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

PUBLIC HEALTH SERVICE

NATIONAL INSTITUTES OF HEALTH

SPECIAL RESEARCH RESOURCE ANNUAL REPORT

Report Period: (same as current 12-month budget period) From: August 1, 1967 (mo/day/year) To: July 31, 1968 (mo/day/year)		Grant No. FR 00311-02
Resource Title: Advanced Computer for MEdical Research (ACME)	Resource Address: Stanford University School of Medicine Palo Alto, California	Resource Tel. No.: (415)321-2300 Ext. 5818
Principal Investigator: Lederberg, Joshua	Title: Professor	Academic Dept.: Genetics
Grantee Institution: Stanford University School of Medicine	Type of Institution (Private Univ., State Univ., Hosp., etc.): Private	Investigator's Tel. No.: (415)321-2300 Ext. 5049

Name of Institution's Special Research Resource Advisory Committee:

Computer Policy Committee

Membership of Special Research Resource Advisory Committee
(Indicate Chairman)

Name	Title	Department	Institution

see next page

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

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Gio Wiederhold
Associate Director for the Real-Time Facility

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*Sebbatical Leave 67-68

**Substituting for Dr. Morrel

General Descriptions of Resource Operations

This report covers the period from June 1, 1967, the date of the preceding report, to April 20, 1968. The past year has seen the development of the ACME system from a primitive calculator system to one of the most powerful timesharing systems operating today.

During this second year there was no change in the organizational status of the resource. The entire ACME Facility operates as one of the Stanford Computation Center facilities and received administrative assistance and technical information through SCC's central offices. ACME is housed in the medical school, however, and operates on an independent budget, and its professional staff is solely responsible to the medical school and the needs of medical researchers, as represented by the Medical Computer Committee.

Development of Service Facilities

The initial services ACME provided were miscellaneous batch-type operations while the system was being developed. In May 1967, ACME had started providing calculating services at remote terminals. In July programs could be saved in ACME files and kept available for later use. In August single user data acquisition into the system was provided while other users were calculating. The ACME display was used for the first user project in September. In October small computers could be serviced by the ACME system; and since November, data storage is provided in ACME. In February the system started providing data acquisition service for multiple users. Facilities for reading cards into the system also became available in February.

Current Status of Facilities

The size and complexity of programs that ACME can handle has increased steadily so that a number of programs currently in use at ACME are larger than could be handled in 7090-size equipment. Since no timesharing alternatives of similar scope exist yet at Stanford, which was one of the expectations when the proposal for the ACME system was made originally, the system services a larger quantity of statistical and data manipulation needs than was originally expected. This has slowed down the development of ACME's capabilities for realtime data acquisition and control.

Currently, the system has the capability to handle up to 30 users operating simultaneously. Of these, up to four can use the data acquisition facilities provided by the time-shared 1800. These four share 12 data channels and an aggregate data rate of up to 6000 samples per second. In addition, four data channels are available for high-speed transmission to or from instruments to the 360 processor. However, new high speed applications are still scheduled outside of normal operating hours until they have proven that they do not introduce errors or problems in the overall system. Small computers can be serviced routinely and four of these we connected to ACME.

Future Development Needs

Only two major additions are contemplated to the basic timesharing system: the implemention of external subroutines and provision for double precision arithmetic. The realtime aspects of the system will require further development since they are lagging very much behind current demands.

The other issue is system reliability. Even though the number of system failures we experience are less than is typical for batch operating systems a single failure is felt by many users immediately and the failure rate has to be an order of magnitude less to be tolerable.

Development of the real-time facilities need continuing effort. Both the number of simultaneous users and lines, aggregate data rates, and system response times are less than the demand put on the system by the medical school. Within the current hardware we hope to be able to handle 12 users sharing a 20-kc aggregate rate on the 1800--as well as allow slow-rate collection of data over 24 hours periods.

Development of Usage of the System

We began collecting usage records in September 1967. The table below shows a steady increase of usage over the period of operation. The exceptions in December and January/February are due to major problems that we experienced, mainly with the IBM data cell, which has now been replaced. The detailed accounting covers only actual accounting records, beginning in October when our summary accounting procedure came into operation.

On the detailed usage listing there is an entry for MISC. USERS (no files). This is the total for the many small occasional users--mainly students--who do not keep permanent records in ACME. Neither does ACME keep permanent individual records of their usage.

We have designed our system so that no record is produced when a user's run is terminated due to system failure. In an on-line system this does not mean that all the time is wasted.

SUMMARY OF USAGE DEVELOPMENT

Month and Days	Daily Scheduled Service	Account Records		Account Days Missing	Estimated Usage based on 30 days	
		Console Hours	Page Minutes		Console Hours	Page Minutes
Sept 1 to 30	11-1800	783	220,376		783	220,000
Oct 1 to 31	11-1800	766	260,283		766	260,000
Nov 1 to 30	7-14.30 1800-2200	983	353,936	7*	1227	460,000
Dec 1 to 31	7-14.30 1800-2200	705	297,324		705	247,000
Jan 1 to 20	7-14.30 1800-2200	918	403,649		1377	606,000
Jan 21 to Feb 20	7-15.30 18.30-2200	1056	431,649	6*	1267	518,000
Feb 21 to Mar 20	7-15.30 18.30-2200	1966	826,350		1966	826,000
Mar 20 to Apr 20	7-15.20 18.30-2200	1274	639,826	10*	1911	960,000

* Our usage record system uses IBM's operating system files for its record-keeping functions. Unfortunately, there is an error in this system which has caused us to lose our accounting records three times. A fix is promised by IBM by June, therefore tabulated usage figures in the estimate columns above compensate for the lost days.

Current Problems

Now that the ACME system has developed to a desirable level for the users, reliability becomes of prime concern.

Hardware

Hardware reliability is largely out of ACME control. The ACME staff is trying to develop a better understanding with IBM of the needs posed by real-time operations. A major source of unreliability, the data cell, has been replaced. Higher data acquisition rates, however, are still prone to induce failures in the central processor.

Software

Software reliability, on the other hand, is under ACME control. The staff continues to redesign some system areas that are prone to failure. In addition, the rate of change in our basic system software is slowing down considerably, with resultant positive effects.

Failsoft

In addition, work has been going on and is expected to continue to minimize the effects of both hardware and software failures. Part of the effort is in obtaining control from IBM code when a failure is signalled, and limiting the interruption to one user. Another part consists of utility programs that repair files and programs when a failure has been serious.

Presentations

Even though the ACME project has been productive less than a year, its existence and design are becoming well known.

The ACME project is described in an IBM-distributed film on data acquisition. This film is also scheduled for showing on the educational television network. Another film was made at ACME and shown in Washington for the benefit of IBM salesmen.

ACME will also be on NBC nationwide television May 24th as part of a Frank McGee program on the future of medicine.

Presentations describing the system have been made at:

IBM customer executive class, San Jose, October 6, 1967 (G. Breitbard).
Katholischore Unversteit, Nymegen, Holland, November 6, 1967.
California Nurses Association, Sacramento, California, November 19, 1967.
Cornell Medical School, New York, January 25, 1968.
IBM Computer Center directors' executive class, Poughkeepsie, New York, January 26, 1968.
SHARE PL/I Committee, Houston, Texas, March 1968.
Johns Hopkins University, Baltimore, Maryland, May 3, 1968.
Johns Hopkins Hospital, Baltimore, Maryland, May 3, 1968.
Brooklyn Polytechnic Institute, New York, May 7, 1968.

ACME has received many visitors from many parts of the United States and from outside of the United States. There are currently 253 ACME Notes documenting the system. Our regular mailing list includes 132 addresses in the Stanford community and 32 addresses outside. The PL/ACME user's manual has gone through two major revisions since August 1967; there are approximately 300 copies in use.

Courses

During the year, about 300 medical school faculty, staff, residents, and students attended the three-session ACME course. About 50 percent of these now use ACME at least occasionally.

SUMMARY OF RESOURCE USAGE

The material for this section is presented in two forms in the following pages. The first presentation is computer printout as resource utilization is reported by ACME on a monthly basis. This presentation is then expanded to include the coding needed for NIH to prepare its statistical report. As explained in Section I-A, all utilization is for the period beginning October, 1967.

category=?'ACME STAFF'

Name	Department	project	runs	minutes	pageminutes	Equiv. cost
BREITBARD,G	ACME	/ACME	146	3268	20603	$ 1030.15
CLASS_,C_	ACME	/ACME	236	3441	13088	$ 654.40
CROUSE,L_	ACME	/CATH_LAB	137	5372	59652	$ 2982.60
CUMMINS,D	ACME	/DOMESTIC	203	4584	23372	$ 1168.60
DREW__,D_	ACME	/STAT21	9	15	60	$ 3.00
FEINBERG,DA	ACME	/ACME	193	2329	9119	$ 455.95
FLEXER,R_	ACME	/TV	31	223	1063	$ 53.15
GILMAN,J_	ACME	/ACME	9	4	13	$ 0.65
GIRARDI,S_	ACME	/ACME	64	1542	5388	$ 269.40
HUNDLEY,L_	ACME	/ACME	89	1960	9080	$ 454.00
IBM ENGINEERS	ACME	/TERMDIAG	269	2113	8781	$ 439.05
KORTZEBORN,B	ACME	/DISASTER	22	129	482	$ 24.10
LIERE_,R_	ACME	/ACME	72	3606	25134	$ 1256.70
MATOUS,J_	ACME	/GET	53	470	1537	$ 76.85
MEEK__,J_	ACME	/REST	93	1355	4543	$ 227.15
MILLER,J_	ACME	/pie	95	1499	5500	$ 275.00
MILLER,J_	ACME	/pie	14	97	374	$ 18.70
MOORE_,M_	ACME	/stat	157	4017	34399	$ 1719.95
NELSON,G_	ACME	/ACME	72	1843	43010	$ 2150.50
OSBORNE,D	ACME	/TECH	50	395	1380	$ 69.00
PATEL_,A_	ACME	/ACME	50	410	1384	$ 69.20
PLASCH,G_	ACME	/ACME	95	3443	13178	$ 658.90
PUBLIC PROGRAMS	ACME	/ACME	63	654	2708	$ 135.40
RIEMAN,J_	ACME	/VAT	103	1844	8343	$ 417.15
SANDERS,WJ	ACME	/asdfg	144	7016	42137	$ 2106.85
SANDERS,G	ACME	/CONSULT	64	2401	13702	$ 685.10
SCHACH,E_	ACME	/MEDCOMP	9	49	149	$ 7.45
SCHACH,E_	ACME	/MEDCOMP	286	7281	42066	$ 2103.30
SHIH__,T_	ACME	/STAT	13	159	655	$ 32.75
WIEDERHOLD,V	ACME	/Instruct	8	40	136	$ 6.80
WIEDERHOLD,G	ACME	/test	190	5647	26777	$ 1338.85
WIEDERHOLD,G	ACME	/CSMP	3	59	205	$ 10.25
WIEDERHOLD,V	ACME	/CLASS	95	1638	5699	$ 284.95
WIEDERHOLD,G	ACME	/demo	23	296	1033	$ 51.65
WIEDERHOLD,V_	ACME	/Manual	26	438	1560	$ 78.00
total			3186	69637	426310	$ 21315.43
averages	='hours',= 1160.62	per user	13	290	1776	$ 88.81

