA)	....-3	24	23:29	15.0210	23.4550	(12, 6)

project	department	account	runs	hours	pageminutes(K)	blockmonths(K)	months
VONDER GROEBEN j_vonder.covar	(*ANESTHESIA	) ....-3	2	1.66: 1	0.003	0.006	(12, 6)
VONDER GROEBEN J_VONDER.LARRY2	(*ANESTHESIA	) ....-3	1	1.66: 1	0.001	0.006	(12, 6)
VONDER GROEBEN J_VONDER.DATA	(*ANESTHESIA	) ....-3	1	1.66: 1	0.001	0.012	(12, 6)
WARRICK,G G_WARRIC.STEROID	(*PSYCHIATRY	) L209-5	156	162:12	204.890	.531000	(12, 6)
WEISSMAN,I I_WEISSM.THYMUS	(*RADIOLOGY	) L246-5	15	10:54	2.29800	0.040	(12, 6)
WEXLER,L L_Wexler.ContrEff	(*RADIOLOGY	) ....-3	5	1:37	.381000	.102000	(11, 6)
WHITCHER,C c_whitch.ONCALLA	(*ANESTHESIA	) L245-2	12	11: 1	10.1200	.220000	(7, 6)
WHITCHER,C c_whitch.spctrm	(*ANESTHESIA	) ....-3	2	3.33: 2	0.004	0.012	(12, 6)
WHYMAN,A A_WHYMAN.JJJJ	(*MED STU YEAR 5	) L210-4	26	26:50	22.3410	.248000	(8, 5)
WONG,F F_WONG__.SUMMARY	(*RADIOLOGY	) L212-5	112	133:34	87.8200	4.47800	(6, 6)
WONG,F F_WONG__.MEDONCOL	(*RADIOLOGY	) L213-5	148	118:25	71.4370	.376000	(10, 6)
WONG,F F_WONG__.PLAN	(*RADIOLOGY	) L211-5	56	52:29	56.4020	.101000	(12, 6)
YGUERA,J J_YGUERA.LUM	(*BIOCHEMISTRY	) L214-1	10	9:33	2.00300	0.075	(11, 6)
YOUNG,M M_YOUNG_.XENON133	(*NUCL. MEDICINE	) ....-3	82	66:54	20.3770	0.000	(8, 0)

project	department	account	runs	hours	pageminutes(K)	blockmonths(K)	months
ZAJAC,F							
F_ZAJAC_.FLYHIGH	(*NEUROLOGY)	....-3	17	14:39	3.71700	0.000	(7, 0)
ZWICK,M							
M_ZWICK_.CRYSTAL	(*BIOCHEMISTRY)	L233-1	10	12:38	8.79500	.222000	(7, 6)
totals for group	1		229	7950	21004:43	12125.90	388.146

project	department	account	runs	hours	pageminutes(K)	blockmonths(K)	months
BUCHANAN,B							
B_BUCHAN.A534STAT	(*COMPUTER SCIENC)	A534-9	62	51:34	20.9960	.293000	(3, 2)
FORK,D							
D_FORK__.A521RESE	(*CARNEGIE)	A521-9	30	21:47	13.8630	.185000	(7, 6)
FORK,D							
P_BIOLOG.A521RESE	(*CARNEGIE)	....-9	12	4:25	1.14200	0.000	(6, 0)
GUSTAVSON,DB							
D_GUSTAV.A516DATA	(*SLAC)	A516-9	318	266:11	85 0	1.25000	(12, 6)
HALL,R							
R_HALL__.A526OPED	(*U.C. BERK-ECON)	A526-9	62	98:43	59.9440	2.24500	(7, 6)
HARBAUGH,JW							
JWHARBAU.A504GEOL	(*GEOLOGY)	....-9	16	16:11	6.05700	.160000	(8, 1)
JUDSON,CJ							
CJJUDSON.A529CPUN	(*LAW SCHOOL)	A529-9	352	244:49	114.576	3.13700	(7, 6)
JUROV,J							
J_JUROW_.A501PHEL	(*SLAC)	A501-9	226	101:56	39.1050	1.31500	(12, 6)
KNIGHT,KE							
KEKNIGHT.A525INF	(*GSB)	A525-9	53	23: 6	9.28700	.184000	(8, 4)
LIKENESS,B							
B_LIKENE.A503AERO	(*AERO & ASTRO)	A503-9	48	40: 6	17.1520	.314000	(12, 6)
MACINTOSH,J							
A_ASTRO_.A515	(*AERO & ASTRO)	A515-9	956	510:58	199.709	1.83500	(12, 6)
MCKINNEY,G							
G_MCKINN.A523TWO	(*GRAD SCH BUSINE)	A523-9	23	13:52	4.08600	0.017	(2, 2)
MCKINNEY,G							
G_MCKINN.A523ONE	(*GRAD SCH BUSINE)	A523-9	23	19: 0	6.72800	0.013	(2, 2)
MCKINNEY,G							
G_MCKINN.A523BPOG	(*GRAD SCH BUSINE)	A523-9	125	79:47	32.9540	1.10400	(10, 6)
MOFFAT,R							
R_MOFFAT.A505LAB	(*MECH ENGIN)	....-9	473	226:21	77.5570	0.000	(7, 0)

project	department	account	runs	hours	pageminutes(K)	blockmonths(K)	months
MOFFAT,RJ							
RJMOFFAT.A528ME13	(*MECH ENGR)	A528-9	37	19:40	5.70900	.114000	(7, 6)
OLSON,GL							
GLOLSON_.A535CHEM	(*CHEMISTRY)	A535-9	15	1:10	.387000	0.012	(3, 3)
PASSAL,RA							
RAPASSAL.A518CBO	(*STANFORD CLINIC)	....-9	86	52: 5	34.3060	0.000	(6, 0)
PAVLINA,NJ							
NJPAVLIN.A517INFO	(*CONTROLLERS OFF)	A517-9	13	8:12	2.87900	.108000	(11, 6)
PRITCHARD,RL							
RLPRITCH.A524EE31	(*ENGR SCHOOL)	A524-9	44	16:57	4.64800	.129000	(10, 6)
RICHTER,B							
B_RICHTE.A536ECSL	(*SLAC)	A536-9	6	2:28	.511000	0.030	(3, 2)
SAAL,HJ							
HJSAAL__.A533HJSA	(*SLAC)	A533-9	45	39:58	16.0690	.299000	(6, 4)
SUTHERLAND,G							
G_SUTHER.A511LAWS	(*LAW SCHOOL)	....-9	220	49:50	13.9270	0.000	(7, 0)
WEAVER,W							
W_WEAVER.A519EN11	(*CIVIL ENGINEERI)	A519-9	5	3:28	1.48100	0.064	(5, 4)
totals for group 3		24	849	1912:32	768.080	11.9770	
total accountable usage		310	10963	28962:16	14843.10	440.640	

SUMMARY OF COMPUTER RESOURCE USAGE

Period Covered 4/20/68 - 4/21/69

PRINCIPAL INVESTIGATOR	DEPARTMENT INSTITUTION	PROJECT TITLE	FIELD OF INVESTIGATION		COMPUTER EQUIPMENT (Pageminutes)
			Main Field	Sub-Category Code	
		CORE RESEARCH PROJECTS			
Allen, L.F.	Computation Center	System tests.	Computation	3710	68
Bagwell, P.	ACME	User consultation.	Computation	3740	168,389
Beebe, J.T.	Computation Center	System demonstrations.	Computation	3740	7,923
Berns, T.I.	Computation Center	System demonstrations.	Computation	3740	21,240
Breitbard, G.Y.	ACME	System development and testing.	Computation	3710	42,337
C.E., IBM	ACME	Terminal testing.	Computation	3710	10,884
Class, C.H.	ACME	Daily operations equipment inventory; system testing and demonstration.	Computation	3710 3740 7420	308,049
Crowse, L.F.	ACME	Development of real-time medical procedures.	Computation	3710	54,812
Cummins, L.A.	ACME	Communication systems development.	Computation	3710	10,217
De la Hoca, D.	ACME	Assembler development.	Computation	3710	88,609
Feigenbaum, E.A.	Computation Center	System demonstrations.	Computation	3740	6,239
Frey, R.	ACME	File system testing; consulting programs.	Computation	3710 3740	69,584
Girardi, S.F.	ACME	File testing.	Computation	3710	48,334
Godwin, J.D.	ACME	Student instruction: how to use ACME.	Computation	3740	10,306
Granieri, C. (2 Projects)	ACME	System development and testing.	Computation	3710	51,077
Gray, E.	ACME	Daily operations.	Computation	3710 3720	1,417

[illegible]	ACME	Real-time data acquisition.	Computation	3720 3730	59,692
[illegible]	ACME	Daily operations.	Computation	3730 3720	7,225
[illegible] (Miscellaneous User)	ACME	Minor student desk calculator services; no file storage.	Computation	3709	388,177
Lederberg, J.F.	Genetics	System tests.	Computation	3710	320
Lederberg, J.F.	Genetics	Appointment and lecture scheduling.	Computation	3750	57,644
Liere, R.O.	ACME	Library programs.	Computation	3710	124,789
Liere, R.O.	ACME	Statistical programs.	Computation	3710	7,658
Matous, J.R.	ACME	Daily operations.	Computation	3730 3720	6,209
Miller, J.	ACME	Assembler development.	Computation	3710	7,044
Miller, J.	ACME	File development.	Computation	3710	33,469
Morris, M.	Genetics	Departmental service routines.	Computation	3720	33,669
Osborne, E.	ACME	System tests.	Computation	3710	456
Plasch, E.S.	ACME	Index to ACME documentation.	Computation	3720	[illegible]
Poulic, J.F.	ACME	Development and storage of PUBLIC files.	Computation	3710	[illegible]
Rieman, S.	ACME	Daily operations.	Computation	3730 3720	[illegible]
Sanderr, T.	ACME	User documentation.	Computation	3720	[illegible]
Sanders, J.F.	ACME	Hardware and software development.	Computation	4710	[illegible]
Smith, L..	ACME	System tests by TIM system engineer.	Computation	3710	[illegible]
Ware, A.	ACME	[illegible]	Computation	3730	

[illegible]	ACME	Daily operations.	Computation	3730 3720	39,318
[illegible]	ACME	System testing to make sure it meets old and new specifications.	Computation	3710	34,560
Wiederhold, G.	ACME	Demonstrations for visitors to ACME.	Computation	3740	51,194
Wiederhold, G.	ACME	Developing continuing system modeling program.	Computation	3710	3,594
Wiederhold, G.	ACME	Usage statistics, accounting, and yearly reports.	Computation	3740 3730	21,807
Wiederhold, V.	ACME	Editing the PL/ACME manual.	Computation	3740	7,746

[illegible]	DEPARTMENT INSTITUTION[1]	PROJECT TITLE	FIELD OF INVESTIGATION		COMPUTER EQUIPMENT (Pageminutes)
			Main Field	Sub-Category Code[2]	
INDIVIDUAL USER PROJECTS					
Agnel, J.R.	Neurology	Movement patterns, limb displacement and velocity, and electromyography.	Psychomotor Learning	1716	0
Aronow, L.	Pharmacology	Laboratory data analysis related to anti-cancer drugs.	Cellular Pharmacology	1544	6,067
Atkinson, M.L.	Neurology	Mathematical formulation of the kinematic properties of muscle.	Neurophysiology	1716	34,129
Bacon, V.A.	Genetics	Operating quadrupole mass spectrometer.	Mass Spectrometry	3914	1,182
Baldwin, R.L.	Biochemistry	Characterization and helix of short DNA helices.	Biochemistry	1310	16,862
Bausek, C.	Radiology	Radiotherapeutic treatment of lymphomas.	Radiology	3750 3720	39,205
Beard, R.R.	Preventive Medicine	Behavioral responses and influences of inhaling CO.	Air Pollution	4143	1,722
Bellville, J.W.	Anesthesia	Pharmacology of anesthetics and related agents.	Clinical Pharmacology	1569 1549	50
Bellville, J.W.	Anesthesia	Respiratory control mechanisms.	Anesthesia	4516	200,744
Bernfield, M.R.	Pediatrics	Biochemistry in birth defects.	Pediatrics	1310 3430 3750	24,419
Bodmer, W.F.	Genetics	Human white blood cell and population genetics.	Population Genetics and Cytogenetics	354 3316	1,144,329
Boyle, J.	Clinic Business Office	Clinic patient billing.	Patient Billing	4499 4550	179,720
Brant, W.B.	Med Student	Data collection of glucocortical injection results.	Psychology	3014 3740	24,267

[1] All departments are Stanford Medical Center unless another institution is named.

[2] Use of BCMM is oriented towards information collection, storage, retrieval, and information processing. Therefore it is inevitable that all the projects listed here fall into the 3720 category to some extent.

Brast, N. .	Med Student	Storing and searching biographic information.	Psychology	3720	1,027
Bridges, J. .	Genetics IRL	Control of quadrupole mass spectrometer.	Mass Spectrometry	3914	15,098
Britt, R.P.	Neurology	Auditory pathway responses to acoustic stimuli.	Auditory Neurophysiology	1717	16,995
Brody, W.R.	Med Student	Med student history taking and formulation of differential diagnoses.	Student Education	4449	9,023
Brody, W.R.	Med Student	Information processing in sensory systems.	Biomedical Engineering	3919	34,862
Brown, B.M.	Med Student	Serum levels of therapeutic agents and analyzing essay data.	Drug Metabolism	1569 1349	29,616
Brutlag, D.L.	Biochemistry	Computer applications to medical research.	Med Student Education	3610	8,492
Buchanan, B.	Genetics	Teaching medical students basic statistics.	Student Education	3610	13,704
Bunnenberg, E.	Chemistry	Analysis of mass spectra and spectropolorimeter spectra; routine chemical analysis.	Spectropolorimetry	1230	37,853
Butler, E.	Urology	Real-time measurements of dynamics of the urinary tract.	Urology	1714 3730	504,723
Cann, H.	Pediatrics	Frequencies of genes controlling human characters.	Population Genetics	2334	200,840
Clayton, R.B.	Psychiatry	Effects of steroids and hormones of RNA activity on the brain.	Psychiatry	3962	17,959
Collins, K.D.	Biochemistry	Compare model compounds with experimental spectra; analyze chromatograms; ultracentrifugation.	Biochemical Research	1310 3720	28,700
Conner, R.L.	Psychiatry	Relating neuroendocrine function to behavior.	Psychology	3900 1717 1730	10,657
Cooper, J.M.	Psychiatry	Biochemical correlation of neonatal sexual differentiation in rats.	Biochemical Research	1310 3420	13,630
Daughters, G.T.	Palo Alto Medical Research Foundation	Routine use for clinical laboratory.	Bioengineering and Physiology	3970	7,780