,='pagehours',= 7105.16 ;

0 144: PAUSE AT LINE 26.800
RUN!?

category=?'MEDICAL SCHOOL'

Name	Department	project	runs	minutes	pageminutes	Equiv. cost
ADLER_,S_	GENETICS	/SERANAL	9	15	49	$ 2.45
ARONOW,L_	PHARMACOLOGY	/LCELL	53	1207	6430	$ 321.50
BARLOW,IH	PATHOLOGY	/EMISSION	51	1197	5870	$ 293.50
BASSET,RL	GENETICS	/CENSUS	114	3039	30019	$ 1500.95
BASSET,RL	GENETICS	/CENSUS	7	51	177	$ 8.85
BAYER_,A_	ANESTHESIA	/SHUNT	13	155	724	$ 36.20
BAYLEY,P_	BIOCHEMISTRY	/FLU	39	1480	5949	$ 297.45
BEATRICE,ES	PATHOLOGY	/LASER	107	2367	13875	$ 693.75
BEERNINK,KD	FLEISCHMANN	/HANNA	24	184	612	$ 30.60
BELLVILLE,E	ANESTHESIA	/RESPIRAT	11	330	1661	$ 83.05
BELLVILLE,E	ANESTHESIA	/PROBABIL	77	954	3431	$ 171.55
BELLVILLE,E_	ANESTHESIA	/PROB	28	525	2370	$ 118.50
BODMER,W_	GENETICS	/POPGEN	137	5699	31552	$ 1577.60
BOLTON,G_	ANESTHESIA	/SCOPE	25	287	993	$ 49.65
BOLTON,G_	ANESTHESIA	/SCOPE	22	290	1077	$ 53.85
BRAST_,N_	MED	/CATALOG	32	1111	6550	$ 327.50
BRAST_,N_	PSYCHIATRY	/RODENTS	288	9053	66614	$ 3330.70
BRITT_,R_	NEUROLOGY	/STARR	109	3461	31086	$ 1554.30
BROWN_,BN	MED	/PROTEIN	42	1975	16115	$ 805.75
BROWN_,L_	PHARMACOLOGY	/ASSAY	10	56	164	$ 8.20
BROWN_,E_	MEDICINE	/MED_DATA	62	1405	8516	$ 425.80
BROWN,BN	MED	/PROTEIN	7	1	4	$ 0.20
BRODY_,B_	NEUROLOGY	/FLYHIGH	54	2074	7619	$ 380.95
BUNNENBURG,E	CHEMISTRY	/CHEM	25	961	7265	$ 363.25
BUTLER,E_	UROLOGY	/UROLOGY	199	6242	39779	$ 1988.95
CANN__,H_	PEDIATRICS	/GUAT	257	16242	144995	$ 7249.75
CASTELANO,R_	RADIOLOGY	/SCHEDULE	8	128	1146	$ 57.30
CAVE__,P_	ANESTHESIA	/vent1	25	610	2412	$ 120.60
COLLINS,K_	BIOCHEMISTRY	/ATCase	96	3675	32670	$ 1633.50
CONSTANTINO,C	UROLOGY	/AD	5	5	17	$ 0.85
DOERING,CH	PSYCHIATRY	/ISORATIO	14	243	888	$ 44.40
DOERING,CH	PSYCHIATRY	/DESMOLAS	120	4263	20648	$ 1032.40
DONG__,E_	SURGERY	/DATA	6	287	1003	$ 50.15
DONG__,E_	SURGERY	/MARG1	134	6963	95314	$ 4765.70
DONG__,E_	SURGERY	/heart	334	14213	109840	$ 5492.00
DUFFIE,A_	CHEMISTRY	/CHEM	9	37	126	$ 6.30
DURBRIDGE,T	PATHOLOGY	/DEADMAN	140	3017	17393	$ 869.65
EDWARD,D_	PSYCHIATRY	/STRESS	24	252	878	$ 43.90
ENGLUND,P_	ANESTHESIA	/ENZYME	27	966	3865	$ 193.25
ENLANDER,D	PATHOLOGY	/cases	89	3888	14239	$ 711.95
FJELDBO,W_	UROLOGY	/CHEM	12	87	381	$ 19.05
FOLK__,B_	BIOCHEMISTRY	/GRS	22	920	4642	$ 232.10
FORREST,W	VA	/ANALGESI	204	8642	77645	$ 3882.25
GERSCH,W_	NEUROLOGY	/SYNTHESI	45	922	10486	$ 524.30
GLEASON,C	NEUROLOGY	/CORTMEAS	31	1048	5122	$ 256.10
GODWIN,D_	RADIOLOGY	/ADRENAL	48	2893	23462	$ 1173.10
GOLDSTEIN,A	PHARMACOLOGY	/PHA1	195	6966	43938	$ 2196.90
GOLDSTEIN,DB	PHARMACOLOGY	/BARB	64	1857	9134	$ 456.70
GOLDSTEIN,A	PHARMACOLOGY	/APH	19	298	1211	$ 60.55
HAHN__,G_	RADIOLOGY	/RADIATE	26	968	4798	$ 239.90
HANCE_,AJ	PHARMACOLOGY	/MINOTAUR	33	594	2322	$ 116.10
HARRIS,DJ	PEDIATRICS	/EPIGENET	11	305	951	$ 47.55

Name	Department	project	runs	minutes	pageminutes	Equiv. cost
HAUSAMEN,T	MEDICINE	/STAT	98	963	3155	$ 157.75
HELLERSTEIN,D_	GENETICS	/ELECTROT	49	2483	21250	$ 1062.50
HERZENBERG,L_	GENETICS	/PIGGY	51	2121	12655	$ 632.75
HERZENBERG,L_	GENETICS	/LAB	25	393	1479	$ 73.95
HILL___,C_	BIOCHEMISTRY	/MISSENSE	31	1549	5779	$ 288.95
HILF___,F_	VA	/BLACKBOX	22	1042	4705	$ 235.25
HUFF___,J_	GENETICS	/REPRINT	22	267	865	$ 43.25
HWANG_,J_	GENETICS	/GENLIB1	162	3267	20079	$ 1003.95
HWANG_,J_	GENETICS	/MKIRSCH	13	231	820	$ 41.00
HWANG_,J_	GENETICS	/CROUT	198	4576	37849	$ 1892.45
JONES_,D_	BIOCHEMISTRY	/FLU	133	7036	57050	$ 2852.50
KADIS_,L_	ANESTHESIA	/INDIRECT	50	2381	11800	$ 590.00
KAKIHANA,R_	PSYCHIATRY	/ANOVA1	52	994	3154	$ 157.70
KAPLAN,B_	PSYCHIATRY	/PSYCHOPH	19	383	1329	$ 66.45
KAPLAN,HP	NUCLEAR	/BLDVOL1	53	591	3206	$ 160.30
KESSLER,S	PSYCHIATRY	/MATSPEED	14	237	1102	$ 55.10
KOUNTZ,S_	SURGERY	/TRANSPLA	108	2750	14106	$ 705.30
KRAEMER,H	PSYCHIATRY	/PSYSTAT	18	425	1528	$ 76.40
KRISS_,J_	NUCLEAR	/ASSAY	51	565	2476	$ 123.80
KRISS_,J_	NUCLEAR	/ASSAY	49	811	4533	$ 226.65
LEDERBERG,J	GENETICS	/TESTS	12	358	1240	$ 62.00
LEDERBERG,J_	GENETICS	/MEMOPAD	185	5751	41972	$ 2098.60
LEDERBERG,J_	GENETICS	/DENDRAL	28	1006	4317	$ 215.85
LEIBOWITZ,U	PHARMCOLOGY	/MS	11	228	1377	$ 68.85
LIEBES,S_	GENETICS	/MS	164	6424	55760	$ 2788.00
LUETSCHER,J	MEDICINE	/Blood_pr	347	7650	41535	$ 2076.75
LUMB___,J_	MICROBIOLOGY	/C_TUMORS	17	149	510	$ 25.50
LUTZKER,M_	RADIO	/TORY	37	1542	7598	$ 379.90
MACPHERSON,L		/META	32	721	3105	$ 155.25
MAFFLY,R_	MEDICINE	/CO2	52	2132	14700	$ 735.00
MCPHIE,P_	BIOCHEMISTRY	/RNASE	17	315	1164	$ 58.20
MESEL_,E_	PEDIATRICS	/DOGLAB	90	3665	27923	$ 1396.15
MESEL_,E_	PEDIATRICS	/VSD	53	4174	45523	$ 2276.15
MESEL_,E_	PEDIATRICS	/WFR	113	7132	49504	$ 2475.20
MESEL_,E_	PEDIATRICS	/TV	6	37	137	$ 6.85
MESEL_,E_	PEDIATIRICS	/carcat	318	13559	186106	$ 9305.29
MEYER_,S_	MED	/DOSE1	12	142	641	$ 32.05
MILLER,R_	BIOCHEMISTRY	/BIOSTAT	46	1910	10657	$ 532.85
MISC.USERS (no files)	# ACME	/SCRA	1272	27429	102039	$ 5101.95
MORRIS,M_	GENETICS	/MISC	162	3010	9968	$ 498.40
MORRIS,S_	GENETICS	/EXPT4	83	2619	12374	$ 618.70
NALL___,L_	DERMATOLOGY	/PSORIASI	5	117	439	$ 21.95
NELSEN,T_	SURGERY	/GASTRIC	33	528	1722	$ 86.10
NYE____,W_	MICROBIOLOGY	/STRUCTUR	150	6413	31529	$ 1576.45
NYE____,W_	MED	/STUDENT	28	930	4013	$ 200.65
PEARSON,M	BIOCHEMISTRY	/CTCOR	6	73	252	$ 12.60
PETRALLI,J	INFECTIOUS	/MED_DATA	78	7332	43922	$ 2196.10
PORTER,RW	BIOCHEMISTRY	/ATC_KIN	129	6612	38012	$ 1900.60
PRYOR_,H_	MED	/GROWTH	15	425	1460	$ 73.00
RABKIN,R_	GENETICS	/SETUP	12	59	177	$ 8.85
REAM___,AK	MEDICINE	/RETRIEVE	70	1280	7558	$ 377.90
REYNOLDS,WE	GENETICS	/S007	87	4123	23650	$ 1182.50

Name	Department	project	runs	minutes	pageminutes	Equiv. cost
ROSS__,R_	CHEMISTRY	/CHEM	7	2	5	$ 0.25
ROSENTHAL,W_	AUDIOLOGY	/RESEARCH	41	682	2329	$ 116.45
ROSAN_,R_	PATHOLOGY	/OXYCEL	14	483	2196	$ 109.80
ROTH__,W_	PSYCHIATRY	/COMP	63	1413	6495	$ 324.75
SAUNDERS,AM	PATHOLOGY	/MASTCELL	194	6162	25456	$ 1272.80
SCHNEIDERMAN,L	MEDICINE	/PATCHART	13	146	521	$ 26.05
SCUDO_,F_	GENETICS	/MIGRA	27	2117	14655	$ 732.75
SHEFFLER,IE	BIOCHEMISTRY	/OLIGOMER	48	1593	8420	$ 421.00
SILVERMAN,L_	PATHOLOGY	/QUEM	53	1792	7281	$ 364.05
SILVERS|A_	LIPID	/PAT_DATA	314	8798	41522	$ 2076.10
SMALLWOOD,R	MEDICAL	/MEDIPLAN	184	9015	101849	$ 5092.45
STARK_,L_	PHYSIOLOGY	/COMPUP	14	103	347	$ 17.35
STENSON,B	CARDIOLOGY	/CATH_LAB	302	14217	233453	$ 11672.64
STILLMAN,R	PHYCHOLOGY	/PSYGAME	61	1683	6541	$ 327.05
STRICK,R_	MEDICINE	/GASTRIC	81	1485	5969	$ 298.45
STRYER,L_	BIOCHEMISTRY	/NANOS	20	471	2957	$ 147.85
STUEDEMAN,D	GENETICS	/ADMIN	34	1231	5264	$ 263.20
THATHACHARI,YT	DERMATOLOGY	/DOPA	52	1130	4604	$ 230.20
TUCKER,RB	GENETICS	/MS	92	3009	14449	$ 722.45
UPSHER,M_	UROLOGY	/DOCALL	7	24	125	$ 6.25
VONDER,J_	ANESTHESIA	/chuck1	14	88	324	$ 16.20
VONDER,J_	ANESTHESIA	/john1	72	2412	20672	$ 1033.60
VONDER,J_	ANESTHESIA	/larry1	235	9533	79932	$ 3996.60
VONDER,J_	ANESTHESIA	/cardio	11	42	133	$ 6.65
WARRICK,G V		/STEROID	26	409	1603	$ 80.15
WEISSMAN,I	RADIOLOGY	/THYMUS	18	246	946	$ 47.30
WHITCHER,C	GENETICS	/spctrm	10	23	107	$ 5.35
WONG__,F_	RADIOLOGY	/PLAN	63	1782	17651	$ 882.55
ZAJAC_,F_	NEUROLOGY	/FLYHIGH	11	183	632	$ 31.60
total			10512	345592	2504269	$ 125211.56
=' hours ' ,=	5759.86	,=' pagehours ' ,=	41737.8	;		
averages	per user		79	2598	18829	$ 941.44

```
@ 144: PAUSE AT LINE   26.800
RUN!?@
?logoff!
USER G_____Wiederhold_____,PROJECT test      FROM a39 (LINE  5)
TIME ON WAS 21:03,    TIME OFF IS 21:50.     506 PAGE-MINUTES WERE USED.
LOGOFF COMPLETED ON  4/27/68
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category=?'OTHER MEDICAL USERS'
 Name       Department        project     runs  minutes pageminutes Equiv. cost

HARDYCK,C PSYCH   /EMG                      30     2909      27262 $   1363.10
UNIVERSITY OF CALIFORNIA, BERKELEY

total                                       30     2909      27262 $   1363.10

 =' hours ' ,=     48.4833  ,=' pagehours ' ,=    454.366   ;
averages        per user                     0       12        113 $      5.68


0 144: PAUSE AT LINE   26.800
RUN!?
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```
category=?'CAMPUS USERS'
 Name       Department        project     runs  minutes pageminutes Equiv. cost

BERNS_,RI CAMPUS   /A512BERN                13      274       1487 $      74.35
HARBAUGH,JW GEOLOGY ./A504GEOL              73     5333      45010 $    2250.50
JUROW_,J_ SLAC   /A501PHEL                 273     7336      34362 $    1718.10
LEPPERT,G MECHANICAL  /A505LAB              11      438       1860 $      93.00
LIKENESS,B AERO   /A503AERO                14      202       1789 $      89.45
MACINTOSH,J AERO   /A515                    21      685       3558 $     177.90
RABINOWITZ,M_ SLAC   /A501PHEL              10       63        212 $      10.60

total                                      415    14331      88278 $    4413.89

 ='hours' ,=     238.850    ,='pagehours' ,=    1471.30     ;
averages         per user                1       59        367 $      18.39


0 144: PAUSE AT LINE    26.800
RUN!?


category=?'STANFORD COMPUTATION CENTER'
 Name       Department        project     runs  minutes pageminutes Equiv. cost

LIEBERMAN,M_ CAMPUS   /T066AMRE             7       4         12 $       0.60
MOSES_,L_ STATISTICS   /DEVELOPE          171     5410      32730 $    1636.50

total                                      178     5414      32742 $    1637.10

 ='hours' ,=      90.2333   ,='pagehours' ,=     545.700    ;
averages         per user                0       22        136 $       6.82


0 144: PAUSE AT LINE    26.800
RUN!?
```

SUMMARY OF COMPUTER RESOURCE USAGE
PERIOD COVERED 10/1/67 - 4/20/68

Investigator	Project Title	Main Field of Investigation	Subcategory Code
Alder, S.	Data collection for white cell analysis.	Cytogenetics	2310
Aronow, L.	Analysis of laboratory data.	Cellular Pharmacology	1544
Barlow, I.H.	Cell analysis of layer microprobe.	Pathology	2730
Basset, R.L.	Large file handling and processing.	Genetics - census study	2342
Bayer, A.	Pulmonary shunts associated with oxygen intake.	Respiratory Physiology Drug Effects	1713
Bayley, P.	Spectroscopy of biological molecules ORD and CD.	Biochemistry	1360
Beatrice, E.S.	Biochemical analysis of elements by laser microprobe emission spectroscopy.	Biochemistry	2420
Beernink, K.D.	Samples on typhoid fever in the mouse.	Microbiology	3610
Bellville, E.	Quantitative study of anesthetics and of related drugs.	Analgesics	4449 4518
Bellville, E.	Quantitative study of anesthetics and related drugs.	Analgesics	4449 4518
Bellville, E.	Quantitative study of anesthetics and related drugs.	Analgesics	4449 4518
Bodmer, W.	Human white blood cell genetics.	Cytogenetics	2310

Investigator	Project Title	Main Field of Investigation	Subcategory Code
Bolton, G.	Quantitative study of anesthetics and of related drugs.	Anesthesia	4449 4518
Brast, N.	The effects of prenatal glucocorticoid injection on offspring behavior and steroid stress response.	Psychology	1520 3262
Brast, N.	Data-collection and reporting of glucortical injection results.	Psychology	3720
Britt, R.	Auditory regulation.	Neuro Physiology	1717
Brody, B.	Control of movement in hemiplegia.	Neurological Sciences	1716 1717
Brown, B.N.	Statistical analysis of drugs on kidney.	Developmental Pharmacology	3610 3720
Brown L.	Mode of action of barbital.	Biochemical Pharmacology	1569
Brown, E.	Data quality control, storage and analysis.	Medicine	3970
Bunnenburg E.	Use of data converter to replace manual calculations.	Spectroscopy, Magnetic Circular Dichrosm	3610
Butler, E.	Application of computers to urology.	Urology	1714 3720
Cann, H.	Genetic studies in the Lake Atitlan Basin, Guatemala.	Genetics	2342

Investigator	Project Title	Main Field of Investigation	Subcategory Code
Castelino, R.	Computerized on-call scheduling.	Diagnostic Radiology	4230
Cave, P.	Investigation of mechanical ventiliation in infants. Collection of patient data.	Infant Respiratory Distress	3440 3720
Collins, K.	Analysis of chromatograms.	Protein Chemistry	1310
Constantino, C.	Waveform and interval analysis of UMG.	Ureteral Physiology	1714
Doering, C.H.	Neonatal development of the adrenal gland.	Psychiatry	3720 3730
Doering, C.H.	Development of adrenocortical hormone biosynthesis.	Psychiatry	3720 3730
Dong, E.	Development of control system for artificial heart.	Cardiac Surgery	1712 1713
Dong, E.	Analysis and reduction of cardiac data.	Cardiac Surgery	3720
Duffield, A.	High-resolution mass spectrometer measurement on-line.	Organic Chemistry	1230
Durbridge, L.	Laser microprobe of single cells. Oxygen toxicity. Antemortem/post-mortem electrolytes.	Histochemistry	2420 3720
Edward, D.	Time estimation on EEGs.	Psychiatry	3227
Englund, P.	Calculating data for binding of substrates to enzymes.	Enzymology	1310 3720