Daughters, V.L.	Palo Alto Medical Research Foundation	Education for research scientists on how to use ACME.	Computer Education	4449	51,758
Daughters, J.L.	Palo Alto Medical Research Foundation	Study of medical insurance utilization.	Medical Economics	4250	24,228
DeWardo, G.	Nuclear Medicine	Using radioactive methods to assess regional distribution of ventilation and pulmonary blood flow.	Nuclear Medicine	1713	6,985
Doering, C.H.	Psychiatry	Storing and searching an author and subject index.	Biochemistry	3720 1310	18,760
Doering, C.H.	Psychiatry	Development of the enzyme system in the rat adrenal gland.	Steroid Hormone Metabolism	1349	38,714
Doherty, R.A.	Pediatrics	Random sampling of cells; statistical evaluations of data.	Developmental Biology	2414	938
Dong, E.	Cardiovascular Surgery	Effects of heart transplants; white cell correlations; pulmonary data collection.	Cardiovascular Research	1712 4514 2230 2420	186,012
Dong, E.	Cardiovascular Surgery	Develop a controller for an artificial heart.	Cardiovascular Research	1713	630,121
Duffield, A.M.	Chemistry	Analysis of mass spectra and spectrapolorimeter spectra; routine chemical analysis.	Spectrapolorimetry	1030	[illegible]
Durbridge, T.	Pathology	Compute research statistics.	Statistics	3610	32,715
Edwards, P.K.	Med Student	Effects of hormones on the alpha rhythm and temporal perception.	Psychiatry	3262	2,934
Enlander, D. (3 Projects)	Pathology	Filing and retrieving coded medical diagnoses.	Medical Record Retrieval	3720	137,679
Fletcher, G.	Anesthesia	Research of acute ventilary insufficiency.	Respiratory Physiology; Anesthesia	1713 4518	27,784
Folk, B.	Biochemistry	Mitrants of Ecali, having altered activating enzymes.	Molecular Biology	1350	2,681
Forrest, W.H. (2 Projects)	Anesthesia	Develop quality and quantity control system for large masses of clinical data.	Clinical Pharmacology	1569	881
Fries, J.F.	Immunology	Clinical information about rheumatic diseases.	Clinical Medicine	2299 3720	977

Gersch, W.	Neurology	Develop linear model of electrophysiological data.	Neurology	1717	148,350
Glattke, T.J.	ENT Clinic	Collecting and processing ANS data; patient categorization.	Auditory Physiology; Clinical Research	1799 3720	4,080
Glick, T.	Pathology	Laser-microprobe element analysis.	Histochemistry	2420	15,484
Gleason, C.A.	Neurology	Self-education: how to use computers in electrophysiological research.	Electrophysiology	1799	1,362
Godwin, J.D.	Med Student	Clinical cancer research record protocols; data analysis.	Cancer Research	2750 3720	145,355
Goldstein, A.	Pharmacology	Drug-induced mouse activity.	Pharmacology	1520 1530	17,908
Goldstein, D.B.	Pharmacology	Biochemical action of barbital.	Pharmacology	1520	3,862
Hagn, G.M.	Radiology	Survival curves of x-irradiated mammalian cells; output of plauchet counter.	Radiobiology	2920	404
Harrison, D.C.	Cardiology	On-line cardiac catheterization data analysis; recognizing abnormal EKG complexes.	Cardiology	1714 4914	292,377
Harris, R.F.	Med Student	Correlation between human emotions and their appraisals of their environment.	Psychiatry	3440 3499	1,618
Helikson, M.A.	Med Student	Evaluating liver blood flow with radioactive isotopes.	Research Training	1715 1719	15,600
Herzenberg, L.A. (3 Projects)	Genetics	Collating multiple mouse immunoglobulin levels; store data and direct antiserum production.	Immunology	3211	111,334
Hilf, F.D.	Psychiatry	Developing new techniques of psychologically testing paranoid patients.	Psychology	3207	18,180
Hilf, F.D.	Psychiatry	Interactive on-line psychological testing.	Psychology	3212	57,045
Hodges, D.	Radiology	Motions of esophagus during normal and induced swallowing (on-line).	Esophagus Motility	1714 1717	66,049

[illegible]	Biochemistry	Reducing data from equilibrium dialysis.	Biochemistry	1310	4,317
[illegible]	Genetics	Birthweight and IQ in relation to sex, parents, edication, race, and income.	Genetics	2334 2338 2399	1,218
[illegible]	Genetics	Statistical analysis, plotting, and sorting programs.	Statistics	3610	24,128
[illegible]	Palo Alto Med. Res. Fndn.	Dynamics of the myocardium on open-chest canine preparations.	Cardiac Dynamics	1712	35,647
[illegible]	Med Student	Statistical tests on data from laboratory experiments.	Statistics	3610	6,448
[illegible]	Biochemistry	On-line kinetic measurement of fluorescence as a function of time-data acquisition and data reduction.	Nanosecond Fluorometry	1310	[illegible]
Kakihana, R.	Psychiatry	Effects of alcohol on the CNS of rodents.	Biochemical Endocrinology	1310 [illegible]	[illegible]
Kaplan, [illegible]	Psychiatry	Relation of ANS responses to attentional sets (thinking and environmental observation).	Psychophysiology	[illegible]	[illegible]
Kessler, C.	Psychiatry	Mating speed analysis in drosofhela pseudoobscura.	Behavioral Genetics	[illegible]	[illegible]
Korman, L.M.	Psychiatry	Relationship of student test scores to other variables.	Psychiatry	[illegible]	
Kountz, S.L.	Univ. of Calif. San Francisco	Select recipients for renal homotransplantation; measure hemodynamic changes in transplant patients.	Organ Transplantation	4014 1714	[illegible]
Kraemer, H.	Psychiatry	Biostatistical analysis of various psychological data.	Biostatistics in Psychiatry	[illegible] 3910	101,[illegible]
Kriss, [illegible].P.	Nuclear Medicine	Calculate plasma and blood volumes and red cell mass in patients receiving radiation.	Nuclear Medicine	[illegible]	
Kriss, [illegible].P.	Nuclear Medicine	Calculate results of a bioassay for the long-acting thyroid stimulator, and of radioactive iodine assay for TSH.	Endocrynology	1730	18,844

[illegible], .	Genetics	Genetics of B. subtilis.	Genetics	2399	3,021
Hamm, [illegible].	Gynecology/Obstetrics	Relative potency and confidence limits for the total gonadotropic bioassay.	Bioassay	3420	12,126
Lederberg, J.	Genetics	Generate chemical structures on Sanders 720 display unit.	Chemistry	1240	2,317
Leifer, A.F.	Psychiatry	Development of premature and full-term infants and maternal behavior	Psychology	3299	624
Levine, R.J.	Pediatrics	Evaluate and process data obtained during biochemical assays.	Human Development	3420 1310	22,051
Levinthal, E.C.	Genetics IRL	Photointerpretation and enhancement.	Photointerpretation	3914	47
Liebes, S.J.	Genetics IRL	Relationship of mass spectroscopy to organic materials.	Mass Spectroscopy	3914	127,533
Lorenson, M.Y.	Pharmacology	Molecular mechamisms that control sheep-heart enzyme and carbohydrate metabolism.	Biochemistry; Pharmacology	1310 1320	[illegible]
Luetscher, J.A.	Metabolic Research	Secretion and metabolism of adrenal hormones.	Metabolic Research	1730 1342	[illegible]
Lumb, J.R.	Medical Microbiology	Biochemical characterization of alkaline phosphatase of thymic lymphomas in mice.	Tumor Immunology and Virology	[illegible] [illegible] 3110	4,739
Luzzatti, L.	Pediatrics	Study family with a chromosomal mosaicism in 3 generations.	Cytogenetics	3310	[illegible]
Mac Pherson, L.	Psychiatry	Relationships between average evoked potential, expectancy wave, and EEG in humans.	Psychiatry	3247 3342	4,989
Maffly, R.H.	Lipid Research	Relationship of metabolism to sodium transport.	Membrane Transport	1349	10,400
Mesel, E.	Pediatrics	Indicator dilution techniques for measuring pulmonary blood flow and lung transfer function.	Pediatric Cardiology	1713	50,856

[illegible], .	Pediatrics	Hemodynamics of congenital heart disease.	Pediatric Cardiology	1713 3430	45,978
Meisel, .	Pediatrics	On-line analysis of cardiac catheterization data.	Pediatric Cardiology	1712	122,761
Meisel, .	Pediatrics	Store patient identification and diagnosis obtained during the course of illness.	Patient Information System	3720	40,779
Miller, .P.	Preventive Medicine	Biostatistical consulting to Stanford Medical Center.	Biostatistics	3610	146,113
Monnin, L.M.	Speech and Hearing Sciences	Relationship of articulation and identification abilities of normal and speech defective children.	Speech and Hearing Sciences	4416	6
Hall, M.L.	Dermatology	Effect of electron beam on mycosis fungoides.	Dermatology	1729	14,822
Hall, M.L.	Dermatology	Etiology of chronic skin disease.	Dermatology	1799	20,600
Noble, E.P.	Psychiatry	Effects of alcohol on CNS of rodents.	Biochemical Endocrinology	1211 1730	7,737
Nye, J.H.	Medical Microbiology	Immunochemistry statistical calculations and bibliography compilations.	Immunochemistry	2220 3610 3720	29,600
Payne, R.O.	Hematology	Extending leukocyte and/or tissue antigen classification by serologic and genetic analysis.	Leukocyte Immunology	1711 3430	43,672
Pearson, M.L.	Biochemistry	Compute normalized chromatographic elution profiles of viral RNA.	Biochemistry	1310	6
Pebralli, S.K.	Infectious Diseases	Improvement of antibiotic sensitivity data and guidance in therapy.	Bacteriology	1140	238,177
Porter, R.W.	Biochemistry	Steady-state kinetics of aspartate transcarbamylase.	Biochemistry	1310	65,849
Reaven, G.M.	Lipid Research	Relationship between glucose, insulin, and triglyceride kinetics and diabetes mellitis and arteriosclerosis.	Lipid Research	1729 1349	66,781

[illegible]	Lipid Research	Calculating theoretical curve displayed on a CRT, and comparing data on CRT.	Lipid Research	1799 1349	28,514
Keeton, [illegible]	Lipid Research	On-line display procedure to determine physiological models of metabolic processes.	Lipid Research	1799 1349	7,722
Keiban, C.	Anesthesia	Processing cardiac interval timing to monitor contractele state under varying loads and drugs.	Anesthesia	1712 4518	0
Keynolds, W.E.	Genetics IRL	Text management to support engineering instrumentation.	Genetics Instrumentation	3912	18,081
Keynolds, W.E.	Genetics IRL	Automation in mass spectrometer instrumentation systems.	Genetics Instrumentation	3912 1310 1830	263,233
Robertson, W.V.B.	Pediatrics	Urinary analysis; data on immunoglobidin concentration.	Biochemistry	2911 1310	2,144
Rosenberg, E.T.	Medical Microbiology	Levels of serum complement in mice of diverse pedigree.	Immunology	2911 3610	6,364
Rosenthal, W.	Speech Pathology	Speech and language pathology; normal speech perception.	Speech and Language Pathology	3723 3111	21,233
Ross, K.G.	Chemistry	Analysis of mass spectra and spectropolorimeter spectra; routine chemical analyses.	Spectropolorimetry	1 [illegible]	1,781
Roth, W.T.	Psychiatry	Habituation of evoked response and EEG desynchronization distinguishing arousal process by emotional stimuli.	Electroencephalography	[illegible]	[illegible]
Saunders, A.M.	Pathology	Chemistry of single cell; maturation and biology of mast cell.	Quantitative Cytology	4[illegible] 3430 3[illegible]	[illegible]
Saunders, A.M.	Pathology	Measurement of cells by a rapid sensor system.	Quantitative Cytology	420 3430 3470	[illegible]
Savageau, M.A.	Cardiology	Kinetic behavior of enzyme catalyzed reactions.	Enzyme Kinetics	1771	14,441

[illegible]	Ambulatory Medicine	Clinical research data indexing.	Clinical Medicine; Genetics	2500 3730	42,409
Cfforts, L.	Genetics	Simulation of population genetics studies.	Population Genetics	3342	139,889
Smallwood, [illegible]	Medical Facilities Planning	Design of Stanford Medical Care Facilities.	Medical Facilities Planning	4340	456,222
Smith, W.L.	Anesthesia	Data file storage; statistical analyses.	Anesthesia	4518 3610	0
Smith, W.T.	Anesthesia	Calculating cardiovascular data from normal patients.	Anesthesia	1712 4518	46,740
Smith, P.L.	Anesthesia	Premature or sick newborn infant research.	Pediatrics; Anesthesia	3430 4518	5,849
Smith, P.C.	Anesthesia	Mechanical ventilation influences in newborns having respiratory failure.	Pediatric Respiration	1713 3430	
Smith, R.C.	Med Student	Experimental study of family structure; sociophysiological studies of kidney transplant patients.	Social Psychology; Sociophysiology	3267 1799	930
Solomon, G.	Psychiatry	Relationship of stress and environmental manipulation to immunity.	Psychiatry and Immunology	1502 2711	1,704
Stewart, L.	C.G. Jung Institute	Establish archive of psychological data about dreams and other unconcious material. Test, clinical, and systematic demographic data also included.	[illegible]chology	3[illegible] 3[illegible]	
Stillman, R.	Psychiatry	Interviewing and testing psychiatric patients.	Psychiatric Testing	3[illegible] 3[illegible]	7,[illegible]27
Stillman, R.A. (2 Projects)	Chemistry	Analysis of mass spectra and spectropolorimeter spectra; routine chemical analyses.	Spectropolorimetry	3[illegible] 1[illegible]3	241,[illegible]72
Stocker, B.A.D.	Medical Microbiology	Genetics and physiology of salmonella typhimurium.	Medical Microbiology	[illegible]14[illegible]	34,1[illegible]
Stryer, L.	Biochemistry	Electronic energy transfer; structure of macromolecules; protein structure and function.	Physical Biochemistry	1[illegible]2	12,[illegible]4

[illegible], .	Genetics IRL	Capital equipment inventory.	Administration	4538 3720	14,271
[illegible]. .	Medicine - G.I. Division	Analyzing gastric secretory function tests.	Clinical Research	1715	2,385
[illegible], M.L.	Dermatology	Biochemical control of collagen formation.	Dermatologic Biochemistry	1310	754
Chathachari, Y.T.	Dermatology	Structure of melanins; radioactive tracer techniques to detect and treat melanins.	Dermatology	2440 8750 1799	73,977
Fickner, S.S.	Palo Alto Medical Research Foundation	Spectral analysis of cardiac murmurs: correlating onset and sites with instantaneous flow rate (on-line).	Cardiology	1712 1713 3914	45,565
Frudel, J.R.	Chemistry	Interpreting mass spectroscopy.	Mass Spectroscopy	3914	7,156
Locker, Y.Y.	Genetics IRL	Computer system to control mass spectrometer - GLC apparatus; data analysis.	Mass Spectrometer Control Systems	3914	97,877
Marrick, T.V.	Psychiatry	Analyzing continuous EEG for averaged evoked response (on-line).	Psychophysiology	[illegible]	[illegible]
Meissman, I.H.	Radiology	Statistical analysis and data handling.	Cellular Immunology	[illegible]	[illegible]
Mitchell, C.R.	Anesthesia	Spectral analysis of blood pressure sounds.	[illegible] Radiology	1715 4[illegible]	[illegible]
Whitcher, J.F.	Anesthesia	Establishing anesthesia staff call schedule.	Anesthesia	[illegible] 4[illegible]	[illegible]
Whyman, M.F.	Med Student	Teaching medicine effectively.	Medical Student Education	4[illegible]	[illegible]
Wittner, M.K.	Psychiatry	Influence of correctly and incorrectly guessed visual patterns on visual average evoked response.	Psychiatry	[illegible]	[illegible]
Wong, T.Y.	Radiology	Radiation dosimetry.	Radiology	8750 [illegible]	[illegible]

[illegible]	Radiology	Classify and retrieve patient data from the tumor registration.	Radiation Therapy	2750 3720	87,820
[illegible]	Radiology	Correlating drug responsiveness in cancer patients.	Cancer Therapy	2750 1569	71,437
Yguerabide, [illegible]	Biochemistry	Electronic energy transfer; structure of macromolecules; protein structure and function.	Physical Biochemistry	1360	2,003
Zackheim, [illegible]	Dermatology	Determination of serum copper and ceruloplasmin levels in psoriasis patients.	Dermatology	1799	0
Zwick, M.	Biochemistry	Theoretical techniques for solving protein crystal structures.	Biochemistry	1310	8,795

ACME
Rental Equipment

CONTRACT PR0250 LIST OF COMPONENTS ON ORDER AS OF [illegible] [illegible] PAGE

QTY	TYPE-SERIAL	DESCRIPTION	MODEL NO.	LOCATION	AGREED SHPMNT/ REMOVAL DATE	RENTAL START DATE	RENTAL STOP DATE	DAYS TO PAY	MONTHLY RATE	C/A	GROSS RENTAL	EDUCATION ALLOWANCE	TAX	NET RENTAL AFTER TAX	UNIV ACCT CODE
01	1052-50618	CONSOLE TYPEWRI	07	S101-MED CTR	/ /	12/13/66	/ /	[illegible]	65.00	20	65.00	13.00	2.40	54.40	10
01	1403-14708	PRINTER 600 LPM	02	S101-MED CTR	/ /	12/13/66	/ /	[illegible]	860.00	20	860.00	172.00	34.40	722.40	10
01	2050-11047	CPU	F	S101-MED CTR	/ /	12/13/66	/ /	[illegible]	10,340.00	35	10,340.00	3,622.15	33[illegible].34	7,063.19	10
01	2314-11149	DISK DRIVE	01		/ /	04/12/68	/ /	[illegible]	5,410.00	20	5,410.00	1,082.00	216.40	4,544.40	10
1	2314-12226	DIR ACESS STGE	01		01/03/69	01/06/69	/ /	[illegible]	5,410.00	20	5,410.00	1,082.00	216.40	4,544.40	10
01	2361-10102	CORE STORAGE	02	S101 MED CTR	/ /	07/01/68	/ /	3	6,695.00	45	6,695.00	3,012.75	184.11	3,866.36	10
01	2361-10102	CORE STORAGE	02	S101 MED CTR	/ /	07/01/68	/ /	[illegible]	4,635.00	45	4,635.00	2,085.75	127.44	2,676.71	09
						TYPE-SERIAL TOTAL			11,330.00			5,098.50		6,543.07	
											11,330.00		311.57		
01	2401-10877	MAG. TAPE	01	S101-MED CTR	/ /	12/13/66	/ /	[illegible]	345.00	20	345.00	69.00	13.80	290.40	10
01	2403-70738	MAG. TAPE & CON	01	S101-MED CTR	/ /	12/13/66	/ /	[illegible]	1,012.00	20	1,012.00	202.40	40.48	850.08	10
01	2540-12531	CARD READER PCH	01	S101-MED CTR	/ /	12/13/66	/ /	[illegible]	680.00	20	680.00	136.00	27.20	571.20	10
01	2701-11144	DATA ADAPTER UN	01	S101-MED CTR	/ /	12/13/66	/ /	[illegible]	1,013.00	20	1,013.00	202.60	40.52	850.92	10
04	2701-11144	5501 PAR DATA T		S101-MED CTR	10/06/68	10/22/68	/ /	[illegible]	40.00	20	40.00	[illegible]	1.60	33.[illegible]	10
						TYPE-SERIAL TOTAL			1,053.00			[illegible]		884.[illegible]	
											1,053.00		[illegible]		
01	2702-20185	TRANSMISSION CO	01	S101-MED CTR	/ /	12/13/66	/ /	[illegible]	1,277.00	20	1,277.00	255.40	51.08	1,072.68	10
01	2821-12464	CONTROL UNIT	01	S101-MED CTR	/ /	12/13/66	/ /	[illegible]	1,110.00	20	1,110.00	222.40	44.72	939.12	10
01	2841-031219	STGE CON UNIT	01	S101-MED CTR	04/23/68	12/13/66	04/2[illegible]		764.00	20	.00	.00	.00	.00	10
						CONTRACT TOTAL			[illegible],676.00			1[illegible]		23,07[illegible]	
											[illegible]		1,[illegible]		

ACCOUNT DISTRIBUTION

CODE	ACCOUNT NO.	AMOUNT
09	0-KKG040-32635	2,676.71
10	0-KKG041-32635	25,402.75
	*-TOTAL -DIST.	28,079.46

CONTRACT PROCESSED — LIST OF COMPONENTS ON ORDER AS OF MAY 27, 69 — PAGE 4

QTY	TYPE-SPECIAL	DESCRIPTION	MODEL NO.	LOCATION	AGREED SHPMNT/ REMOVAL DATE	RENTAL START DATE	RENTAL STOP DATE	TAX EX	MONTHLY RATE	GROSS RENTAL	EDUCATION ALLOWANCE	TAX	NET RENTAL AFTER TAX	UNIV ACCT CODE
01	2316-24122	DISK PACK	1	S101 MED CTR	05/07/68	05/08/68	/ /	3	20.00	20.00	4.00	.20	15.80	15
01	2316-24123	DISK PACK	01		05/07/68	05/08/68	10/09/68		20.00	.20	.00	.00	.20	15
01	2316-24124	DISK PACK	1	S101 MED CTR	05/07/68	05/08/68	/ /	3	20.00	20.00	4.00	.20	15.80	15
01	2316-24125	DISK PACK	1	S101 MED CTR	05/07/68	05/08/68	/ /	3	20.00	20.00	4.00	.20	15.80	15
01	2316-30092	DISK PACK	01	S101-MED CTR	04/03/68	04/12/68	/ /	3	20.00	20.00	4.00	.20	15.80	15
01	2316-30093	DISK PACK	01	S101-MED CTR	04/03/68	04/12/68	/ /	3	20.00	20.00	4.00	.20	15.80	15
01	2316-30094	DISK PACK	01	S101-MED CTR	04/03/68	04/12/68	/ /	3	20.00	20.00	4.00	.20	15.80	15
01	2316-30095	DISK PACK	01	S101-MED CTR	04/03/68	04/12/68	/ /	3	20.00	20.00	4.00	.20	15.80	15
01	2316-30096	DISK PACK	01	S101-MED CTR	04/03/68	04/12/68	/ /	3	20.00	20.00	4.00	.20	15.80	15
01	2316-30097	DISK PACK	01	S101-MED CTR	04/03/68	04/12/68	/ /	3	20.00	20.00	4.00	.20	15.80	15
01	2316-30098	DISK PACK	01	S101-MED CTR	04/03/68	04/12/68	/ /	3	20.00	20.00	4.00	.20	15.80	15
01	2316-30099	DISK PACK	01	S101-MED CTR	04/03/68	04/12/68	/ /	3	20.00	20.00	4.00	.20	15.80	15
01	2316-30100	DISK PACK	01	S101-MED CTR	04/03/68	04/12/68	/ /	3	20.00	20.00	4.00	.20	15.80	15
01	2316-30101	DISK PACK	01	S101-MED CTR	04/03/68	04/12/68	/ /	3	20.00	20.00	4.00	.20	15.80	15
01	2316-30102	DISK PACK	01	S101-MED CTR	04/03/68	04/12/68	/ /	3	20.00	20.00	4.00	.20	15.80	15
01	2316-30103	DISK PACK	01	S101-MED CTR	04/03/68	04/12/68	/ /	3	20.00	20.00	4.00	.20	15.80	15
01	2316-57822	DISK PACK	01		10/29/68	10/30/68	/ /	3	20.00	20.00	4.00	.20	15.80	15
							CONTRACT TOTAL		340.00	336.20	64.00	3.40	268.80	

ACCOUNT DISTRIBUTION

CODE	ACCOUNT NO.	AMOUNT
15	0-KKGC41-92636	268.80
	*-TOTAL -DIST.	268.80

Grant No. FR00311-03
Section I-C-1

LIST OF ACME TERMINALS ON HAND 04/30/69

QTY	TYPE-SERIAL	DESCRIPTION	MODEL NO.	LOCATION	AGREED SHPMNT/ REMOVAL DATE	RENTAL START DATE	RENTAL STOP DATE	DAYS TO PAY	MONTHLY RATE	E/A	GROSS RENTAL	EDUCATION ALLOWANCE	TAX	NET RENTAL AFTER TAX
01	2741-10477	COMM. TERM.		GENETICS	12/30/66	12/13/66		30	103.50	20	103.50	20.70	4.14	86.94
01	2741-10490	COMM. TERM.		ACME	12/30/66	12/13/66		30	103.50	20	103.50	20.70	4.14	86.94
01	2741-10508	COMM. TERM.		ACME	12/30/66	12/13/66		30	103.50	20	103.50	20.70	4.14	86.94
01	2741-12847	COMM. TERM.		ACME	11/15/67	05/01/68		30	108.50	20	108.50	21.70	4.34	91.14
01	2741-12849	COMM. TERM.		FLEISCHMAN	11/09/67	05/01/68		30	108.50	20	108.50	21.70	4.34	91.14
01	2741-12853	COMM. TERM.		PHARMA	11/09/67	05/01/68		30	108.50	20	108.50	21.70	4.34	91.14
01	2741-12856	COMM. TERM.		ACME	11/13/67	05/01/68		30	108.50	20	108.50	21.70	4.34	91.14
01	2741-12858	COMM. TERM.		FLEISCHMAN	11/09/67	05/01/68		30	108.50	20	108.50	21.70	4.34	91.14
01	2741-12883	COMM. TERM.		ACME	10/05/67	10/06/67		30	103.50	20	103.50	20.70	4.14	86.94
01	2741-14382	COMM. TERM.			05/09/68	05/10/68		30	103.50	20	103.50	20.70	4.14	86.94

RESOURCE EQUIPMENT LIST--PURCHASED

Period Covered 8/1/67 - 7/31/69
(Updated to Reflect Acceptance of 270 X/Y, 1826, 1442, and 029)

EQUIPMENT LOCATED IN MAIN RESOURCE AREA

Equipment					Cost		
Description / Identification	Manufacturer	Model No.	Date Installed	Date Accepted	Purchase Price	Annual Rental	Source of Funds
1800 System							
Process Controller	IBM	1801			76,694.		Other Fed. Agency
Printer Keyboard	"	1816			2,438.		" " "
Enclosure	"	1828			333.		" " "
Analog Input Terminal	"	1851			2,908.		" " "
Analog Output Terminal	"	1856			6,540.		" " "
Data Adapter Unit	"	1826			7,752.		SRR
Card Read Punch	"	1442			2,671		SRR
Card Punch	"	029				696.	SRR
5 Data Sets	Westinghouse Electric	103A2				2,322.	SRR
Digital Display	ACME					(1)	"
Oscilloscope	Hewlett Packard				1,500.		Navy 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 (2) Other 22,414. Fed. Agency

(1) Fabricated and assembled by ACME staff.
(2) $50,600 accrued in Grant Year 01.

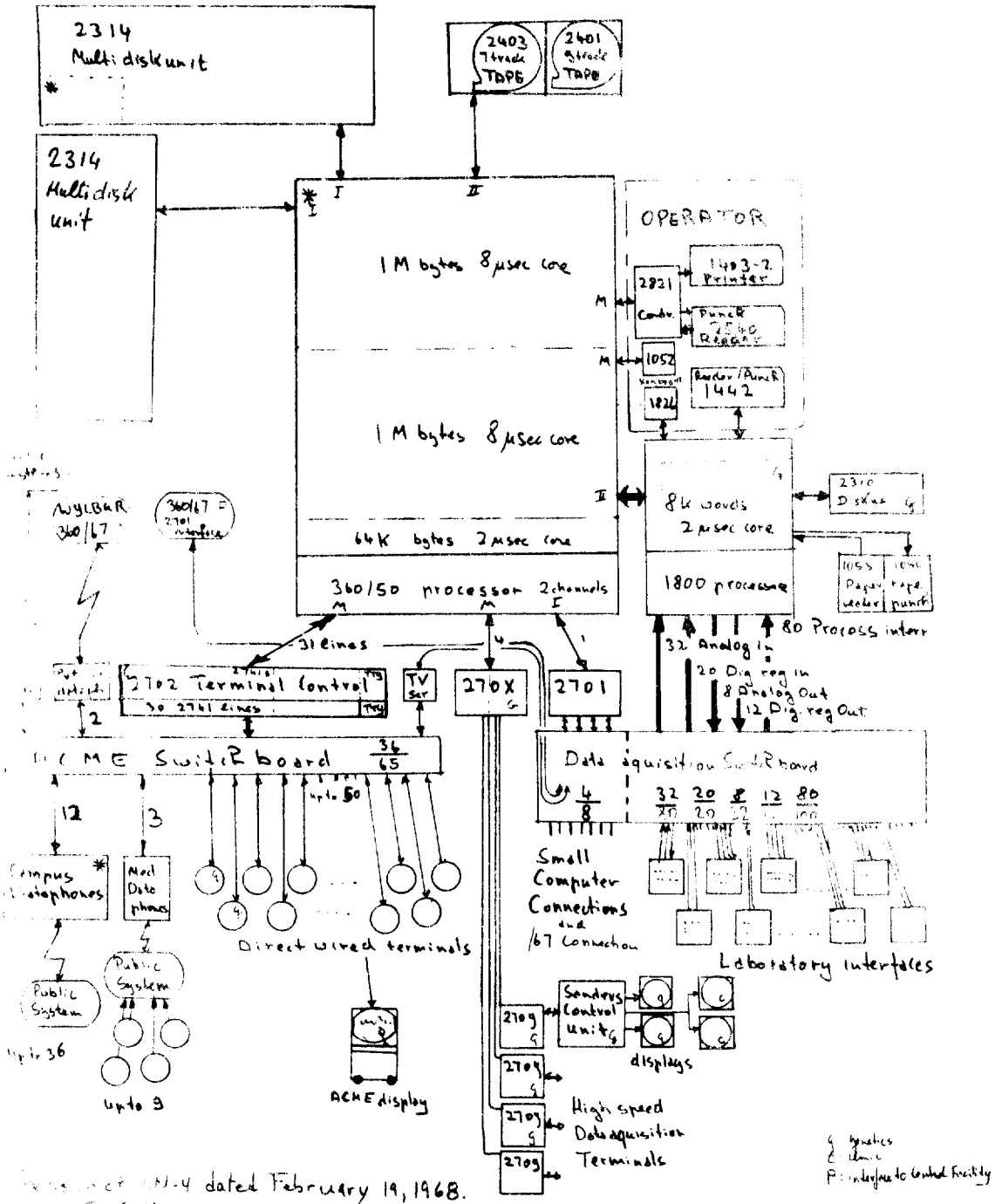
ACME Note

CN 2

Gio Wiederhold

April 30, 1968

Configuration of Machine



dated February 19, 1968.