Investigator	Project Title	Main Field of Investigation	Subcategory Code
Enlander, D.	Data retrieval of hospital records.	Pathology	3720
Fjeldbo, W.	Calculation of renal function studies.	Urology	1310 1714
Folk, B.	Studies of coli alycyl-f-RNA synthetase.	Molecular Biology - Biochemistry	1350
Forrest, W.	Veterans Administration cooperative analgesic study.	Clinical Pharmacology	1569
Gersch, W.	Relationship between intracelluian potentials and neurophysiology.	Neurology	1325
Gleason, C.	Cortical neuroral activity.	Neurology - Electrophysiology	1799 3912
Godwin, D.	Analysis of case records of adrenalectomy for storage, analysis and review.	Radiology - Cancer	3720
Goldstein, A.	Drug-induced mouse activity. Tissue distribution of radioactive levorphanol in mice.	Pharmacology	1530 1582
Goldstein, A.	Drug-induced mouse activity.	Pharmacology	1530 1582
Goldstein, D.B.	Biochemical mode of action of barbital.	Pharmacology	1569
Hahn, G.	Analysis of survival data and simulation of X-irradiated accumulation of cells.	Radiobiology	2414
Hance, A.J.	Miscellaneous statistical treatment of numerical data.	Neuropharmacology (CNS)	1530 3615

Investigator	Project Title	Main Field of Investigation	Subcategory Code
Harris, D.J.	Epidemiology of virus in children.	Infectious Diseases	2730 3720
Hausamen, T.	Biological effects of antibodies to gastrointestinal antigens.	Immunology	2217
Hellerstein, D.	The theory of potentials in neural tissue.	Neurology - Biophysics	1325
Herzenberg, L.	Studies on mouse immunoglobins.	Genetics - Immunology	2356
Herzenberg, L.	Studies of mouse immunoglobins	Genetics - Immunology	2326
Hill, C.	Genetics of missense suppression.	Biophysics & Biochemistry Molecular Biology	1350
Hilf, F.	Mechanical/electrical analysis and recording of psychological data.	Psychiatry	3212 3730
Huff, J.	Mailing list of article reprints.	Genetics and Immunology	3740
Hwang, J.	Statistical plotting & sorting programs.	Genetics	3610 3720
Hwang, J.	Birth weight study.	Genetics	2399
Hwang, J.	Analysis of cyclic graphs.	Genetics	2399 3720
Jones, D.	Nanosecond fluorometric methods for protein structure determination.	Biochemistry	1310 1360
Kadis, L.	Measurment of time interval during systolic contraction of the heart.	Anesthesia	1712 1716

Investigator	Project Title	Main Field of Investigation	Subcategory Code
Kakihana, R.	Steroid stress response to ethanol in inbred strains of mice.	Physiological Psychology	3262
Kaplan, B.	Analysis of psychophysiological data.	Psychiatry	3262
Kaplan, H.P.	Calculation of blood volumes used in isotope procedures.	Hermatology	3222 3262
Kessler, S.	Mating speed analysis in drosofhela pseudoolscura.	Behaviorial Genetics	2338
Kountz, S.	Patho-Physiology of renal transplation.	Transplant Renal Physiology	1714
Kraemer, H.	Biostatistical analysis.	Psychiatry	3610
Kriss, J.	Measuring human material in animals (bio-assay response) .	Nuclear Endocrinology (Medicine)	1730 3610
Lederberg, J.	Training program in genetics. Genetics of bacteria.	Biochemical Genetics	2310 2318 2342
Lederberg, J.	Information retrieval interfacing with display unit.	Genetics	3720
Lederberg, J.	Computer constructing of organic molecules as tree structures.	Genetics	3720
Leibowitz, U.	Clinical and epidemiologic study of multiple sclerosis.	Clinical Neurology	4412

Investigator	Project Title	Main Field of Investigation	Subcategory Code
Liebes, S.	Mass spectral data handling.	Genetics	2399 3720
Luetscher, J.	Hormones and pressor factors in arterial hypertension.	Metabolic Research Endocrinology	1349
Lumb, J.	Study of alkaline phosphatase from chemically induced thymic lymphomas.	Medical Microbiology	1310
Lutzker, M.	Collection and analysis of social service aspects of patient data.	Radiology	3720
MacPherson, L.	Human responses to flashes of light.	Psychiatry	3247 3912
Maffly, R.	Relationship of metabolism to sodium transport.	Ion Transport	1349
McPhie, P.	Kinetics of conformational changes in rifonuclease.	Physical Chemistry of Macromolecules	1360
Mesel, E.	On-line analysis of cardiac catherization data.	Pediatric Cardiology	1712 1713
Mesel, E.	Indicator dilution measurements of pulmonary blood flow.	Pediatric Cardiology	1713
Mesel, E.	Direct measurement of intracardiac blood flow.	Pediatric Cardiology	3430 3440
Mesel, E.	Mathematical modeling technique.	Pediatrics	3710
Mesel, E.	TV display of cardiovascular hemodynamic data.	Cardiology	1712 1713

Investigator	Project Title	Main Field of Investigation	Subcategory Code
Meyer, S.	Radium implant dosage calculation.	Radiation Therapy	1140 3610
Miller, R.	Biostatistical analysis of various medical data.	Biostatistics	3610
Morris, M.	Files of department directory, mailing, list, seminar.	Genetics	3740
Morris, S.	Brain protein biochemistry.	Genetics	2399 3720
Nall, L.	Correlation between psoriasis and diabetes.	Dermatology	
Nelsen, T.	Cancer record keeping.	Surgery	3720
Nye, W.	Genetics of mouse compliments.	Immunology	2220
Pearson, M.	Control of bacteriophaze and RNA synthesis.	Biochemistry	1350
Petralli, J.	Data quality control, storage, and analysis.	Infectious Diseases	3970
Porter, R.W.	Kinetics of aspartate transcarbamylase.	Biochemistry	1310
Pryor, H.	Unable to locate. Research project unknown.	--	--
Rapkin, R.	Experimentation with ACME system.	Medical Student	3799

Investigator	Project Title	Main Field of Investigation	Subcategory Code
Ream, A.K.	Development of method to access medical records for a clinic.	Biomedical Engineering	3720 4230
Reynolds, W.E.	Computer instrumentation of basic research instrumentation.	Genetics	3912
Ross, R.	High-resolution mass spectrometer measurment on-line.	Organic Chemistry	1230
Rosenthal, W.	Statistical analysis of speech pathology and speech perception data.	Speech Pathology and Speech Perception	3720
Roman, R.	Disc electrophoresis of lung secretions in oxygen toxicity.	Perinatal Pathology	2710
Roth, W.	On-line elicitation of patient information and behavior.	Psychiatry	3299 3720
Saunders, A.M.	Quantitative psycology.	Pathology	2410 3470 3730
Schneiderman, L.	Clinical research data indexing.	Clinical Research	3720
Scudo, F.	Genetical models with migration.	Population Genetics	2342
Sheffler, I.E.	Study of d AT diogomers in solution.	Physical Biochemistry	1360
Silverman, L.	Intracellular concentration of proteins.	Subcellular Pathology	2499 2730

Investigator	Project Title	Main Field of Investigation	Subcategory Code
Silvers, A.	Glucose, insulin and triglyceride metabolic analysis.	Lipid Research	1349 3720
Smallwood, R.	Design of medical care facilities.	Medical Facilities Planning	4299
Stark, L.	Neurological control of pupillary area.	Neurophupiology	1717 3970
Stenson, B.	On-line cardiac catherization data analysis.	Cardiac Catherization	1712 1713 3730
Stillman, R.	On-line elicitation of patient information and behavior.	Psychology	3299 3720
Strickland, R.	Effect of corticosteroids on gastric function and structure.	Clinical Research	2211
Stryer, L.	Protein structure and function.	Physical Biochemistry	1360
Studeman, D.	Capital equipment inventory	Property Accounting Genetics	3649 3720
Thathachari, Y.T.	Studies on melanin and melanoma.	Dermatology - Melanin and Melanoma	1300
Tucker, R.B.	Computer control of mass spectronomers.	Computer/Instrument Interaction	3970
Upsher, M.	Resident call schedule	Anesthesia	4230
Von der Groeben, J.	Experimental project -- not used.	--	--

Investigator	Project Title	Main Field of Investigation	Subcategory Code
Von der Groeben, J.	Computer applications in cardiology.	Cardiology - Anesthesia	1712 1713
Von der Groeben, J.	Adaptive digital filtering, sorting, processing, pattern recognition and adaptive classification.	Vector-Electrocardiology	
Von der Groeben, J.	Experimental project -- not used.	--	--
Warrick, G.L.	Analysis of avereaged EEG.	Psychophysiology	3262
Weissman, I.	Role of the thymus in immunocellular differentiation.	Developmental Immuology and Cancer Research	2229 2250 2742
Whitcher, C.	Spectral analysis of korotkov blood pressure sounds.	Anesthesia	4518
Wong, F.	Radiation dosimetry and oncology.	Radiation Therapy and Clincial Cancer Training	4400
Zajac, F.	Mathematical formulation of the kinematic properties of muscle.	Neurophysiology	1716

RESOURCE EQUIPMENT LIST

Period Covered 8/1/67 - 7/31/68

EQUIPMENT LOCATED IN MAIN RESOURCE AREA

Description / Identification	Equipment: Manufacturer	Equipment: Model No.	Equipment: Date Installed	Equipment: Date Accepted	Cost: Purchase Price	Cost: Annual Rental	Cost: Source of Funds
360/50 System	IBM						
CPU		2050-F				80,722.20	SRR (1)
Console Typewriter		1052-7				624.00	"
Control Unit		2821-1				10,732.80	"
Printer		1403-2				8,256.00	"
Card Reader Punch		2540-1				6,528.00	"
Magnetic Tape Model		2401-1				3,312.00	"
Magnetic Tape and Control		2403-1				9,715.20	"
Data Adapter Unit		2701-1				9,724.80	"
Transmission Control		2702-1				12,259.20	" (2)
16 Dist Packs		2316				3,072.00	
						144,946.20	" (1)
Bulk Core		2316-2				74,778.00	" (3)
Disk Drive and Control		2314				51,936.00	" (4)
Trans Control Unit		2701				5,337.60	SCC-CF
18 Communication Terminal		2741				17,884.80	SRR

(1) $115,956.96 cost to SRR; $28,989.24 cost to SCC CF all rentals above are also subject to 5% California use tax.
(2) $4,060.80 paid by Instrumentation Research Laboratory of Genetics Department.
(3) $35,349.60 cost to SRR; $39,428.40 cost to SCC-CF plus 5% use tax.
(4) $37,102.68 cost to SRR; $14,833.92 cost to SCC-CF.