Staff/All

RESOURCE EQUIPMENT LIST

Period Covered 8/1/67 - 7/31/[illegible]

EQUIPMENT LOCATED OUTSIDE THE MAIN RESOURCE AREA

Equipment						Cost		
Location/ Description/ Identification	Manufacturer	Type	Model No.	Date Installed	Date Accepted	Purchase Price	Annual Rental	Source of Funds
NONE								

ACME Note

APHB 2
Voy Wiederhold
May 15, 1969

Papers Written by ACME Users

This list contains papers voluntarily reported to ACME.

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Beatrice, E. S., I. Harding-Barlow, and D. Glick, "Electric Spark Cross-Excitation Laser Microprob-Emmission Spectroscopy for Samples of 10-25 Micron Diameter," APPLIED SPECTROSCOPY, 1969.

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Bellville, J.W., G. Fleischli, and G. Attura, "Servo Control of Inhaled Carbon Dioxide," J. APPL. PHYSIOL., vol. 24, pp. 414-415, 1968.

Breitbard, Gary Y., and Gio Wiederhold, "PL/ACME: An Incremental Compiler for a Subset of PL/1," IFIP68 CONGRESS PROCEEDINGS, Edinburgh, Scotland, August 1968.

Butler, E., "Dynamics of the Urinary Tract," JOURNAL OF INVESTIGATIVE UTOLOGY, in preparation.

Clayton, R.B., METHODS OF ENZYMOLOGY, STEROLS AND STEROIDS, vol. XV, Academic Press, in preparation.

Collins, K.D., and G.R. Stark, "Aspartate Transcarbanglase: Studies of the Catalytic Subunt by Ultraviolet Difference Spectroscopy," J. BIOL. CHEM, Feb. 1969.

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Doering, C.H., "Cholesterol Side Chain Cleavage Activity in the Adrenal Gland of the Young Rat: Development and Responsiveness to Adrenal Cortical Tropic Hormone," ENDOCRINOLOGY, in preparation.

Englud, P.T., J.A. Huberman, T.M. Jovin, and A. Kornberg, "Enzymatic Synthesis of Deoxyribonucleic Acid, XXX. Binding of Triposphates to DNA Polymerase," submitted to J. BIOL. CHEM., 1969.

Farber, Eugene M., and Richard P. McClintock, Jr., M.D., "A Current Review of Psoriasis, "MEDICAL PROGRESS, 108:440-457, June 1968.

Farber, Eugene M., M.D., and Alvin J. Cox, M.D., "The Biology of Psoriasis, "J. OF investigative dermatology, vol. 49, no. 4, pp. 348-357, 1967.

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

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Dist: Staff/All

SUMMARY OF RESOURCE EXPENDITURES

	Total Resource Expenditures			SRR Support		
	Actual Previous Budget Period	Current Budget Period	Estimate Next Budget Period	Actual Previous Budget Period	Current Budget Period	Estimate Next Budget Period
1. Personnel:						
a. Salaries & Wages	182,667.	174,767.	232,990.	171,127.	163,474.	232,990.
b. Fringe Benefits	18,915.	20,587.	28,522.	17,703.	19,287.	28,522.
Subtotal	201,582.	195,354.	261,512.	188,830.	182,761.	261,512.
2. Consultant Services		500.	1,000.		500.	1,000.
3. Equipment:						
a. Main Resource-Rented	313,770.	362,190.	386,937.	220,751.	303,796.	386,937.
b. Main Resource-Purchased			29,167.			29,167.
c. Supporting Equipment						
Subtotal	313,770.	362,190.	416,104.	220,751.	303,796.	416,104.
4. Supplies	32,656.	26,896.	35,000.	32,656.	25,957.	35,000.
5. Travel	4,214.	3,620.	5,000.	4,214.	3,520.	5,000.
6. Alterations & Renovations	35.			35.		
7. Publication Costs	3,505.	4,418.	6,000.	3,505.	4,418.	6,000.
8. Other:						
a. Computer time	10,000.	5,000.	10,000.	10,000.	5,000.	10,000.
b. Other	19,400.	11,991.	12,250.	12,469.	11,767.	12,250.
Subtotal	29,400.	16,991.	22,250.	22,469.	16,767.	22,250.
9. Total Direct Costs	585,162.	609,969.	746,866.	472,460.	537,719.	746,866.
10. Indirect Costs:						
a. % of Salaries		108,509.	149,062.		103,704.	149,062.
b. 25% Direct	98,529.			94,492.		
11. Total Costs	683,691.	718,478.	895,928.	566,952.	641,423.	895,928.

Grant No. FR00[illegible]-05

Section II-B

SUMMARY OF RESOURCE FUNDING

	BUDGET PERIODS		
	Actual Previous Budget Period	Current Budget Period	Estimate Next Budget Period
Source of Funds			
DRR Grant (Amount of Award plus unobligated balance from prior period	570,984.	559,562.	692,218.
DRR Grant Amendment		10,000.	
Service Charges (when applicable):			
Consulting/Programming			
Peripheral Equipment			
Computer Equipment 3/21/69 - 7/31/69		20,195.	
Other Service Charges			
Subtotal	570,984.	589,757	692,218.
NIH Funds (identify source)			
Other Outside Support (identify source)			
Josiah Macy, Jr. Foundation Grant	11,572.		
SCC Campus Facility	105,167.	65,114.	
SRR Rental Refund		{31,748(1) 11,859(2)	
Institution Funds			
Stanford Medical Clinics		20,000.	60,000.
Total Funds Available	687,723.	718,478.	752,218.

(1) To SCC-ACME (SRR Grant)
(2) To SCC Campus Facility

EXPENDITURE DETAILS

Direct Costs Only

PERSONNEL:	Current Budget Period				Estimate for Next Budget Period			
	TOTAL		SRR		TOTAL		SRR	
	% of Time or Effort	Amount	% of Salary From SRR Grant	Amount	% of Time or Effort	Amount	% of Salary From SRR Grant	Amount
Programmer start								
Bassett, R. Sept.	50	$ 4,125.	100	$ 4,125.	100	$10,000.	100	$10,000.
Programmer								
Breitbard, G.	100	13,675.	100	13,675	100	15,400.	100	15,400.
Programmer								
[illegible], L.	100	11,400.	100	11,400.	100	12,750.	100	12,750.
Programmer								
Cramins, D. 9 mos.	100	10,987.	100	10,987.	100	14,750.	100	14,750.
Programmer Aug-								
[illegible], C. R. Apr.	100	9,450.	56	5,250.	100	13,750.	100	13,750.
Programmer								
Flanders, W. 11 mos	100	13,108.	100	13,108.	100	15,300.	100	15,300.
Programmer								
Miller, G.	--	---	--	---	20	2,520.	100	2,520.
Programmer								
Nishkora, D.	hourly	2,213.	100	2,213.				
Programmer								
Simons, K.	hourly	689.	100	689.	50	6,000.	100	6,000.
Programmer								
[illegible]ani, C.	hourly	2,224.	100	2,224.				
Programmer								
[illegible], R.	hourly	1,670.	35	577.	50(9mo.)	2,475.	100	2,475.
Programmer								
Shaad, S.	hourly	554.	100	554.				
Engineer								
[illegible], K.	100	13,500.	100	13,500.	100	14,500.	100	14,500.
Engineer May-								
[illegible]ley, L. July	100	4,046.	100	4,046.	100	16,700.	100	16,700.
Data Manager								
[illegible], S.	--	---	--	---	100	11,500.	100	11,500.
Education								
[illegible], J.	on demand	2,425.	100	2,425.	30	4,200.	100	4,200.
Education								
Wiederhold, V.	on demand	575.	100	575.	30	4,200.	100	4,200.
Statistician								
Schuch, E.	Aug.part.	511.	100	511.				
Statistician								
---	--	--	--	--	100	12,000.	100	12,000.
Consultant								
Sanders, G.	hourly	839.	100	839.				
Technician term.								
Curtis, G. Mar.	100	3,537.	100	3,537.	100	6,250.	100	6,250.
Technician								
Osborne, D.	100	6,430.	100	6,430.	100	7,200.	100	7,200.

EXPENDITURE DETAILS

Direct Costs Only

	Current Budget Period				Budget for Next Period			
	TOTAL		SRR					
PERSONNEL: (Cont'd.)	% of Time or Effort	Amount	% of Salary from SRR Grant	Amount				
Technical Aide Bullene, R.	hourly	$ 281.	100	$ 281.				
Technical Aide Bundy, M.	hourly	1,202.	100	1,202.				
Technical Aide Dover, Richard	hourly	2,695.	100	2,695.	hourly	$ 750.		
Technical Aide Hoffman, Stephen	hourly	247.	100	247.	hourly	1,000.		
Technical Aide Howard, Stephen	hourly	761.	100	761.				
Machinists		453.	100	453.				
Operations Mgr. Moss, C.	100	10,500.	100	10,500.	100	11,[illegible].		
Operators		32,017.	93	29,748.		36,500.		
Student Res. Asst	--	--	--	--	50(yr.)	[illegible].		
Secretary Bland, G.	100	7,413.	100	7,413.	100	6,600.		
Secretary Eckelson, G.	5	275.	10	27.	5	300.		
Secretary Finley, J.	9.4	646.	15	96.	9.4	700.		
Secretarial Assistance	--	--	--	--	20	1,[illegible].	100	
Administrative Aignard, R.	5	800.	8	67.	5	[illegible].		
Administrative Engle, R.	15	2,400.	8	200.	15	2,[illegible].		
Associate Dir. Peterhold, G.	73	13,119.	100	13,119.	20	3,[illegible].	100	
Total Salaries		174,767.		163,474.		237,340.		
Staff Benefits		20,587.		19,287.		29,057.		
Total Personnel		195,354.		182,761.		266,397.		
CONSULTANT SERVICES		500.	100	500.		1,[illegible].		

Assist from Instrumentation Research Laboratory as needed.
Supplied from Stanford Computation Center Operator Pool.

EXPENDITURE DETAILS

Direct Costs Only

	Current Budget Period		Estimated for [illegible]	
	TOTAL	SRR	[illegible]	[illegible]
PERMANENT EQUIPMENT				
Main Resource - Rented (Net After E. A. and Taxes)				
TIM 360/50				
[illegible]-50618	656.	612.	[illegible]	[illegible]
1403-14708	8,669.	8,091.	[illegible]	[illegible]
[illegible]-11047	84,859.	79,108.	[illegible]	[illegible]
[illegible]-11149	54,533.	49,341.	[illegible]	[illegible]
2311-10102	78,517.	43,303.	[illegible]	[illegible]
4C1-10877	3,478.	3,246.	[illegible]	[illegible]
[illegible]-10738	10,201.	9,521.	[illegible]	[illegible]
[illegible]-12531	6,854.	6,397.	[illegible]	[illegible]
[illegible]-11144	10,524.	9,837.	[illegible]	[illegible]
[illegible]-20185	12,872.	12,014.	[illegible]	[illegible]
[illegible]-13464	11,269.	10,518.	[illegible]	[illegible]
[illegible]-10007(1)	15,267.	7,217.		
[illegible] - (16 units)	3,202.	3,202.	[illegible]	[illegible]
[illegible] - (10 units)	10,534.	10,534.	[illegible]	[illegible]
[illegible]-12326	31,205.(2)	31,205.	[illegible]	[illegible]
Total Main Configuration	342,540.(3)	284,146.	[illegible]	[illegible]
Add'l mods of CPU(4)			[illegible]	[illegible]
1050 - Additional Units				
[illegible]	7,752.	7,752.	[illegible]	[illegible]
[illegible]	2,671.	2,671.		
[illegible]			[illegible]	[illegible]
[illegible]			[illegible]	[illegible]
[illegible]	696.	696.	[illegible]	[illegible]
Less Rentals	6,551.	6,551.	[illegible]	[illegible]
[illegible] lines	1,980.	1,980.	1,980.	1,980.
[illegible] for 1[illegible] CRT Interfaces			[illegible]	[illegible]
[illegible] Display			[illegible]	[illegible]
Total Equipment	362,190.	303,796.	[illegible]	[illegible]

(1) April, May, & June, 1969 billed and paid March, 1969.
(2) Rental beginning 1/6/69.
(3) [illegible] Campus Facility participated in 2361 for full year; August-November only for other components.
(4) Estimate Delivery 9/1/69.

EXPENDITURE DETAIL

Direct Costs Only

	Current Budget Period		[illegible]	[illegible]
	TOTAL	SRR	[illegible]	[illegible]
SUPPLIES:				
a. Office	3,973.	3,973.	[illegible]	[illegible]
b. Comp. & Eng.	22,923.	21,923.	[illegible]	[illegible]
	26,896.	[illegible]	[illegible]	[illegible]
[illegible]	3,620.	3,520.	[illegible]	[illegible]
[illegible] COSTS	4,418.	4,418.	[illegible]	[illegible]
[illegible]				
[illegible] Computer Services 360/67	5,000.	5,000.	[illegible]	
[illegible] Other				
Equipment Maintenance	2,412.	2,412.	[illegible]	
Books & Publications	157.	157.	[illegible]	
Postage & Freight*	2,097.	1,873.	[illegible]	
Telephone & Telegraph	5,245.	5,245.	[illegible]	
[illegible] Rental Plant	449.	449.	[illegible]	
[illegible] Technical Services	1,631.	1,631.	[illegible]	
	16,991.	16,767.	[illegible]	
[illegible] Direct Costs	609,969.	537,719.	[illegible]	

*Includes $1,638.94 for freight incurred November, 196[illegible]; an additional $[illegible] [illegible] Domestics; total bill $1,[illegible]34.04.

Budget Justification

During ACME's third year the Stanford Computation Center Campus facility [illegible] trial period of attempting to market ACME service to non-Medical School users at Stanford was completed. Although there was a continuing level of use by this group of users, the utilization was not adequate to sustain the level of expenditures by the Campus Facility for ACME hardware, 20% of computer operators, and a file programmer. Consequently, the experiment was discontinued [illegible] of November, 1968; and considerable rebudgeting of ACME's expenditures within the NIH grant ceiling resulted from this termination.

The details of this rebudgeting were set forth in our letter to DSRR [illegible] February 28, 1969. An increase in operating level from $621,423.00 to $641,[illegible] was requested with the increase to be funded with anticipated revenue from the Stanford Medical School Clinics and the Stanford Hospital Clinics for patient billing computing. If the full $20,000.00 of revenue from these sources is not realized expenditures will have to reduced even further in the remaining months to stay within the NIH award.

Additional expenditures are: $40,600.00 equipment rentals as a result of [illegible] paying for all the configuration of the 360/50 (except the incremental one million byte bulk core) from December on; additional salaries of $18,162.00 for 80% of operators instead of 80%, and the file programming effort. To offset these increases two programmers were transferred to the Stanford Computation Center - SLAC Facility, one programmer's time was reduced from 75% to 50%, a technician was terminated, and part of Gio Wiederhold's salary was transferred

to another account for the balance of the year. [illegible] graphics unit was also deferred, utilization of the [illegible] was reduced, and expenditures in supplies and equipment and travel [illegible] classes were reduced. The ability to make the [illegible] demonstrated one value of ACME being linked with similar facilities of the university complex. We were able to hold a competent staff together even [illegible] period of substantial rebudgeting.

The funding of ACME also had two unique features in the third year [illegible] recognition of the unusually poor performance of the ACME configuration following the installation of the second million bytes of bulk core in the Spring of 1968, IBM granted a refund of rentals paid during a fifty day period. ACME's share of the refund was $31,748, which was slightly over the estimate of $30,000.

User service charges were also inaugurated during the year. These were approved effective March 21, 1969. This gives us essentially four months experience with such charges; and based on the first two of these months, the total revenue for the current year will be approximately $20,000. Since this is $10,000 short of the budgeted goal at the time the proposal for the period was submitted, SRRB has granted an amended award increasing the total $[illegible] consideration of the short period remaining, following approval of our [illegible] in the current budget period. A large majority of NIH grants at Stanford are non-competing renewels and therefore ineligible for computing charges until grant anniversary dates after July 1, 1969.

The principal investigators of the few "eligible" grants are corresponding with their individual sponsoring institutes for supplemental funds. The revenue from user charges to date has come from non-NIH government grants and institutional funds.

The estimate for the next budget period reflects the effect of the ACME Facility paying the full cost of the equipment and staff for the full year. Temporary staff reductions resulting from this years rebudgeting have been restored. The Macy Grant, which funded a part of ACME's expenditure in the first two years, has been exhausted; and without the participation of the Campus Facility, the Medical School computing facility will be funded entirely by the SRR grant and user charges.

The present year should be the last in which late invoicing by IBM will distort the cash expenditure for equipment. As indicated in a footnote in Section II-C, the April, May, and June 1968 rental of the IBM 2361 was not paid until March, 1969. A freight invoice for part of the original configuration was also invoiced and paid in the current year. Accounting for IBM rentals has been a serious problem at Stanford, but the problem has now been corrected and rentals are paid on a current basis.

During the year, the partial salaries for ACME administration by SCC staff members were assumed by the Medical School. The present charge for these administrative services is low and negotiations will be held soon to determine a more realistic effort distribution of the Stanford Computation administrative staff and an appropriate distribution of this time between direct and indirect costs of the NIH grant supported ACME. The inauguration of user charges has contributed substantially to the administrative burden.

Detailed Description of Resource Projects

Core Projects

As discussed in the Introduction of this Annual Report, the efforts of the core projects have been directed toward increasing the serviceability, reliability, and performance of the system. Although many of these problems are not glamorous in the scientific spectrum, the fact that a very advanced computer facility has come to the point where it can extend its efforts to improving its reliability and serviceability is certainly significant. Because of our efforts to maintain constant communication between users, usage has increased considerably.

Major efforts went into system measuring and system testing in order to preserve integrity of the system, even while continuing changes and adjustments are being made. In the real-time data-acquisition area we have achieved the capability to handle multiple users, each with multiple lines doing data acquisition and data distribution under routine timeshared operations. The ability to handle moderately high data acquisition within an interactive environment allows modification of the algorithm being employed by the user without loss of data; as far as we know this capability is unique to ACME. Continued efforts have been expended on the compiler and interactive control language development in order to insure that the system fulfills the needs as expressed by the users. Here, the efforts that are being expended are largely in response to request for additional capabilities that originated from the user community. System measurement is part of this activity so that we may predict how and where system changes will affect total system performance the most.

A fair amount of resource activity has also gone into the file maintenance programs which can now be largely run on-line. Our file reliability encourages medical users to keep data on line without worrying about back-up. Daily back-up runs and weekly complete system check runs are now an important part of operational procedures.

Due to the establishment of recharge rates, efforts have also gone into producing an accounting system with a proper audit trail which still runs at minimum overhead to the system itself.

Laboratory support, development, and testing have resulted in direct benefits to users who had greater need of computing assistance than the average user,

Development projects that have required a much smaller fraction of the core resource use are the display support for storage scope, the testing of algorithms for continuous system modelling programs, and the development of the assemblers for the 1800 computer part of the system which can operate inside the 360/50.

Usage of the ACME system is also made by our own staff while engaged in consultation for the medical school faculty and staff. A product of this work is the public EKG program which can be used to mark cardiology data acquired on-line. Statistical routines for users are developed by our staff and then made available on the PUBLIC files.

Internal usage of the system is also made for editing of the PL/ACME Manual and editing and preparing indexes for the ACME Notes. Other internal usage has been for teaching and demonstration of the system to visitors.

The bulk of this section of the annual report is devoted to usage that our users are making of the system. However, we do not feel capable of evaluating the scientific merit of these applications. In an organization serving well over 200

medical research projects, no single person would dare evaluate all these projects for their scientific merit, or place them in the proper perspective relative to each other. The allocation of the resource that is available at the Stanford Medical School for computation will be controlled in the future through the individual institutes themselves, by allocating grant monies to be used for research computer support. The individual progress reports are ordered alphabetically by the name of the researcher who requested the usage of the computer facility. Since the projects are described in the medical researcher's own wording, some inconsistencies in terminology--especially as they pertain to the description of the computer-oriented aspects of the project itself--will have to be excused.

ACME INDIVIDUAL USER PROJECTS

Angel, R. W.

Name: RWANGEL

Project: ERCORECT

Department: Neurology (Veterans Administration Medical Center)

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.

Between now and July 1969 further data will be collected for both dissertation research (unsupported) and medical (neurology) research. Two publications are pending completion of research now underway.

Aronow, L.

Name: LARONOW

Project: LCEL

Department: Pharmacology

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

Atkinson, M.

Name: MATKINS

Project: FLYHIGH

Department: Neurology

Project Description: We use ACME for Neurology research to help process data that our Linc-8 cannot easily handle. We send data down to ACME via the interface, perform several statistical operations on the data and then return the data to the Linc-8 via the interface.

Our data consists of digitized position, velocity, and EMG traces for a specific arm movement. Since the number of data points used is too great in some cases for our Linc-8, we use ACME.

Our plans to July 31, 1969 are to continue to use ACME for statistical manipulations of EMG traces.

No publications as of yet on our use of ACME, although one now being prepared.

Baldwin, R. L.

Name: RLBALDWI 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 oliogomers 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.

Kaplan, H. S.

Name: GBAUSEK Project: HODPAT

Department: Radiology

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 in readily retrievable form, of data on many aspects of lymphoma patients. 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 inference can be drawn regarding optimun treatment scheduling and, hopefully, regarding the possible causes of these diseases.

Beard, R. R.

Name: R_BEARD_ Project: PREVMED

Department: Preventive Medicine

Project Description: We are making correlation computations. Analyzing behavioral responses and influences of inhaling carbon monoxide. An example: correlation of carbon monoxide in the breath with athletic performance.

Bellville, J. W.

Name: JBELLVI 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.

Bellville, J. W.

Name: JBELLVI Project: RESPIRAT

Department: Anesthesia

Project Description: This project involves the use of a special purpose analog computer that preprocesses data, which is then entered into 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.

Bernfield, M. R.

Name: MBERNFI

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.

Bodmer, W. F.

Name: WBODMER

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 ready interaction between the experimental worker and the computer. This allows us, at short notice, to do small scale 2 x 2 analyses for serum characterization, selection of appropriate individuals for absorbtion and automatic typing according to complex patterns of serum reaction. These increased opportunities for interaction with the computer have been a great help in our day-to-day work and in establishing new relationships amongst our sera. Our future plans include the development of programs for the systematic analysis of family data.

Grant No. [illegible]
Accts. [illegible]

Brast, N. B.

Name: NBRAST

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 project for Physiology 150 and a laboratory project for Biochemistry 101.

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.

Brast, N. B.

Name: NBRAST

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 Medical School.

Bridges, J. C.

Name: JCBRIDGE

Project: JCY

Department: Genetics IRL

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

Britt, R. H.

Name: RBRITT

Department: Medical Student -

Project Description: These experiments [illegible] auditory pathway responses to meaningful acoustic stimuli. It is a common sense observation that the perception of sound is not [illegible] simply by the physical parameters of the stimulus (intensity, [illegible]), but with factors relating to attention, significance, and past experience also play important roles. An electrophysiological equivalent of the changing properties of perception may be the dynamic alteration of evoked responses to meaningful sound stimuli recorded in auditory pathway of unanesthetized animals. These response modifications are due to activity in [illegible] including the middle ear muscles, the olivo-cochlear bundle, and descending cortical connections. The specific experiments to be carried out [illegible] an analysis of single unit discharge patterns in [illegible] cats making an acoustic discrimination; (2) the [illegible] 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. [illegible] 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 human perception.

ACME has been used for statistical analysis of histograms in the following paper: Starr, A. and Wernick, J. S. "Olivocochlear Bundle Stimulation: Effects on Spontaneous and Tone-Evoked Activities of Single Units in Cat Cochlear Nucleus," J. Neurophysiol., 31: [illegible].

Brody, W. R.

Name: B_BRODY_

Project: DIAGNOTI

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. Project is presently an unsponsored pilot study.

Brody, W. R.

Name: BBRODY

Department: Medical Student

Project Description: I am using [illegible] simulations of non-linear [illegible] systems (unsupported project).

Brown, B. N.

Name: BNBROWN

Department: Pediatrics

Project Description: Studies involve [illegible] and analyzed. In addition, studies of [illegible] require correlations with age, body weight, [illegible], etc..

Brutlag, D. L.

Name: DBRUTLA

Department: Biochemistry

Project Description: I have just begun graduate work [illegible] useful ACME will be in my studies yet. [illegible] - during the past several months I have been studying the role of divalent metal ions in the reaction mechanism of the enzyme DNA polymerase. [illegible] nonlinear weighted regression analysis of [illegible] test various theoretical models which describe how the enzyme works. I also use ACME routinely as a general laboratory [illegible] all of my experimental data. One program reduces [illegible] assays and prepares a written report. Another calculates binding [illegible] from equilibrium dialysis experiments. I have also used ACME for calculating physical parameters of macromolecules from data obtained from the analytical ultracentrifuge.

Buchanan, B. G.

Name: B_BUCHAN Project: STAT

Department: Computer Science Department/Genetics

Project Description: Professor L. Cavalli-Sforza and myself will use ACME to teach medical students the foundations of statistics, with particular emphasis on medical applications. The course is Genetics 217, Spring Quarter, 1969.

Bunnenberg, E.

Name: EBUNNEN Project: CHEM

Department: Chemistry

Project Description: (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 three mass spectrometers (ALTAS CH4, AEI MS9, and a FINIGAN 1015 quadrupole). The taken spectra are then to be fed to the Artificial Intelligence group under the supervision of J. Lederberg and E. Feigenbaum to be used in their dendral 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 derivitives for theoretical projections. (C) Also included is a battery of utility programs for metastable analysis, chemical rate analysis, C^{13} substitution ratios and other routine analysis that the Chemists wished programmed.

Butler, E. D.

Name: EBUTLER

Project: UROLOGY

Department: Surgery (Urology)

Project Description: ACME is used to study the dynamics of the urinary tract. The following measurements are made real time: (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, frequency plots. A series of four papers are in preparation to be published in the "Journal of Investigative Urology" in early 1969 concerning work and techniques established entirely on the use of ACME for the data collection, presentation, and analysis. These will have a general title of "Dynamics of the urinary tract."

Cann, H. M.

Name: HCANN

Project: GUAT

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-polulations 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.

[illegible] B.

Name: RBCLAYTO Project: SEXBRN

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 rates with radioactive tritriated uridine. The rats are then killed and processed in the regular histological procedure. Radioactive element reduces silver grains and slides are made from which the grains in the brain cell are counted. From the number of grains, we determine the area of RNA incorporation in the brain, the brain cell, and other tissues. The level of RNA incorporation is also determined. Experimental and control groups are compared by ACME. Our data analysis time is greatly reduced by using ACME.

Collins, K. D.

Name: KCOLLIN Project: ATCASE

Department: Biochemistry

Project Description: This file (KIM COLLINS, AT Case) 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 (AT Case) and some of its inhibitors (see Journal Biological Chemistry, approximately February 1969; "Aspartate Transcarbenglase: Studies of the Catalytic Subumt by Ultraviolet Difference Spectroscopy," by Kim D. Collins and George R. Stark). It will be used in the future to simulate difference from model compounds and compare these spectra with the experimental spectra. It will also be used in the future to analyze data from equilibrium dialysis studies of AT Case and its substrates and inhibitions.

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 (See previous ACME write-up).

Third, it is used as an education device. For instance, this file has been used to process data from a laboratory course in ultracentrifugation (Biochemistry 214).

[illegible]. V. A.

Name: VABACON Project: GAM[illegible]

Department: Genetics - IRL

Project Description: DATA COLLECTION, STORAGE, ANALYSIS FROM FINNIGAN 1015 MASS SPECTROMETER. In this "on line" application, 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. Publications using this system of computer operation of the mass spectrometer are:

B. Halpern, V. A. Close, A. Wegmann, J. W. Westley, "Gass Chromatography of Amino Acids as N-Thiocarbonyl Ester Derivatives", Tetrahedron Letters 27, 3119 (1968).

J. W. Westley and B. Halpern, "The Use of (-)-Methyl Chloroformate in the Optical Analysis of Asymmetric Amino and Hydroxyl Compounds by Gas Chromatography" J. Org. Chem. 33, 3978 (1968).

J. W. Westley, V. A. Close, D. N. Nitecki, and B. Halpern, "Determination of Steric Purity and Configuration of Diketopiperazines by Gas-Liquid Chromatography, Thin-Layer Chromatography, and Nuclear Magnetic Resonance Spectrometry Anal. Chem. 40, 1888 (1968).

[illegible] R. L.

Name: KLCONNER Project: RATRAC

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 PDP8 interface, or listed by the PDP8 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 ACME facilities 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.

Cooper, J. M.

Name: JMCOOPER Project: SEXDIFF

Department: Psychiatry

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

Such use is not mainstream to my project, in that the calculations could be performed manually.

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

Daughters, G. T.

Name: G_DAUGHT

Project: SECURITY

Department: Medical Research (Palo Alto)

Project Description: This project is a study of insurance (Medical) utilization. A comparison of membership and doctor visits, laboratory work, etc., of the same population under two different insurance plans is being made.

Studies of costs to the patient (according to diagnosis) are also being made on the same group, for the two different plans.

The results should be of wide interest to employers, insurers, hospital planners, etc.

Daughters, G. T.

Name: G_DAUGHT Project: PLAYTIME

Department: Bioengineering and Physiology

Project Description: This project is purely educational in nature. It is desirable to make a knowledge of a high-level scientific computer language one of the standard tools of today's research scientist. PL/ACME is such a language, and being FORTRAN based, is useful wherever a machine with a FORTRAN compiler is found. The availability of a machine as large as ACME's 360/50 is a definite asset in learning how to use a computer on scientific problems, since storage space is almost never exceeded, and programs can be very straightforward.

The Palo Alto Medical Research Foundation has active training programs (one supported by N.I.H.) in Molecular Genetics, Allergy, Immunology, Infectious Diseases, and Bioengineering. There are currently several post-doctoral fellows in training at the Foundation, and members of the Foundation staff hold faculty appointments at Stanford University and the University of Santa Clara.

Those of us at the Foundation who are relatively competent in the ACME language have been giving informal instruction to members of our staff who have taken an interest in using the computer as a research tool, and the terminal sees almost full-time use only a month after installation in a facility where only two people had had any previous computer training.