RESOURCE EQUIPMENT LIST

Period Covered 8/1/67 - 7/31/68

EQUIPMENT LOCATED IN MAIN RESOURCE AREA

Description / Identification	Equipment: Manufacturer	Equipment: Model No.	Equipment: Date Installed	Equipment: Date Accepted	Cost: Purchase Price	Cost: Annual Rental	Cost: 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					
Card Read Punch	"	1442					
Card Punch	"	029					
5 Data Sets	Westinghouse Electric	103A2				2,322	SRR
Digital Display	ACME					(1)	"
Oscilloscope	Hewlett Packard				1,500		Macy Grant
Pulse Generator	E. H. Research Labs	139B				1,275	"
Data Transmission Device	IBM	270 X/Y	12/14/67	6/14/68(2)	72,800		50,600 SRR 22,200 Other Fed. Agency

(1) Fabricated and assembled by ACME staff.
(2) If it passes acceptance tests.

RESOURCE EQUIPMENT LIST

Period Covered 8/1/67 - 7/31/68

EQUIPMENT LOCATED IN MAIN RESOURCE AREA

Equipment						Cost		
Description/ Identification	Manufacturer	Type	Model No.	Date Installed	Date Accepted	Purchase Price	Annual Rental	Source of Funds

See communication terminals, IBM 2741, Note 5 in 1-C-1; included as a group as they are moved about from time to time.

Section I-D. Summary of Publication

The publication published during the report period is shown below. The publications originating wholly from members of the faculty in the medical school are not listed.

"An Advanced Computer for Medical Research," W. Sanders, et al, published in the proceedings of the Fall Joint Computer Conference of the American Federation of Information Processing Societies, 1967.

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
	11 Mos.			11 Mos.		
1. Personnel:						
a. Salaries & Wages	$123,221	$185,969	$205,171	$ 87,527	$170,648	$200,271
b. Fringe Benefits	12,938	20,828	23,714	9,190	18,846	23,151
SUBTOTAL	136,159	206,797	228,885	96,717	189,494	223,422
2. Consultant Services	---	---	1,000	---	---	1,000
3. Equipment						
a. Main Resource - Rented	137,888	223,908	246,647	137,888	223,908	246,647
b. Main Resource - Purchased	177,299	1,605	8,500	63,538	1,605	8,500
c. Supporting Equipment	9,016	4,227	7,029	7,131	4,227	7,029
SUBTOTAL	324,203	229,740	262,176	208,557	229,740	262,176
4. Supplies	43,034	26,428	31,000	38,770	25,951	31,000
5. Travel	3,537	4,943	4,000	2,126	3,967	4,000
6. Alterations & Renovations	65,818	---	---	30,818	---	---
7. Publication Costs	1,591	3,305	4,000	1,550	3,305	4,000
8. Other:						
a. Computer time	532	10,344	10,000	507	10,000	10,000
b. Other	18,521	12,116	11,005	16,131	10,616	11,005
SUBTOTAL	19,053	22,460	21,005	16,638	20,616	21,005
9. SUBTOTAL - Direct Costs	593,395	493,673	552,066	395,176	473,073	546,603
10. Indirect Costs	49,101	96,666	108,413	49,101	94,615	107,320
11. TOTAL COSTS	$642,496	$590,339	$660,479	$444,277	$567,688	$653,923

SUMMARY OF RESOURCE FUNDING

	BUDGET PERIODS		
	Actual Previous Budget Period	Current Budget Period	Estimate Next Budget Period
	11 Mos.		
Source of Funds			
SRR Grant (Amount of Award plus unobligated balance from prior period)	$444,278	$567,688	$653,924
Service Charges (when applicable):			
Consulting/Programming			
Peripheral Equipment			
Computer Equipment			
Other Service Charges			
SUBTOTAL			
PHS Funds (identity source)			
Other Outside Support (identity source)			
Josiah Macy Jr. Foundation Grant	85,715	11,572	
NASA Grant	112,502		
Institution Funds			
TOTAL FUNDS AVAILABLE	$642,495	$579,260	$653,924

EXPENDITURE DETAILS

Direct Costs Only

		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
1. PERSONNEL:									
Position	Name								
SCC Assoc. Dir.	Wiederhold, Gio	100	$ 16,850	100	$ 16,850	100	$ 17,600	100	$ 17,600
Systems Programmer	Brietbard, Gary	100	12,475	73	9,088	100	14,000	100	14,000
Systems Programmer	Cummins, David	100	13,313	67	9,113	100	13,800	100	13,800
Systems Programmer	Miller, Gerald	---	---	---	---	70	8,679	100	8,679
Systems Programmer	Patel, Arunkant (term 2-1-68)	100	5,883	100	5,883				
Systems Programmer	Sanders, William	100	13,692	100	13,692	100	14,300	100	14,300
Real-Time Programmer	Crouse, Linda	100	10,392	100	10,392	100	12,000	100	12,000
File Programmer	Frey, Regina (start SCC-CF May 15, 1968)	100	2,670	---	---	100	12,825	100	12,825
Programmer	Feinberg, David	hourly	4,884	100	4,884*	hourly	5,040	100	5,040
Programmer	Nelson, Virginia	hourly	1,484	100	1,484*	hourly	2,400	100	2,400
Engineer	Holtz, Klaus	100	12,600	100	12,600	100	14,025	100	14,025
User Education	Wiederhold, Voy	hourly	3,850	100	3,850*	30	4,200	100	4,200
Statistician	Moore, Mabel (term 1-12-68)	100	3,348	100	3,348				

EXPENDITURE DETAILS (continued)

Direct Costs Only

		Current Budget Period				Estimate for Next Budget Period			
		TOTAL		SRR		TOTAL		SRR	
Position	Name	% of Time or Effort	Amount	% of Salary From SRR Grant	Amount	% of Time or Effort	Amount	% of Salary From SRR Grant	Amount
1. PERSONNEL:									
Statistician	Schach, Elisabeth (started 9-18-67)	100	$ 6,550	100	$ 6,550	100	$ 11,100	100	$ 11,100
Operations Manager	Class, Charles	100	9,730	100	9,730	100	10,400	100	10,400
Computer Operators	(80% x 3)	300	23,349	80	18,679	300	24,500	80	19,600
Computer Operators		hourly	6,515	100	6,515*	hourly	6,071	100	6,071
Computer Technician	Curtis, Gayle (started 10-5-67)	100	4,145	100	4,145	100	6,040	100	6,040
Computer Technician	Osborne, DeWayne	100	6,050	100	6,050	100	6,850	100	6,850
Comp. Tech. Trainee	Hoffman, Stephen	hourly	1,132	100	1,132*	hourly	2,300	100	2,300
Operations Asst.	Bundy, Maurice	hourly	1,172	100	1,172*	hourly	1,200	100	1,200
Operations Asst.	Larned, Stephen	hourly	1,074	100	1,074*				
Student Res. Asst.	Sprague, M. L.					50/9 mos.	2,475	100	2,475
Student Res. Asst.	Lierre, Raymond					50/9 mos.	2,475	100	2,475
Secretary	Plasch, Gyneth	100	5,976	100	5,976	100	6,250	100	6,250
Secretarial Assistance		hourly	855	100	855*	15	941	100	941

EXPENDITURE DETAILS (continued)

Direct Costs Only

	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 of Effort	Amount	% of Salary From SRR Grant	Amount
1. PERSONNEL:								
Position / Name								
Administrative Assistance by SCC		$ 4,816	100	$ 4,816		$ 5,700	100	$ 5,700
Miscellaneous hourly		13,164	97	12,770*	---	---	---	---
SUBTOTAL - Direct Salaries		185,969		170,648		205,171		200,271
Fringe Benefits		20,828		18,846		23,714		23,151
SUBTOTAL - Personnel		206,797		189,494		228,885		223,422

EXPENDITURE DETAILS (continued)

	Current Budget Period		Estimate for Next Budget Period	
	TOTAL	SRR	TOTAL	SRR
2. CONSULTANT SERVICES	---	---	1,000	1,000
3. PERMANENT EQUIPMENT				
Main Resource - Rented				
IBM 360/50 and 2741 terminals	$212,041	$212,041	$208,262	$208,262
IBM 029, 1442, 1826	11,262	11,262	11,118	11,118
IBM 1316 disk packs	605	605	---	---
IBM 2314 direct access storage device (2nd unit)	---	---	27,267	27,267
SUBTOTAL	223,908	223,908	246,647	246,647
Main Resource - Purchased	1,605	1,605	8,500	8,500
Supporting Equipment				
Data set rentals	1,347	1,347	5,229	5,229
Transfer from FR 00311-01	2,880	2,880	1,800	1,800
SUBTOTAL	4,227	4,227	7,029	7,029
SUBTOTAL EQUIPMENT	229,740	229,740	262,176	262,176
4. CONSUMABLE SUPPLIES				
(Grouped by major category)				
Office supplies	3,794	3,317*	4,000	4,000
Engineering Materials & Supplies	22,362	22,362*	27,000	27,000
Miscellaneous Equipment under $100	272	272		
SUBTOTAL CONSUMABLE SUPPLIES	26,428	25,951	31,000	31,000

EXPENDITURE DETAILS (continued)

	Current Budget Period		Estimate for Next Budget Period	
	TOTAL	SRR	TOTAL	SRR
5. TRAVEL	$ 4,943	$ 3,967*	$ 4,000	$ 4,000
6. ALTERATIONS AND RENOVATIONS	---	---	---	---
7. PUBLICATION COSTS	3,305	3,305*	4,000	4,000
8. COMPUTER TIME				
SCC-CF IBM 360/67	10,344	10,000	10,000	10,000
9. OTHER EXPENDITURES				
(Items not included in previous categories)				
Books and Publications	382	290*	350	350
Postage and Freight	51	51*	100	100
Equipment Maintenance	1,678	1,678	2,055	2,055
Subsistence	53	53	---	---
Telephone and Telegraph	5,793	4,384*	4,500	4,500
Physical Plant	720	720	500	500
Technical Services (weekend operators, secretarial assistance)	3,439	3,439*	3,500	3,500
SUBTOTAL OTHER EXPENDITURES	12,116	10,616	11,005	11,005
GRAND TOTAL - DIRECT COSTS	$493,673	$473,073	$552,066	$546,603

BUDGET JUSTIFICATION

There is no significant deviation in the budget for the current year or contemplated in the next year from the three year plan originally proposed for ACME. The resource had substantial funding from the Josiah Macy Jr. Foundation during the first year; but the funds remaining at the end of the 01 year were used during the current period; and we do not expect additional funding from this source during the next year. As the Macy funds were consumed, the NIH funding became a larger percentage of the total support of the resource.