DeNardo, G.

Name: GDENARD

Project: XENON133

Department: Nuclear Medicine

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

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

Boering, C. H.

Name: CHDOERIN Project: DESMOLAS

Department: Psychiatry

Project Description: CONNECTIONS TO LABORATORY INSTRUMENTS, E.G., LIQUID SCINTILLATION COUNTER. We have studied the development of an enzyme system in the rat adrenal gland which is involved in the response to stress. In the newborn rat, there is a brief period of poor response to stress by the adrenal gland. As one parameter, we are measuring the capacity of the adrenal gland to synthesize steroid hormones.

We prepare an enzyme system that catalyzes the conversion of cholesterol to pregnenolone. The rate of this conversion is an indicator of the amount of enzyme present in the glands. We follow the rate of conversion by using cholesterol labeled with two different radioactive isotopes and calculating the change in isotope ratio. From each incubation more than ten samples are withdrawn, counted in duplicate for the two isotopes and recounted with a radioactive standard. Thus, about 100 different counts are generated with each incubation.

We use ACME to compute the ratio of the two isotopes for each sample (by averaging duplicate counts and correcting for overlapping counts) and to store these results along with other information about the incubation. Various other programs are used to work on the information stored in the data file and to proudce the rate of enzymatic conversion by fitting the best line through the experimental points and by determining the slope and its confidence interval. All this derived information is stored in another data file. The date over 150 incubations ranging over the ages of 1 to 46 days have been carried out and treated in this manner. The project was started in October 1967.

All the information of a set of similar experiments has been retrieved, and a significant pattern of development of the enzyme system has been discerned. Another program analyzes the entire set of experiments and generates a mathematical function that describes the pattern of development. This development pattern of the enzyme system was found to correlate closely with the pattern of stress responsiveness described for the adrenal gland of the neonatal rat. Two reports of this work have been submitted for publication in Endocrinology.

Some aspects of the work on the rat adrenal capacity to produce hormones will continue. At the same time we will use the above method to study genetic differences of this capacity in different strains of mice. The use of ACME will be very similar to the past.

Doherty, R. A.

Name: RADOHERT 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.

Dong, E.

Name: EDONG Project: heart

Department: Surgery

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

Douglas, D.

Name: EDONG Project: MARG1

Department: Stanford Electronics Laboratory

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 Stanford Electronics Laboratory. It is funded by a grant from NIH and is to be completed September 1969.

At present time we are recording 3 channels of analog data from an auto transplanted dog. This data is processed using the 1800-360/50 ACME system. The data are converted to digital data using the 1800 and stored in the 360/50. It is then processed and 6 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.

Duffield, A. M.

Name: ADUFFIE Project: CHEM

Department: Chemistry

Project Description: 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 three mass spectrometers (ALTAS CH4, AEI MS9, and a FINIGAN 1015 quadropole). The taken spectra are then to be fed to the Artificial Intelligence group under the supervision of J. Lederberg and E. Feigenbaum to be used in their dendral investigations, (B) Another use of data transmission through the 270Y is to take spectropolorimeter measurements and then analysize these spectra for form, bandwidths and similarities between derivitives for theoretical projections, (C) This project also includes a battery of utility programs for metastable analysis, chemical rate analysis, C13 substitution ratios and other routine analysis that the Chemists wished programmed.

Durbridge, T. C.

Name: TDURBRI Project: ROOT

Department: Pathology

Project Description: (1) Statistics: Using ACME subroutines, programs, and minimal own coding will compute statistics for S.V.H. research projects, (A) only when requested, and (B) only if researcher will foot the bill. Hopefully, I will not be doing too much of this. (2) Pathologese Snop Translation: Working with Derek Enlander on the same problems. I am transferring the files to d-enland cases, and deleting this aspect of ROOT.

Edwards, D.

Name: D_EDWARD 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, (4) to prepare and justify manuscripts. In the near future, specific programs will be employed (with the 1800) to identify hormone-indured changes in the EEG on the basis of Fourier and spectical analysis of recorded EEG's.

Enlander, D.

Name: d_enland 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.

Enlander, D.

Name: d_enland Project: snop

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 converse 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.

Enlander, D.

Name: d_enland Project: PIPIC

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 comphrehensive modern terminology.

Folk, W. R.

Name: BFOLK 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.

We are presently writing two papers in which ACME facilities have been used.

Forrest, W. H.

Name: W_FORRES Project: DATA

Department: Anesthesia

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

Forrest, W. H.

Name: W_FORRES Project: ANALGESI

Department: Anesthesia

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

Fries, J. F.

Name: JFRIES Project: DXARTH

Department: Medicine

Project Description: Present projects involving computer diagnosis of rheumatic disease are, in addition, partly designed to increase our familiarity with the system. (Experience Counting in Sequential Computer Diagnosis, J. F. Fries, 1969, (submitted for publication).

Beginning in late Spring 1969 we will begin work on a large-scale data file entry, storage, 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. and so forth. Methods of supporting clerical, software, and hardware needs are currently being explored in several areas. During early development, we will request 100% support for hardware costs through the ACME System.

Fung, D.

Name: D_FUNG_ Project: RESPUNIT

Department: Anesthesia

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, (d) Statistical parameters are calculated.

No data files will be used.

Gerstein, W.

Name: WGERSCH Project: SYNTHESI

Department: Neurology

Project Description: The project is a research investigation to examine the extent to which the interrelationship between a variety of electrophysiological data records can be modified by a linear relationship.

Examples of previous and ongoing computations include:

1. Computation of the coherence between macropotentials and intracellular slow waves (human data provided by Dr. F. Morrell and animal data now being gathered in collaboration with Dr. Morrell - preliminary research results reported at a Neurosciences Research Program Work Session on "Neural Coding" February 1968 to be described in a forthcoming N.R.P. bulletin.

2. Determination of transfer function and a study of the causality relationship between averaged evoked potential and post stimulus time histograms on experimental data provided by Dr. K. L. Chow taken in cat lateral geniculate with light stimulation and by Dr. A. Starr in cat cochlear nucleus with sound stimulation.

3. Determination of the evolution of a transfer function between macropotentials during the evolution (over a period of weeks) of epilepsy in cats. Computations performed on data supplied by Dr. G. Goddard.

Glattke, T. J.

Name: T_GLATTK

Project: ENG

Department: ENT (Surgery)

Project Description: Use of the ACME facility through July 31, 1969, is anticipated in two research areas: Auditory physiology: We are collecting data on an almost-daily basis from a group of preparations with electrodes implanted in the auditory nervous system. Generally, the recorded activity is processed and stored briefly with a small general-purpose computer. Use of ACME in this work would seem desirable for numerical analysis incorporating ACME, but since the sample sizes are modest, use of ACME for analyses requiring many replications of an operation (e.g., in auto-correlation) is advantageous. Clinical research: 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 a half-dozen tests. Patient selection for a given course of treatment or additional special testing would seem to be enchanced by the availability of such trend analyses.)

Gleason, C. A.

Name: CGLEASO

Project: CORTMEAS

Department: Medical Student - Graduate

Project Description: This user project is being used in connection with my predoctoral research fellowship. To date the various researchers in the Neurology department have been sharing the costs for the ACME terminals but there has been no provision in their budgets for computer time. Their projected budgets do not provide for computer time and my predoctoral fellowship does not provide funds either. While my use of ACME has not been extensive I have been using it primarily in an educational way to learn how computers can be used in electro-physiological research.

I would like to continue using ACME and storing programs on a 100% rebate basis through the summer at which time my predoctoral program is to be completed.

Glick, D.

Name: D_GLICK Project: LASER

Department: Pathology, Histochemistry

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 variance, and also linear regressions, graphical interpolations and curve fitting. A second system is now being 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 ACME-dependence. Papers completed this year of work in which ACME was involved are:

Pepper, N. A., Scribner, E. J., Alterton, L. E., Honey, R. C., Beatrice, E. S., Harding-Barlow, I., Rosan, R. C. and Glick, D. Q-switched ruby laser for emission microspectroscopic elemental analysis. Anal. Chem. 40:1178-1182 (1968).

Beatrice, E. S., Harding-Barlow, I and Glick, D. Electric spark cross-excitation in laser microprobe-emission spectroscopy for samples of 10-25 micron diameter. In preparation.

Beatrice, E. S. and Glick, D. A direct reading polychromator for emission spectroscopy. In preparation.

Godwin, T. S.

Name: DGODWIN Project: ADRENAL

Department: Surgery

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

Hackney, J. F.

Name: JHACKNE Project: PHA1

Department: Pharmacology

Project Description: User works with Goldstein who is on leave until September 1, 1969. Project is not being used now, but want to keep in abeyance for now.

Hahn, G. M.

Name: G_HAGN Project: RADIATE

Department: Radiology

Project Description: There are various programs used in graphics of experimental data, e.g., survival curves of x-irradiated mammalion cells; output of planchet counter, etc.

Harrison, D. C.

Name: DCHARRIS Project: CATH_LAB

Department: Cardiology

Project Description: An extensive cardiac catheterization data analysis program has been developed (1, 2, 3). Statistical analysis of the results obtained by a 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.

The computer facility 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.

References

1. Stenson, R. E., Crouse, L., Henry, W. L., Harrison, D. C. A time shared Digital Computer System for On-Line Analysis of Cardiac Catheterization Data. Computers and Biomedical Research, Vol. 1, Number 6 P. 605 June 1968.

2. Henry, W. L., Crouse, L., Stenson, R., Harrison, D. C. Computer Analysis of Cardiac Catheterization Data. Am. J. of Cardiology, Vol. 22, Number 5, p. 696, Nov. 1968.

3. Stenson, R. E., Henry, W. L., Crouse, L., Harrison, D. C. Cardiac Catheterization Data Analysis. J.A.M.A. - Submitted for publication.

Harris, R. F.

Name: RHARRIS 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 this data at that time. Data from the second part of the study will be collected by the end of April and processed then.

Harris, R. F. (cont.)

Name: RHARRIS Project: PNP

Department: Medical Student

Project Description: 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.

Helikson, M. A.

Name: MHELIKS Project: LBF

Department: Medical Student

Project Description: EVALUATION OF LIVER BLOOD FLOW WITH RADIOACTIVE ISOTOPES. Use of ACME facility: storage of data, statistical analysis, 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 develope a relatively quick and technically easy method for determining blood flow in humans on a screening basis and in pathologic states.

Herzenberg, L. A.

Name: LHERZEN Project: LAB

Department: Genetics

Project Description: Our studies in immunology, genetics and maternal fetal immunologic relationship's in the mouse require the colation of many experimental observations on a given serum sample or individual. Since such data is accumulated over long periods of time, frequent interim reviews must be made to determine new directions, etc. Currently, most data colation 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 momth ACME is called upon to draw updated pedigree charges, so that breeding decisions may be made.

Presently we are working on programs to colate 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.

Herzenberg, L. A.

Name: LHERZEN Project: STORE

Department: Genetics

Project Description: Same project description as for project LAB.

Herzenberg, L. A.

Name: LHERZEN Project: PIGGY

Department: Genetics

Project Description: Same project description as for project LAB.

Hilf, F. D.

Name: FHILF Project: BLACKBOX

Department: Psychiatry

Project Description: This project, which is virtually complete, involves pathological tests using a new technique of "non-contingent reinforcement" of paranoid and non-paranoid patients. The raw data obtained by an electronic apparatus was analyzed by ACME as were the clinical behavioral ratings of patients.

Other statistical techniques were used involving analysis of variance to obtain level of significance of results.

This project is virtually complete and I anticipate placing my files on tape or deleting this altogether.

Hilf, F. D.

Name: FHILF Project: TESTA

Department: Psychiatry

Project Description: This project 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 bravity procedure is also incorporated in this program. The main purpose is to determine if paranoid psychiatric patients respond to feedback differently than a control group of other VA psychiatric patients.

Hodges, D.

Name: DHODGES Project: SWALLOW

Department: Radiology

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 in the IBM 1800 computer attached to the ACME computer system. It is planned 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.

Huberman, J. A.

Name: JHUBERM Project: TEMPLATE

Department: Biochemistry

Project Description: I am 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.

So far we have produced one publication based on experiments aided by ACME's calculations:

Englud, P. T., Huberman, J. A., Jovin, T. M., and Kornberg, A., Enzymatic Synthesis of Deoxyribonucleic Acid, XXX. Binding of Triphosphates to DNA Polymerase., J. Biol. Chem. Submitted for publication.

Hwang, J.

Name: JHWANG 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, chisquareand 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 occured.

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

Hwang, J.

Name: JHWANG Project: BWTSTUDY

Department: Genetics

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

Ingels, N. B.

Name: NINGELS Project: ASMSPJOB

Department: Bioengineering and Physiology

Project Description: This project is a study of the dynamics of the myocardium, utilizing stereo stop motion photogrammetric methods on an open-chest canine preparation. This study is being done with full N.I.H. support, on grant number HE 11739-01.

Data from two stereo cameras (in the form of a stereo pair of negatives) is reduced by the computer to present the investigator with various length-velocity-load-time relationships. Since this work is of a "pioneering" nature, it is necessary to be able to interact quickly with the computer in order to change the program, certain data, etc.

The size of the data reduction problem in these studies can be gleaned from the fact that the programs necessary could only be run at S.C.C. at night due to the core size limitations.

The grant includes some funds for computer time, but at the rate which it was being used at the Stanford Computation Center, the study could not have been completed. The availability of ACME services at little or no cost is of paramount importance to the studies being presently done under this grant, and to those suggested by our present studies. The TV display at ACME is also of great importance, since the graphics routines therein are exceedingly fast in comparison to the Calcomp Hard-copy plotting routines used at the S.C.C. It is estimated that the availability of ACME has cut computation costs (assuming the 85% rebate rate) by about a factor of ten.

The funds originally committed to computer time are being used to defray the cost of terminal rental.

Jan, W. H.

Name: W_JAN___ Project: WOMAN

Department: Medical Student

Project Description: Run various statistical tests on data from laboratory experiments.

Do Text editing.

Jones, R. E.

Name: DJONES

Project: FLU

Department: Biochemistry

Project Description: Work with ACME centers around a nanosecond fluormeter designed by Stryer, et. al. which measures kinetics of fluorescence as a function of time directly. Data acquisition is accomplished through the 1800, and subsequent data reduction is carried out in the 360 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; 3) excited state proton-transfer reactions.

Kakihana, R. Y.

Name: RKAKIHA

Department: Psychiatry

Project: ETHANOL

Project Description: We have been studying the effects of alcohol on the central nervous system of rodents. This study is supported by MH 14599 from the NIMH. 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.

It is our plan to continue the use of ACME facilities for the period to July 31, 1969. This service has been extremely valuable and has resulted in three publications based on its use.

1. Kakihana, R., Butte, J. C. and Noble, E. P., 1968. Effects of goldthioglucose on alcohol consumption in C57BL mice. Life Sciences 7: 825.

2. Kakihana, R., Noble, E. P. and Butte, J. C., 1968. Corticosterone response to ethanol in inbred strains of mice. Nature, 218: 360.

3. Noble, E. P., Silbergeld, S., Kopell, B., McKinney, W., Wittner, W. K., and Butte, J. C., 1968. The effects of physiologic doses of corticosteroid on catecholamine metabolism in man. J. Psychiat. Res., 6: 159.

Kaplan, B. E.

Name: BKAPLAN 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, the computer 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.

Kessler, S.

Name: SKESSLE Project: MATSPEED

Department: Psychiatry

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

Publications: Kessler, S. 1968. Nature, 220: 1044-1045.
Kessler, S. 1968. An. Behav., 16: ? .

Koran, L. M.

Name: L_KORAN 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.

Kountz, S. L.

Name: SKOUNTZ Project: TRANSPLA

Department: Medical Student

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 of the follow-up on the degree of renal function in an effort to predict the onset of rejection crisis. The computer has been programmed to include sixty or more patients in the Bay Area who are on cronic 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. Although we have a limited amount of funds on an N.I.H. grant to study the pathophysiology of renal transplantation in man, our grant does not include funds for computer analysis.

Kraemer, H. C.

Name: HKRAEME

Project: PSYSTAT

Department: Psychiatry

Project Description: The work done in PSYTAT 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.

Kriss, J. P.

Name: J_KRISS

Project: BLDVOL1

Department: Radiology

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.

Kriss, J. P.

Name: J_KRISS

Project: ASSAY

Department: Radiology

Project Description: This program is used to calculate the results of a bioassay for the long-acting thyroid stimulator, to calculate the statistical significance of these results, and to calculate the results of a radioactive iodine assay for TSH. These data are being acquired as part of a study on the pathogenesis of Graves' disease and on the effects of X-ray therapy upon thyroid function.

Laipis, P. J.

Name: PLAIPIS

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, principly those experiments involving sucrose and cesium chloride gradients in the ultracentrifuge. The computer is also used for other simple operations too complex for a desk calculator, i.e., least-squares line fitting. Use will be sporadic and of short duration. The computer was used in the analysis of sucrose gradients presented in Laipis, Olivera, and Ganesan, P.N.A.S. (in press).

Lamb, E. J.

Name: EJLAMB

Project: EMPIRE

Department: Gynecology - Obstetrics

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

Lederberg, J.

Name: JLEDERB

Project: DENDRAL

Department: Genetics

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

Leifer, A. D.

Name: ALEIFER Project: PREMI

Department: Psychiatry

Project Description: Through July 31, 1969, I will use ACME for data analysis only. Perhaps I will enter permanent data files into ACME during this period. The data analysis that is planned now will consist of calculation of means, standard deviations, slopes, correlations, t-tests, and analyses of variance.

The project for which this data analysis is being done is a long-term study (five years) of the effects of temporary separation during the early post-partum period on maternal behavior and subsequent infant development. The study includes as subjects both premature and fullterm infants and their mothers and fathers. The data which will be analyzed under my account is that obtained from time-sampling observations of mother and infant during routine caretaking at home and in the Stanford Hospital. Many other measures of the mother, father, and infant are taken by others involved in the project. Much of this data will also be analyzed on ACME, but under P. Herbert Leiderman's account. Principal investigators for this project are P. Herbert Leiderman, Department of Psychiatry, and Clifford R. Barnett, Departments of Anthropology and of Pediatrics and Human Development. The project is supported by grants from NICHD and from the Grant Foundation, New York, New York.

Currently, two reports of the results of the mother-infant observations are being completed, one for submission to Science and one for presentation at the March meetings of the Society for Research in Child Development. Data analysis for these papers was done on ACME, but I do not believe it accurate to say that the papers are "based on my use of ACME". However, if you should want more complete titles, etc., please ask for them.

Levine, R. L.

Name: RLLEVINE Project: CPS

Department: Pediatrics - S332

Project Description: (A complete project description was submitted to the Medical Scientist Training Program Committee.)

The project, 'Carbamyl Phosphate Synthetase in the Mammaliam Pyrimidine Pathway', will hopefully form the basis of a thesis undertaken as a Medical Scientist Trainee of the NIH. Stipend support comes from the NIH but laboratory space and research expenses are provided by my preceptor, Dr. Norman Kretchmer.

The purpose of the initial investigations (in progress six months) 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. This work will continue, probably to July 31, 1969 and beyond. Lack of an acceptable assay has hampered work in the field for years. My primary use of ACME has been to evaluate and process data obtained during assays. There is no question that without ACME asssitance 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.

I may also become involved in another project with Dr. Kretchmer which will use ACME services, but probably not until after July 31, 1969.

Levinthal, E. C.

Name: ELEVINT Project: MM71

Department: Genetics

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

Liebes, S. J.

Name: S_LIEBES 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-lFlight 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--in the conventional warmed crucible mode of operation;

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.

Grant No. FR-611-65
Section III-B

Lorenson, M. Y.

Name: MLORENS

Project: PPK1

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 was not used for these calculations, the information to be gained would be difficult to compile and the research work would be slowed considerably.

Luetscher, J. A.

Name: JLUETSC Project: Bloodpr

Department: Medicine - Metabolic Research

Project Description: Our research project, supported by the USPHS (AM-03062), 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 means and variance of different groups, or correlations between different observation). (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 used, and subsequently in practical applications.

Lumb, J. R.

Name: JLUMB Project: C-TUMOR

Department: Medicine - Micro

Project Description: The purpose of this project is the biochemical characterization of alkaline phosphatase of thymic lymphomas in C57Bl mice. This enzyme does not occur in normal thymic lymphocytes. These lymphomas are known to be induced by viruses. This investigation is to determine whether the information for this enzyme is contained in the virus or is cellular. This is being done by characterizing the enzyme biochemically and comparing these results to those found in embryo thymuses and other normal organs. ACME is used for statistical interpretation of the results.

Luzzatti, L.

Name: LLUZZAT Project: GRAGSON

Department: Pediatrics

Project Description: The computer has been used to study a family with a chromosomal mosaicism in 3 generations. Measurements of involved chromosome pairs from affected individuals and normal controls were entered, and means, standard deviations and percentage differences calculated. Distribution curves and three-dimensional histograms to classify different cell lines were also done by the computer. This program is now completed and the majority of the files will be deleted.

At present, the computer is used to store information on history, physical findings and diagnosis on patients with congenital defects. For each patient, a set of anthropometric measurements and dermatoglyphic patterns will also be entered. Our goal is to provide means for correlation of presence of major or minor congenital defects among each other and in relationship to the pregnancy and family histories. Clustering of certain anomalies in a given patient defines a certain phenotypic expression or "syndrome". The computer should be able to provide a "diagnosis" when the appropriate set of symptoms is presented, and new syndromes may be further defined by specific clustering of symptoms. The basic information on patients is already programmed and stored; the historical data have been programmed but have not been stored as yet. We are presently developing a program for storage of the physical findings, anthropometry and dermatoglyphics. Information obtained from this program will have a significant educational value for medical students and house officers in addition to providing clues for investigation.

MacPherson, L.

Name: LMACPHE Project: META

Department: Psychiatry (Veterans Administration)

Project Description: PROPOSAL AND METHOD OF STUDY. We plan to investigate the significance of the CNV and aspects of the MP studying their similarities, differences, interrelationships, and relationships to mental states such as selective attention and expectancy. Healthy college student volunteers will serve as subjects. No drugs will be given and no risk to participants will accrue. We will proceed in an explorative fashion with pilot studies, hoping that as possible avenues of investigation are outlined, more difinitive experiments with larger population samples will take shape. We plan to start with the following study.

Ss' AEP will be obtained under the following experimental conditions.

1. Short auditory stimulus presented repetitively and timed randomly. (To obtain AEP evoked by the auditory stimulus.)

2. S presses button randomly whenever he desires. (To obtain MP associated with muscle contraction.)

3. S presses button immediately after hearing randomly presented tone. (To obtain averaged EEG produced in combination by the AEP to the tone and the MP when S attends to an autside command.)

4. S presses button randomly whenever he desires. This produces a tone. (To obtain EEG as in condition #3 except that S is not paying attention to any outside commands.)

5. S hears a tone (conditional stimulus) and when two seconds later another tone appears (imperative stimulus), S presses button quickly. (To obtain the type of CNV that was reported by Walter.)

The averaged EEG potentials of these conditions will be analyzed and compared with each other in order to ascertain which stimuli produce which potential changes under which conditions and in order to elucidate whether and how the CNV reported in the literature is related to the MP.

IMPLICATIONS. The importance of the proposed work of larger scope lies in development of techniques for the concrete electrophysiologic measurement of psychologic states of the mind. Already such related methods have demonstrated surprising corresondence between cerebral AEP findings and mental states of attention, expectancy, conditioning, habituation, meaningfulness, and levels of certainty. The experiment

MacPherson, L. (cont.)

Name: LMACPHE Project: META

Department: Psychiatry (Veterans Administration)

Project Description: described in more detail could clarify the relationship betwen the MP and the CNV. Since muscle activity (e.g., pressing of switches) is widely used as an indicator of S's intent or state of mind, elucidation of the relationship between CNV and MP is needed.

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1. Caspers, H., in The Nature of Sleep (Churchill, London, 1961).

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3. Rowland, V. and Goldstone, M., Electroenceph. Clin. Neurophysiol. (1963).

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5. Shvets, T. B., Conf. Electrophysiology of Higher Nervous Activity, Moscow, 1958.

6. Walter, W. G., Nature, 203:380-384, 1964.

Maffly, R. H.

Name: RMAFFLY Project: CO2

Department: Medicine (Veterans Administration)

Project Description: Under study is active sodium transport by the toad bladder. We correlate three variables: short circuit current, CO_2 production and $ClYO_2$ proudction. The computer is used to calculate the variables and to interrelate them, and to perform statistical analyses.

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

Mesel, E.

Name: EMESEL

Project: DOGLAB

Department: Pediatrics

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

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

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

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

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

However, a simple 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 in ACME accumulated so much error during execution that it proved useless. Thus if we are to acheive 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.

Mesel, E.

Name: EMESEL

Project: VSD

Department: Pediatrics

Project Description: Project VSD 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 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.

Mesel, E.

Name: EMESEL

Project: CLINIC

Department: Pediatrics

Project Description: The object of this project was to store patient identification information, and diagnoses obtained at each step in the course of illness (clinical - OPD or IPD, cardiac catheterization, surgery, autopsy) in ACME files. This work was patient-service oriented but had 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 purpose, evaluation of patient survival with different modes of therapy, etc. Plans are to discontinue this project until such time as adequate clerical assistance is available to implement the filing system.

Mesel, E.

Name: EMESEL

Project: CARCAT

Department: Pediatrics

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 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 large amounts in clinical data rapidly 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.

Miller, R. P.

Name: R_MILLER

Project: BIOSTAT

Department: Preventive Medicine

Project Description: The Division of Biostatistics, Department of 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. Some of the people who have consulted us in the past years have been Dr. Ken Gardner, Dr. Yule, Dr. Maffly, Dr. Hart of Infectuous Diseases.

The Division 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 computer is used in all these activities.

Monnin, L. M.

Name: L_MONNIN

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.

Grant No. FR00311-03
Section III-B

Morris, S. J.

Name: SMORRIS

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. The original interfacing work was done in lieu of a language requirement for my PhD. The system will be used to analyze the incorporation of radiolabeled amino acids into brain proteins.

See ACME Note TRA-1 for a full discription of the system.

Nall, M. L.

Name: L_NALL__

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 destroys 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 questionaire 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. Hopefully, both will be financed by an NIH grant. The application of ACME to the computerized phase of our findings has been indicated in all grant protocols.

Nall, M. L.

Name: L_NALL__

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 elctron 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. Although no paper has been published as yet (since the study is in progress), the results of the pilot study were presented by Drs. Schneidman and Watson at the annual Meeting of the American Academy of Dermatology in Chicago in December. 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. This information is a pioneering fact; albeit, more detailed studies will be forthcoming to substantiate this early data.

Dr. Schneidman has supported this effort from his personal funds and plans to continue to do so. Thus, we are concerned in keeping our ACME costs at a minimal level.

Noble, E. P.

Name: EPNOBLE_ Project: ALCOHOL

Department: Psychiatry

Project Description: We have been studying the effects of alcohol on the central nervous system of rodents. This study is supported by MH 14599 from the NIMH. 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.

It is our plan to continue the use of ACME facilities for the period to July 31, 1969. This service has been extremely valuable and has resulted in three publications based on its use.

1. Kakihana, R., Butte, J. C. and Noble, E. P., 1968. Effects of goldthioglucose on alcohol consumption in C57BL mice. Life Sciences 7: 825.

2. Kakihana, R., Noble, E. P. and Butte, J. C., 1968. Corticosterone response to ethanol in inbred strains of mice. Nature, 218: 360.

3. Noble, E. P., Silbergeld, S., Kopell, B., McKinney, W., Wittner, W. K., and Butte, J. C., 1968. The effects of physiologic doses of corticosteroid on catecholamine metabolism in man. J. Psychiat. Res., 6: 159.

[illegible], W. N.

Name: WNYE Project: STUDENT

Department: Medicine - Micro

Project Description: Under this user name, several people in this 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. The bibliography compilation will probably be published in the new Biochemistry Handbook by Dr. Kirschbaum.

Payne, R. O.

Name: R_PAYNE Project: SERNAL

Department: Medicine - Hermatology

Project Description: The research is concerned with extending the 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.

Pearson, M. L.

Name: MPEARSO 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.

Grant No. FR00311-03
Section III-B

Petralli, J. K.

Name: JPETRAL

Project: MED_DATA

Department: Infectious Diseases

Project Description: A COMPUTER METHOD FOR IMPROVEMENT OF ANTIBIOTIC SENSITIVITY DATA AND GUIDANCE IN THERAPY. J. K. Petralli*, S. Wallis*, T. C. Merigan. Department of Medicine, Stanford University, School of Medicine, Palo Alto, California.

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 each day on the IBM 360 time sharing computer (which allows on-line continuous data generation). Each zone size is compared with limits based on previous results and unusual values are challenged for further study. This system rapidly detects unusual organisms or laboratory error. The computer 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.

Porter, R. W.

Name: RWPORTER

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.

Porter, R. W. (cont.)

Name: RWPORTER

Project: ATC_KIN

Department: Biochemistry

Project Description: 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. The results of these kinetic studies have been reported to The Journal of Biological Chemistry, where they will be published in March. The manuscript for this report was prepared making extensive use of the manuscript editing facilities of ACME. The authors of the report are Robert W. Porter, Michael O Modebe, and George R. Stark, and the title is "Aspartate Transcarbamylase: Kinetic Studies of the Catalytic Subunit".

Reaven, G. M.

Name: G_REAVEN

Project: DISPLAY

Department: Medicine

Project Description: We are 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. In the third stage, the program PEEL automatically obtains the parameters for a linear sum of exponentials and the program SKINNER obtains parameters which are the 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 get us into the "ball park" and we change parameters until we obtain a satisfactory visual fit. In this phase we use the programs RUNGCURV, DATA, TDATA and berman.

We are in the process of preparing two manuscripts in which the results are based on the above program support. The first paper is a mathematical model of insulin distribution in man in vivo and the second paper is a description of the use of on line display procedure for determining physiological models of metabolic processes. 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 4 and develop stage 5 for analysis of nonlinear metabolic models.

Reaven, G. M.

Name: G_REAVEN Project: FIT

Department: Medicine

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 is a crude manner 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 four programs for this procedure; they are RUNGPOW, sPOWELL, COVARE and EXPOPOW.