To improve reliability of the system the IBM 2321, data cell drive, and IBM 2841, storage control unit, and two IBM 2311, disk drives were replaced with an IBM 2314, direct access storage device. Reference Dr. Lederberg's letter to Dr. Waxman of February 29, 1968. The 2321 had 400K Bytes of memory and each of the 2311s had 7K Bytes; and the replacement 2314 has only 212K Bytes. This change has resulted in substantially improved performance from the hardware configuration at the expense of data storage capability.

A second IBM 2314, Direct Access Storage Device, has been budgeted for addition to the configuration in February, 1969. It would be desirable to install this device as early as possible but delivery will be delayed to keep within the budget ceiling established for the third year.

Travel expenses have been somewhat higher than budgeted in the award for the 02 year and $4,000 is requested again for 03 year. It is frequently more economical to search out information and advice from institutions and individuals who have experienced problems than to duplicate efforts. In the field of computing the months that separate problem solutions and publication (if any) cannot be afforded.

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Breitbard, Gary	ACME	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION	PROJECT TITLE:
Computer Science	Testing in ACME

AMOUNT OF RESOURCE USAGE:

20,603

PROJECT DESCRIPTION

(Approximately 300 words)

My computer time has been used to bring the ACME software system from a desk-calculator level of operation to a full-scale time-sharing system with generalized file handling, real-time input/output capabilities, and a fairly large statistical library. Extensions to the compiler have included full PL/I character handling facilities, internal procedures, ON conditions for interrupt handling, and complete editing facilities for terminal input/output.

File handling capabilities have been implemented entirely within the past year; they include the ability to store and retrieve PROGRAM files by line number, store and retrieve sequential DATA files, and retrieve DATA files by record KEY.

Real-time input/output capabilities were added to the ACME system this year. Basic to these is an ACME-written IBM 1800 software system that allows the 1800 to act as an input/output multiplexor. The 360 software, which can be called from PL/ACME programs, was written to communicate and provide an interface with the 1800 software. This has permitted input (and limited output) of analog and digital data from research laboratories under control of a terminal-written PL/ACME program. Also, PL/ACME-written programs can call for input/output through the 2701 or 270X data control devices to communicate with auxilliary small computers located in the research laboratories or with an ACME-built vector display.

Most of the computer time for the central ACME project has been devoted to compiling, link-editing, and debugging of the software described above. Remaining time has been divided among:

(1) Aiding users in early stages of real-time data gathering when stand-alone use of the computer was indicated.
(2) Dumping data cell (or disk) files onto tape for back-up storage.
(3) Running an analysis program to find errors in the stored files, and the consequent repairing of files that contain errors.

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Class, Charles H.	ACME	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION:	PROJECT TITLE:
Operations	Equipment Inventory Control

AMOUNT OF RESOURCE USAGE:

13,088 page minutes

PROJECT DESCRIPTION

(Approximately 300 words)

I maintain two equipment inventory control reports using the ACME system, a few demonstration programs to show visitors, and a test program to check status of various system functions.

One equipment inventory file lists ACME's IBM 2741 terminals, by machine number, location, department, installation date, device features, and drilling account number.

A second report lists type of equipment interfaced into ACME, by user, department, cable numbers and distances.

Grant No. FR 00311-02

Section III-A

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT	INSTITUTION:
Crouse, Linda P.	ACME	Stanford Computation Center; Stanford Medical School

FIELD OF INVESTIGATION	PROJECT TITLE:
Systems Programmer	Cardiac Catherization Programs

AMOUNT OF RESOURCE USAGE:

59,652

PROJECT DESCRIPTION

(Approximately 300 words)

Several programs listed under my project were test programs developed for the Cardiac Catherization Lab by ACME and the Dept. of Cardiology personnel. These programs were subsequently transferred to the Department of Cardiology files. They include:

1. A ventricular pressure analysis program to analyze ventricular pressure curves transmitted either on-line or during playback of an FM tape recorder in the catherization lab. The program determines end-diastolic and peak-systolic pressures and the times at which they occur, and maximum slopes on the curve [1].

2. A peripheral pressure analysis program.

3. An analyzer program that analyzes ventricular, wedge, brachial-artery, and atrial pressures. It also calculates some gradients and valve areas.

4. Several EKG programs are being developed for use by the Dept. of Cardiology and Anesthesia. The main program digitally filters the data, picks out QRS complexes, and identifies the onset of the Q wave. Another program simply determines heart rate.

Several smaller programs were written to test various aspects of the 1800/360 system. PB, for example, tests the digital control box used by the catherization lab [2]. A program was written to store preliminary artery and EKG data in data files to smooth the data and to display the results on a 360-controlled TV. A TV program was written to display data transmitted from the catherization lab and other projects. This program displays the original ventricular pressure curve, and indicates the points at which the program picks out the end-diastolic pressure points. The accuracy with which these points are determineddetermine the accuracy of subsequent results. The TV program provides indispensable and quick feedback to the user about whether the visual program is working correctly. The TV program also allows the user to magnify a gradient of data to any power.

Grant No. FR00311-02

Section III-A

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT	INSTITUTION:
Moore, Mabel	ACME	Stanford Computation Center; Stanford Medical School

FIELD OF INVESTIGATION	PROJECT TITLE:
Statistical Programming	Statistical Consulting

AMOUNT OF RESOURCE USAGE:

34,399

PROJECT DESCRIPTION

(Approximately 300 words)

ACME provides statistical consulting service and is building a library of statistical programs, so the system was used for:

a. Consulting and some data analysis.

b Writing and debugging of statistical programs for the library (multiple and polynominal regression analysis programs, plotting program, scheduling program for residents on call.)

Grant No. FR 00511-02

Section III- A

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Nelson, Virginia S.	ACME	Stanford Computation Center; Stanford Medical School

FIELD OF INVESTIGATION	PROJECT TITLE:
Programmer	Clinical Research Support

AMOUNT OF RESOURCE USAGE:

43,010

PROJECT DESCRIPTION
(Approximately 300 words)

Mostly used for program development for clinical research in Psychiatry for Dr. Kopell. Also used for various test programs.

Grant No. PR 00911-02

Section III- A

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT	INSTITUTION:
Sanders, Gary	ACME	Stanford Computation Center, Stanford Medical School.

FIELD OF INVESTIGATION:	PROJECT TITLE:
Consulting	User Consulting

AMOUNT OF RESOURCE USAGE:

13,702

PROJECT DESCRIPTION
(Approximately 300 words)

The purpose is to offer consultation and assistance to users of the ACME system. This aid has proved very worthwhile because most of the users are not computer-oriented. The program help allows the users to get information about any of the keywords in the PL/ACME language, while they are working at their terminals.

Other programs have been written to maintain and update the HELP program.

Grant No. FR 00311-02

Section III- A

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT	INSTITUTION:
Sanders, William J.	ACME	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION:	PROJECT TITLE:
Systems Programming	Hardware & Software Development

AMOUNT OF RESOURCE USAGE:

42,137

PROJECT DESCRIPTION
(Approximately 300 words)

The work was done as a member of the ACME staff. Hence, all of the resource usage was devoted to furthering ACME's goals. Specifically, major amounts of computer usage were devoted to:

1. Hardware testing for a TV display, a small computer interface, a 270X, and a Sanders display interface.

2. Develop system software for the hardware.

3. Developing application programs dealing with the above, along with programs for other applications such as interactive text processing.

Grant No. FR 00311-02

Section III- A

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Schach, Elizabeth	ACME	Stanford Computation Center; Stanford Medical School

FIELD OF INVESTIGATION:	PROJECT TITLE:
Statistical Programming	Statistical Consulting

AMOUNT OF RESOURCE USAGE:

55,768

PROJECT DESCRIPTION

(Approximately 300 words)

The ACME system was used to support the ACME-provided statistical consulting service and for writing statistical programs for our library. More specifically ACME was used for:

a. Consulting (data analysis, demonstrations of program usage and data the handling, debugging and testing of user's statistical programs.)

b. Enlarging ACME's statistical library (Linear regression program, programs for frequently-applied statistical tests, periodogram analysis.)

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Wiederhold, Gio	ACME	Stanford Medical School Stanford Computation Center

FIELD OF INVESTIGATION:	PROJECT TITLE:
Computer Science	Testing in ACME

AMOUNT OF RESOURCE USAGE:

26,777

PROJECT DESCRIPTION

(Approximately 300 words)

Work undertaken under this project title falls into two classifications. The major portion of the usage was the testing of new features, developments of the ACME system, and the writing and execution of special test programs to track down programming difficulties reported by users. Much of this usage took place outside of regularly scheduled hours to avoid interference with user programs.

A number of special debugging and monitoring statements have been made available in the ACME system to allow testing, monitoring, and error checking while other users are receiving regular or slightly delayed service. The effect of this type of computer use has not been felt directly, but has enabled ACME to fix, modify, and adjust the system within a few days to a week--rather than the few weeks to hardly ever experienced in other systems.

The other usage under this project is the collection of usage statistics, both for use as a tool in system development and for monthly summaries used for accounting of non-medical use and reporting to NIH.

Grant No. FR 00511-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Robert Bassett	Genetics	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION:	PROJECT TITLE:
Large file handling and processing	Census

AMOUNT OF RESOURCE USAGE:

30196

PROJECT DESCRIPTION

(Approximately 300 words)

This project was established to prove the practicability of using a direct access system to process investigations on a huge demographic file such as a dicennial census subset, and at the same time, protect the file against any violation of the confidentiality of its content. However, the primitive state of file handling routines in the system at the time, prevented any solutions or conclusions. An estimate of four-fifths of the time utilized in this effort was directed to re-entry of data or programs or restart of programs due to system outage or other failure.

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
E. S. Beatrice	Pathology, Division of Histochemistry	Stanford Computation Center Stanford Medical Center

FIELD OF INVESTIGATION:	PROJECT TITLE:
Cytochemistry	Biochemical Analysis of Elements by Laser Microprobe Emission Spectroscopy

AMOUNT OF RESOURCE USAGE:

13875

PROJECT DESCRIPTION

(Approximately 300 words)

A focused laser beam is utilized in the vaporization of cellular targets. Light from the incandescent vapor is separated into characteristic wavelengths by a spectrograph and the spectral line intensities are measured photographically or directly photoelectrically. A correlation is made between recorded photoelectric voltage and quantity of element in target. Computer is used for statistical analyses of data for each analysis and to provide a graphical display of results.