Reaven, G. M.

Name: G_REAVEN Project: PAT DATA

Department: Medicine

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 TGCONRAD determines triglyceride concentration and the program DOUBLE estimates counts from double label experiments. The final program in this phase WEIGHT estimates weights of data points 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, NOVA, CORL, and REGRESS.

Our research activities also include procedures to determine weight patterns of patients. The programs involved in this aspect are BODYCOMP and BODYFAT.

Reitan, J. A.

Name: J_REITAN 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.

Reynolds, W. E.

Name: WEREYNOL

Project: S007

Department: Genetics

Project Description: This project supports the basic development of automation in computer-mass spectrometer instrumentation systems. This worker is an instrumentation engineer, hence the remarks about the biological aspects will be brief.

The mass spectrometer has become a powerful tool in the elucidation of organic molecules. This is of great interest in the biochemistry field and in the case of DNA and related structures to the Genetics Department. Since the basic principles involved are common to at least the Genetics Department and Organic Chemistry, the physical instruments and location are sometimes shared. This is the case for this project. Hence the efforts of this project span over 5 mass spectrometers in 3 diverse locations on the Stanford campus.

The technical development consists in the origination of instrumentation concepts, and realization, in both hardware and software, complete operating systems.

These systems are intended to automate the mass spectrometer (low resolution Bendix t-o-f, Finnigan quadrupoles, Atlas CH-4 and a high resolution AEI MS-9) to provide the following benefits to the biological user-researcher:

Savings of the researcher's time in instrument operation and data reduction.

Improve the quality of the data.

Improve the presentation of the data.

Foster computer files of pertinent data.

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

The ACME system is being used by this user both as the final computer in the automated system and as an engineering design aid to achieve the final systems.

Reynolds, W. E. (cont.)

Name: WEREYNOL Project: S007

Department: Genetics

Project Description: Publication - COMPUTER CONTROL OF MASS ANALYZERS. A paper given, and published in the proceedings of, The Sixteenth Annual Conference on Mass Spectrometry and Allied Topics. (May 1968, Pittsburg, Pa.) (ASTM Committee E-14).

Reynolds, W. E.

Name: WEREYNOL 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.

Robertson, W.

Name: W_ROBERT 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.

Rosenberg, L. T.

Name: L_ROSENB 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.

Rosenthal, W. S.

Name: W_ROSENT Project: RESEARCH

Department: Medical Student - Speech and Hearing Science

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. Plans through July 31, 1969 include continuation of above usage as well as possible use of the computer in a language perception simulation program.

Ross, R. G.

Name: R_ROSS__ 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 finsihed output of mass spectra. The transmission is through the 270Y-270X channel. The project plans to develop this interface to service three mass spectrometers (ALTAS CH4, AEI MS9, and a FINIGAN 1015 quadropole). The taken spectra are then to be fed to the Artificial Intelligence group under the supervision of J. Lederberg and E. Feigenbaum to be used in their dendral 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 analysis that the Chemists wished programmed.

Roth, W. T.

Name: W_ROTH__ Project: COMP

Department: Psychiatry

Project Description: For the period prior to January 1, 1969 I have submitted two papers for publication based on using the ACME system for the analysis of electroencephalograms (EEG's) and the statistical processing of the results.

I will be at Stanford until June, 1969. During the next 5 months I will be doing a project involving the 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.

Since 90+% of the grant goes to stipends of four residents in psychiatry, faculty salaries, and other expenses such as tuition, Dr. Moos feels that the 95% support level is most appropriate at the present time.

Saunders, A. M.

Name: AMSAUNDE

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 fluoresence microscopy.

Saunders, A. M.

Name: AMSAUNDERS

Project: SPHERES

Department: Pathology (Genetics)

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.

Savageau, M. A.

Name: M_SAVAGEAU

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.

Cavalli-Sforza, L. L.

Name: L_SFORZA 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 - except for hoping that it will be less intensive. It will be perhaps 20% of what it was in the period for which sample billing may be carried out.

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.

Smallwood, R. D.

Name: R_SMALLW Project: MEDIPLAN

Department: Engineering - Economic Systems

Project Description: The Stanford Medical Facilities Planning Group is engaged in a system planning study for the design of the new Stanford Medical Care Facilities. The primary goal of this group is the development of systematic quantitative procedures for evaluating the relative utility of alternative plans for the new facilities. Because of the emphasis on quantitative analyses and because of the magnitude of the problem, much of our work will be directed at large scale computer simulations that will aid in the evaluation of alternative macro organization strategy for the facilities.

At the present time we are completing the development of several of the computer programs that will serve as intrinsic components to the overall simulation system. We have also nearly completed the task of gathering the data that is necessary for estimating the parameters of the simulation. Current plans are to complete the integration of these components by the spring of 1969, to use this tool in the actual evaluation of alternative plans, and to write up the results by June.

Smith, N. T.

Name: NTSMITH Project: BABOONS

Department: Anesthesia

Project Description: This particular project (BABOONS) simply 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.

We have an enormous amount of data which we are preprocessing with our analog computer. We would like to transfer this data directly to ACME for analysis. However, because of limited funds, need for programming assistance, and difficulties with ACME, this will not be possible in the forseeable future.

Smith, N. T.

Name: NTSMITH 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.

Smith, P.

Name: p_smith Project: PREMIES

Department: Pediatrics

Project Description: This data will be used in any study involving premature or sick newborn infants cared for in the Stanford nurseries. Such items as birth weight, gestational age, system desease, etc., will be correlated by pairs. For further information, contact the Premature Research Center.

Smith, P.

Name: p_smith Project: ventl

Department: Anesthesia

Project Description: This project (ventl) 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.

Grant No. FR00611-03
Section III-B

Smith, R. C.

Name: RCSMITH Project: FAMILY

Department: Medical Student

Project Description: I am a medical student who has been using the ACME Project for my own research. I am a medical student pursuing an M.D.-PhD. program at Stanford. Funds for my own research have been supplied through the Dean's Office, the General Research Support Fund.

The ACME file 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. However, because my clinical responsibilities will become heavy after January, I plan to put the major file (SFDM) on disc or tape storage, to be recalled when I have more time for further detailed analysis of raw data.

Two papers are currently being prepared from the family research described above. If specific NIH grant support for use of ACME should be listed in publications, please send me data on and account number of the grants.

Grant No. FR00311-03
Section III-B

Solomon, G. F.

Name: G_SOLOMO

Project: STRESS

Department: Psychiatry

Project Description: We are 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. Current projects which will use this program involve the effects of stress responsive adrenal hormones on antibody synthesis.

Publications:

Solomon, G. F., Levine, S. and Kraft, J. K.: "Early Expereince and Immunity" Nature, 220:821 (Nov. 23) 1968.

Solomon, G. F.: "Stress and Antibody Response in Rats", Int. Arch. Allergy & Applied Immunology, in press.

Stewart, L. H.

Name: L_STEWAR Project: DREAM

Department: C. J. Jung Institute (San Francisco)

Project Description: The research aims of the Institute is the establishment of an archive of classified psychological information centering around such primary data as dreams, and other unconscious material. Also included will be psychological test data, clinical assessments, and systematic demographic information.

These archives will be valuable in extending our understanding of unconscious material; i.e., dreams and fantasies, and will enhance our comprehension of the relationships between the ego and the unconscious.

Methods for the rapid collation and analysis of data are being considered. This includes techniques for the indexing and preparation of concordances of clinical material drawn from history, archaeology, mythology, comparative religion, and other sources. Such techniques will facilitate the search seeking the connection between themes from historical and cultural sources mentioned above. The availability of such data will be of immense value in the training of analysts, in the general practice of analytical psychotherapy, and in extending the frontiers of our present knowledge of the human psyche.

Stillman, R.

Name: R_STILLM Project: PSYGAME

Department: Psychiatry

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

The work has appeared as a presentation to The American Psychiatric Association's annual meeting and as a publication in the January 1969 issue of the American Journal of Psychiatry.

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.

Stillman, R. A.

Name: RASTILLM 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 three mass spectrometers (ALTAS CH4, AEI MS9, and a FINIGAN 1015 quadropole). The taken spectra are then to be fed to the Artificial Intelligence group under the supervision of J. Lederberg and E. Feigenbaum to be used in their dendral 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 analysis that the Chemists wished programmed.

Stillman, R. A.

Name: RASTILLM Project: DREAMS

Department: Chemistry

Project Description: See project description for DRAFT.

Strickland, R. G.

Name: R_STRICK Project: GASTRIC

Department: Medicine - Gastro-Intestinal Division

Project Description: I am involved in clinical research projects relating to gastric secretory function tests and have used the ACME Computation Center over the past year for filing of data collected from these projects and for statistically analyzing the results obtained. I plan to continue these usages through July 1969.

One publication, 'The Effect of Preduisolane on Gastric Structure and Function in Man', has been accepted and will be appearing shortly in GASTROENTEROLOGY. Other publications have either been submitted or are in preparation now.

Stocker, B.

Name: B_STOCKER Project: Stm

Department: Medicine - Micro

Project Description: My 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. E. Lederberg's project, which concerns mainly recombination-deficient mutants in the same organism. Main ACME usage so far has been in statistical analysis of data from experiments concerning pathogenicity of lipopolysaccharide mutants (estimations of LD50, rate constant for clearance of bacteria from blood stream, harmonic mean times-to-death, significance tests, etc.). I expect to continue such usage. If my grant is renewed and if I can hire suitable help, I expect to use ACME also for storage and analysis of extensive stock-culture data concerning strains with numerous genetic markers, and for participation in a co-operative scheme for exchange of such data for several Salmonella stock collections.

Stryer, L.

Name: L_STRYER 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 for kinetic measurements in the nanosecond time range and for the detection of fluorescence and phosphorescence emission from membranes and cells.

Stuedeman, D. L.

Name: D_STUEDE 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 preforming 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.

Summerlin, W. T.

Name: WTSUMMER Project: BIOCHEM

Department: Dermatalogy

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

Thathachari, Y. T.

Name: YTTHATHA

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 in 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 (suggested by Blois). 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 this decision is made we plan to commission the equipment and the interfacing with ACME.

References:

X-ray diffraction studies on melanins paper containing some of the preliminary results presented at the Annual American Crystallographic Conference at Buffalo, New York during August 1968.

Physical studies on melanin paper containing the results of the Monte Carlo techniques on the structure of melanin - to appear in the January 1969 issue of the Biophysical Journal.

X-ray diffraction studies on melanins paper describing the inversion of the high precision X-ray diffraction data as a radial distribution function presented to the annual blophysical society meeting to be held in Los Angeles, California in February, 1969.

Tickner, E. G.

Name: EGTICKNE Project: MURMURS

Department: Palo Alto Medical Research Foundation

Project Description: We intend to perform spectral analysis of murmurs recorded with intracardiac microphones in experimental animals before and after making cronic inplants of known sizes. We hope to correlate the onset of murmurs and their characteristics with the instaneous flow rate.

Trudell, J. R.

Name: J_TRUDELL 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.

Tucker, R. B.

Name: RBTUCKER Project: MS

Department: Genetics

Project Description: The project consists primarily of developing a computer system for the control of a mass spectrometer-GLC apparatus and the collection, analysis, and presentation of the resulting data. Presently this work takes on two forms: developing a set of ACME/PL1 programs which control the apparatus utilizing a LINC computer as an I/O buffer, and investigating the capabilities of the ACME 1800 computer persuant to using it (in a time-shared mode) in place of the LINC. When replacing the LINC with the 1800 it will be necessary to build additional hardware to perform certain timing and logic functionsnow performed by the LINC. It is therefore essential that the operating parameters of the 1800 be accurately known.

Warrick, G.

Name: G_WARRIC

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 supply 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.

Weissman, I.

Name: I_WEISSM

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, but which was simply not feasible using ordinary calculators. 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 for each item. This has been incorporated into a paper which has been submitted for publication. The data analyzed in that paper had been obtained in 1963 and 1964. 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.

Whitcher, C.

Name: C_WHITCH Project: ONCALL

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, weekends 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. Arrangement of schedule for night, weekend, holiday, and emergency coverage is filled with many problems and difficulties. For example, two nights on call in a row (except on weekends) is undesirable and each staff member has certain nights and weekends when he prefers not to cover. These reserved nights and weekends vary from week to week. Furthermore, call is rarely, if ever, popular. Each staff member willingly accepts his share, but none willingly accepts more than his share. It is important for purposes of good morale to be sure that this relatively undesirable work is evenly distributed and properly credited.

At least 10 different types of night call work have to be tallied and evenly divided, including first call with obstetrics on business days, first call without obstetrics on business days, first call on weekends with and without obstetrics, second call on weekends, second call on holidays, and third call Saturdays to accomodate Saturday scheduling. Such schedules would be complex enough if they could be assigned in simple rotation, and this might be done if the number of staff were constant throughout the year. However, the number of staff varies; and the fewer the staff, the more frequent the call. This factor is considered in tallying the calls. Gross tallying errors which have occasionally occurred have incited staff members to count up their weekends on obstetrical or other calls, with the finding that they have received more than their share, and understandably have asked, "How come?

Whitcher, C. (Cont.)

Name: C_WHITCH Project: ONCALLA

Department: Anesthesia

Project Description: 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.

The Department of Anesthesia hopes that ACME will support this important clinical project.

Whitcher, C.

Name: c_whitch Project: Spctrm

Department: Anesthesia

Project Description: Spectral analysis of blood pressure sounds. Determine why blood pressure sounds are difficult to hear under adverse circumstances. The pilot project shows that part of the reason lies in their energy distribution. This work should be extended to verify this.

Wittner, W.

Name: W_WITTNE

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. Our laboratory at the V.A. Hospital is connected with ACME by appropriate lines for the transmission of analog data. Once the various AERs are averaged, they will be analyzed and compared with each other, again by use of ACME facilities.

Should the hypotheses prove to be correct, further research will be conducted to investigate the effects of hormones on these parameters. For this reason this research is supported by Dr. David A. Hamburg's NIMH "steroid grant". Dr. Hamburg and Dr. Bert S. Kopell are involved in this research as my preceptors.

Wittner, W. (Cont.)

Name: W_WITTNE Project: AROGUESS

Department: Psychiatry

Project Description: My plans for computer use between now and July 1969: The actual collection of data has been accomplished. Data are stored on magnetic tape. ACME facilities will be used for data reduction as soon as technical difficulties with the transmission lines are solved, hopefully before July 1969.

Wong, F.

Name: F_WONG Project: MEDONCOL

Department: Medicine/Oncology

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

Wong, F.

Name: F_WONG Project: PLAN

Department: Radiology

Project Description: The research is still under way. We hope soon that we can use the computer to provide the radiation therapists with:

1. External beam treatment planning

2. Interstitial and intracavitary dose calculation

3. Data accession and retrieval

Wong, F.

Name: F_WONG

Project: SUMMARY

Department: Radiology

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

1. To gather the case histories and follow-up information of patients with tumors treated by radiation therapy.

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

Yguerabide, J.

Name: J_YGUERA Project: LUM

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 for kinetic measurements in the nanosecond time range and for the detection of fluorescence and phosphorescence emission from membranes and cells.

Zackheim, H. S.

Name: H_ZACKHE 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.

Zwick, M.

Name: M_ZWICK

Project: CRYSTAL

Department: Biochemistry

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