Each analysis consists of recording laser output as well as the integrated photoelectric voltage. Diameter of crater formed by beam is also noted. Correlations are made of mean standard deviation and coefficient of variation for all three recorded values.

It is hoped that in the near future a direct system will store the data without necessity for considerable time spent on the 2741 terminal. Data for a series of 400 analyses will average 1200 numbers and take 1 1/2 hours computer time. Maximum output of the laser system over 6 hours use would yield 1600 analyses to generate 5000 answers.

Recent work included analysis of 10 nanoliter samples of human serum for calcium and magnesium, and determination of iron in single red blood cells.

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Walter F. Bodmer	Genetics	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION:	PROJECT TITLE:
Human White Blood Cell Genetics	POPGEN

AMOUNT OF RESOURCE USAGE:

31,552

PROJECT DESCRIPTION

(Approximately 300 words)

At the present time our major use of ACME is for the storage and analysis of data relating to white blood cell antigens in humans. We are storing data on up to several hundred people, the basic information being reactions to a variety of sera also up to one or two hundred in number. This data is then processed to analyze the relationships between the reactions of different sera on various sub-groups of our population, the identification of people with various combinations of reactions to the sera required for absorption studies and the investigation of the distribution of serum reactions within families in order to elucidate the genetic control of the identified antigens. Other separate projects involve the use of ACME for following through the consequences of simple population genetic models and for the analysis of data from density gradient centrifugations.

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Neil Brast	Psychiatry	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION:	PROJECT TITLE:
Biochemical and Physiological Psychology	Rodents

AMOUNT OF RESOURCE USAGE:

66614

PROJECT DESCRIPTION

(Approximately 300 words)

The programs under this project title service the laboratory of E. P. Noble, Ph.D., M.D., Assistant Professor. The projects in this laboratory include:

✓ 1. Studies of the steroid stress response to ethanol in inbred strains of mice (Ryoko Kakihana, Ph.D.).

2. A study on the effects of menstrual cycle phase and an anovulatory agent (in women) on biochemical (free fatty acids, plasma cortisol, and urinary catecholamines), biopsychological and psychological variables (Sam Silbergeld, Ph.D., M.D.).

3. Development of accurate assay methods for corticosteroids (John Butte, Ph.D.).

4. A study on the effects of prenatal glucocorticoid injection on offspring behavior and steroid stress response (N. Brast, B.S.).

The programs under this project title fall into three categories:

1. Programs to calculate descriptive and inferential statistics for experimental data;
2. Programs to store and analyze data from fluorometric assays;
3. Programs to store and search bibliographic data.

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
R. Britt	MEDICINE (Neurology)	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION:	PROJECT TITLE:
Neurophysiology	Auditory Regulation

AMOUNT OF RESOURCE USAGE:

31086

PROJECT DESCRIPTION

(Approximately 300 words)

The analysis of voltage recordings from the cortical surface of the brain of a cat. 8 channels of data will be digitized over 5 seconds for 1,000 words per second. The analysis will consist of the computation of:

(1) probability density and probability distributions.
(2) joint probability density and probability distribution.
(3) cross correlations and autocorrelations.
(4) cross spectral density functions.
(5) Fourier transforms of data.
(6) eigenvalues for Schroedinger time dependent wave equation.
(7) diagonal from 3 by 3 Hermitian coherency matrix.
(8) the display of recorded data upon television set for photographing.

The analysis is designed to focus upon differences in phase, amplitude and frequency between recordings under different conditions of stimulation. The differences are also to be translated into quantum mechanical form.

The ACME system has also been used in this laboratory for analyzing comparison of single units (neurons). A number of statistical programs have been written utilizing subroutines made available from ACME for this analysis.

Grant No. FR 00311-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
EDMOND D. BUTLER JR., M.D.	SURGERY (Div. of Urology)	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION:	PROJECT TITLE:
UROLOGY	THE APPLICATION OF COMPUTERS TO UROLOGY

AMOUNT OF RESOURCE USAGE:

39779

PROJECT DESCRIPTION

(Approximately 300 words)

During the past nine months we have had the opportunity to explore the application of computers to Urology in the following areas of investigation:

1. Text Processing -

   Patient History and Physical Examination
   Scientific Manuscripts

2. Data Processing -

   Renal Function Study (Calculation and Interpretation)
   Angiotensin Determination

3. T.V. Graphic Display and Teaching Machine (Computer Based)

4. Programs under development -

   Urinary Infection Study
   Neurogenic Bladder Patient Review
   Ureteral Peristalsis Study (On-line data processing)

Please see accompanying descriptive material for details of each project.

Grant No. RR 00511-01

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Howard M. Cann, M.D.	Pediatrics	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION:	PROJECT TITLE:
Genetics	Genetic Studies in the Lake Atitlan Basin, Guatemala

AMOUNT OF RESOURCE USAGE:

144995

PROJECT DESCRIPTION

(Approximately 300 words)

In this research project we are investigating factors which affect frequencies of genes controlling various human heritable characteristics. A group of Mayan Indian isolates are being studied in the Lake Atitlán region in Guatemala. A high infant mortality rate, the age distribution of these populations and of mortality in these populations, and preliminary sero-epidemiologic studies indicate the harsh environment of these communities.

We are collecting from a number of these communities demographic information concerning fertility and migration, genealogic information, data on significant causes of pre-reproductive morbidity and mortality by means of physical examinations and sero-epidemiologic indicators, and information about polymorphisms of blood by laboratory examination of blood specimens. We are emphasizing data collection from individuals in nuclear family units so that we may undertake segregation analysis of polymorphisms. Studies of distributions of gene frequencies are also being undertaken. Demographic data and information about morbidity and mortality will be used to analyze variation in gene frequency distributions and to analyze distortion of segregation frequencies.

The Stanford University Medical School computer system (ACME) is used to process and analyze the large amount of data being generated from these studies. A complete census is performed for each community for identifying inhabitants participating in the study, for demographic data for our analysis, and for establishing nuclear families and relationships of various individuals in the community. These data are processed by computer at Stanford. Computer analysis of the genetic data is also being undertaken.

At present the Indian community, San Antonio Palopó, consisting of Cakchiquel speakers, is being studied.

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
K. COLLINS	BIOCHEMISTRY	Stanford Computation Center Stanford Medical Center

FIELD OF INVESTIGATION:	PROJECT TITLE:
PROTEIN CHEMISTRY	ATCase

AMOUNT OF RESOURCE USAGE:

32670

PROJECT DESCRIPTION
(Approximately 300 words)

ATCase contains two types of programs and data files. One type is used in conjunction with an amino acid analyzer, to process data gotten from the analyzer. The second type is used in conjunction with ultraviolet spectral studies of the E.coli enzyme aspartate transcarbamylase (ATCase).

First type: An amino acid analyzer is used in our research group for a wide variety of studies in protein chemistry. These include structure - function studies on (borine) ribonuclease, structure - function studies on (E.coli) aspartate transcarbamylase, and extensive studies on the development of procedures for the sequential degradation of peptides and proteins. Thus the analyzer is heavily used by a number of people working on several projects. The analysis of the chromatograms obtained from the amino acid analyzer is laborious and tedious when done by hand. Thus ACME, in conjunction with some other automatic equipment, has been adapted to make these analyses fast, accurate, and dependable. The peaks on the chromatograms are either measured automatically (by an integrator attached to the analyzer) or, if necessary, measured by hand. This data is then fed into an ACME program ("AAanal"), which then processes the data. The features of the program include the following:

a. The input may be either H-W (hand measured) or I (automatically integrated) data.

b. Either the most recently determined set of constants normalization factors for each peak of the chromatogram or the average of the last ten sets (stored in the computer) may be used.

c. The program determines the total weight of the sample analyzed.

d. The amount (in millemicromoles) of each amino acid in the sample is computed.

e. The micromoles of each residue per mg. protein in the sample may be computed.

f. All the data can be corrected (automatically) for tryp to plan destruction.

g. The number of residues of each amino acid in the protein can be computed, and the molar ratios of the amino acids, normalized to any residue, can be determined.

h. The program can deal with 23 amino acids and derivatives, or the 17 commonly occurring acid-stable residues.

Thus the use of ACME has allowed large amounts of data that would have had to be calculated by hand be processed by the computer - with resulting improvements in speed and accuracy, and in the increased versatility.

Second type: ACME is being used to create ultraviolet difference spectra from model compounds to simulate spectra generated on studies of the mechanism of action of the catalytic subumit of aspartate transcarbamylase. The studies have not progressed far enough to evaluate their effectiveness, but the outlook is good that this application will prove meaningful and enlightening in the system being studied. Such a simulation study with model compounds could not be undertaken in any systematic way without access to a computer.

Grant No. [illegible]

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Charles H. Doering	Psychiatry	Stanford Medical School Stanford Computation Center

FIELD OF INVESTIGATION:	PROJECT TITLE:
Neonatal development of the adrenal gland.	Desmolase

AMOUNT OF RESOURCE USAGE

20,648

PROJECT DESCRIPTION

24 April 1968

(Approximately 300 words)

The adrenal gland 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.

From the glands of newborn rats of a particular age group we prepare an enzyme system that catalyzes the conversion of cholesterol to pregnenolone, the hormone precursor. 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 produce 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. To date over 125 incubations ranging over the ages of 1 to 46 days have been carried out and treated in this manner. The project was started in Oct. 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 developmental 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. A report of these findings has been submitted for publication in Science (1968).

Grant No. FR 00511-01

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Eugene Dong, Jr., M.D.	Surgery	Stanford Computation Center Stanford Medical Center

FIELD OF INVESTIGATION	PROJECT TITLE:
Cardiac Surgery	Heart, MARG I

AMOUNT OF RESOURCE USAGE

95,314

PROJECT DESCRIPTION

(Approximately 300 words)

Our project is to develop a control system for an artificial heart. The technique will be to telemeter out blood pressure and flow information from an experimental animal whose heart has been denervated by cardiac autotransplantation. The data will be analyzed and reduced on the 360/50. A mathematical model will then be built which will simulate the data. This model will form a comparison model to the live animal which will then form the trajectory for a controller. A mathematical model will be built into a real time computer such that the heart rate of this animal will be controlled according to the model and according to the biologic stress.

Calculations done are blood volume, renal plasma flow, cardiac output and Fournier analyses.

We are also investigating the rhythmic characteristics of arrhythmics using large volumes of interbeat intervals to characterize the populations.

Grant No. RR 00711-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT	INSTITUTION:
Timothy C. Durbridge	Histochemistry, Pathology.	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION:	PROJECT TITLE:
Laser microprobe; Oxygen toxicity -respiratory epithelium; Antemortem/postmortem electrolytes.	SEARMAN (pathology)

AMOUNT OF RESOURCE USAGE:

173,93

PROJECT DESCRIPTION

(Approximately 300 words)

This project title was used for:

1. Learning how to code in Acme/P1.

2. Statistical evaluation of the relationship between antemortem and postmortem values of electrolytes in serum and with postmortem specimens of vitreus and serebrospinal fluids. While we were able to confirm the semi-quantitative findings of earlier authors, our expectation of being able to quantate antemortem serum electrolyte concentrations was not attained. Substantial use of Acme statistical subroutines was made to show the independance of antemortem and postmortem values within acceptable range.

3. Laser microprobe analysis of single cells. It was decided to organize data in the form of scatter diagrams and plots. It was not clear which parameters were of substantial importance in obtaining "accurate" results. Furthermore, results subjectively assessed as aberrant had been rejected, leading to non-correction of microprobe system defects though quite good results.

By introducing raw data into the computer, a better sample of microprobe output was obtained, and graphical analysis certainly assisted in excluding some supposed inter-relationships, between laser output and pmt difference for example. In this way the development of an efficient microprobe has been accelerated. Initial programming of a 2471 output scatter diagram was time consuming and a run cost about 150 page-minutes for 10 data points. Subsequently the program has been improved to where 200 data points with their mean and standard deviation per X line are plotted for 50 page minutes. Use of thislater program is project laser has saved an estimated greater than 10,000 page minutes when compared to the cost for original scatter diagram program. The effect of organic matrix in plasma and self absorption on cation determinations is now clearer.

Effect of oxygen concentration on exfoliated bronchial epithelial cells. Here the data had greater variance than even in the electrolyte concentration project, smoothing routines and trigonometric interpolation was performed. The results were

/continued

ambiguous.

4. Several extensive programs for manipulation and filing of alphanumeric and numeric data were built. The aim initially was to write a sufficiently generalized program to cope with most of the procedures I was being asked to deal with. These programs cost too much to run, and occupied a great quantity of the system's memory. The project title is now being used to file programs for subsequent partial or complete copying into other projects in an attempt to conserve programming time.

Grant No. FR 00511-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Enlander, DEREK	PATHOLOGY	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION:	PROJECT TITLE:
DATA RETRIEVAL	CASES

AMOUNT OF RESOURCE USAGE:

14,239

PROJECT DESCRIPTION
(Approximately 300 words)

RETREIVAL OF AUTOPSY DATA AND HOSPITAL RECORDS FROM VARIOUS PARAMETERS. PROGRAM WILL BE SUITABLE FOR USE BY SECRETARIAL STAFF INSERTION OF DATA DAILY AND THEN PROGRAMMER RETRIEVAL OF DATA FROM ANY IMAGE PARAMETER e.g. DIAGNOSIS, HOSPITAL RECORD NO., etc.CORELATION OF DATA BETWEEN CASES WILL BE AVAILBLE.

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Wm. H. Forrest, Jr., M. D.	Anesthesia	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION	PROJECT TITLE:
Clinical Pharmacology	Veterans Administration Cooperative Analgesic Study

AMOUNT OF RESOURCE USAGE:

77,645

PROJECT DESCRIPTION

(Approximately 300 words)

The Veterans Administration Cooperative Analgesic Study is a cooperative clinical pharmacological study in five VA Hospitals. It has the following aims:

A. To evaluate compounds now in use for analgesic and sedative activity, and to verify under controlled conditions the claims for efficacy and side effect liability.

B. To evaluate newer analgesics of the non-addicting oral type and to place them in their proper heirarchy with standard drugs namely morphine.

C. To investigate the methodologic problems by use of modern computers and statistics.

D. To stimulate new research into the area of analgesic and sedative evaluation, and to provide a framework for the teaching of clinical pharmacology within the Department of Anesthesia.

This study is conducted by the Anesthesia Section of the various involved Veterans Administration Hospitals under the direction of the Chief of Anesthesia and assisted by Nurse Observers. The Nurse Observer has been trained in the standard method of patient interview for subjective and objective pain evaluation in patients, and for followup and interviews for nighttime sedation. The study is oriented to post-operative surgical patients and patients in whom chronic pain is a problem, or in patients with chronic hospital care requiring nighttime sedation. Double blind crossover techniques are used, except when dose ranging is done. Medications are prepared in identically-appearing form, randomized and numbered serially. Patients are selected according to prescribed methods and questioned for efficacy and side effects.

INDIVIDUAL USER PROJECT DESCRIPTION (continued)

Protocols and forms for collection and management have been devised. The data is collected from all the hospitals at the data collection center here in Palo Alto VA Hospital and is inputed directly through the 2741 Terminal to the Acme System at Stanford. Data is errorchecked immediately upon entry into the system and errorchecking reports are redistributed to the participating institutions. At the present time, our data file includes programs for errorchecking our data, analyzing for means, analysis of variance and potency, confidence curves and orthogonal comparisons. In addition, we are contemplating the use of additional programs which will use the linear hypothesis for obtaining relative potencies in those studies where order effects are important.

Subsequent methodologic studies will be made much easier by immediate turnaround and storage capabilities of the 360/50. In addition, we plan to use our date for historical controls using Bayesian theories of statistics and eventually hope to have output of patient histories from the data inputed on the computer forms.

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
GERSCH	NEUROLOGY	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION:	PROJECT TITLE:
RELATIONSHIP BETWEEN INTRACELLULAR POTENTIALS AND NEUROPHYSIOLOGY - EEG	SYNTHESI

AMOUNT OF RESOURCE USAGE:

10,486

PROJECT DESCRIPTION

(Approximately 300 words)

Two computation activities concerning the relationship between the electrical behavior of single intracellular slow potentials and simultaneously recorded macropotentials (EEG) in a human subject were pursued. Dr. Frank Morrell, Chairman, Department of Neurology provided the data.

In one, transfer function and coherence function computations were performed using the intracellular data as input data and the EEG as output data. The objective was to reconcile Dr. Ross Adey's (UCLA) contentions that there was no significant coherence between the intracellular slow potentials and the EEG and Dr. Morrell's demonstration of significant coherence between particular EEG wave complexes and intracellular potentials. (Reference in 1966 Intensive Study Program of the Neurosciences Research Program, Rockefeller Univ. Press 1967). The computational results achieved demonstrated that the relationship between the intracellular potential and the EEG was linear and time varying. This result is compatable with both the Adey and Morrell findings and reconciles the two points of view. (The results were communicated in

the January 1968 Neurosciences Research Program Meeting on Information Coding in the Nervous System, and will appear in a forthcoming Neurosciences Research Program Bulletin.)

In the second activity a preliminary attempt was made to synthesize an interval of an EEG record using portions of simultaneously recorded intracellular data. The technique employed was to construct a filter matched to particular segments of EEG wave complexes and to extract from the intracellular recording those segments which were very highly correlated with it. The computation is that of a running correlation coefficient as computed through a digital matched filter. Preliminary results suggest that EEG records can be synthesized arbitrarily well by this means. The computational results therefore suggest that what happens at any instant in the macropotential (synchronous behavior) is duplicated throughout the time course of the individual cell intracellular potential. In effect therefore, at least under the circumstances examined, it appears that the macropotential can be interpreted as being primarily due to the summation or average of the intracellular potentials within the field of the macroprobe. Additional experimental and computational studies are contemplated to further understand this phenomenon.

In both cases, the investigation could not be conducted without the use of large scale digital computations.

Grant No. FR 00511-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
David Godwin	Radiology-Surgery	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION:	PROJECT TITLE:
Cancer Records	Adrenalectomy

AMOUNT OF RESOURCE USAGE:

23,462

PROJECT DESCRIPTION
(Approximately 300 words)

Pilot Analysis of Case Records of Adrenlectomy for Storage, Analysis, and Review.

Grant No. [illegible]

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Avram Goldstein	Pharmacology	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION	PROJECT TITLE:
various	APH/PHA1

AMOUNT OF RESOURCE USAGE

45149

PROJECT DESCRIPTION

(Approximately 300 words)

ACME is used for general laboratory computations of several kinds, primarily those in which exhaustive calculations are required following experiments of several days' duration. These uses are all in connection with project Biochemical Mechanisms in Drug Addiction, supported by NIMH. Statistical packages are also used routinely. Some of the studies concern drug-induced activity of mice, measured in photoelectric counter cages at successive drug injections. Other studies involve tissue distribution of radioactive levorphanol in the mouse. Yet other studies concern binding of radioactive levorphanol under various conditions to subcellular fractions of mouse brain homogenates.

ACME is also used for miscellaneous purposes in connection with graduate student training; a number of student projects are handled on this same project account.

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Leonard A. Herzenberg	Genetics	Stanford Computation Center Stanford Medical Center

FIELD OF INVESTIGATION	PROJECT TITLE:
Genetics and Immunology	"PIGGY"

AMOUNT OF RESOURCE USAGE:

12,655

PROJECT DESCRIPTION

(Approximately 300 words)

Our laboratory is engaged in quantitative studies on immunoglobulins in antibody production/mice. ACME has been used to calculate immunoglobulin levels from raw data obtained in experiments, to predict immunoglobulin levels from theoretical curves, to calculate geometric means for antibody assays and operations to convert raw data to useable experimental results. In addition some work has already begun to use ACME to keep track of individual histories of thousands of mice maintained in this laboratory. The program to draw pedigree charts for all of the inbred strains is already in operation. Other programs to study the immunologic history are in process of preparation. It is hoped that programs will be developed to make information retrieval for antisera testing easier and quicker.

Grant No. RR 00711-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
J. Hwang	GENETICS	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION:	PROJECT TITLE:
GENETICS	CROUT

AMOUNT OF RESOURCE USAGE:

37,849

PROJECT DESCRIPTION
(Approximately 300 words)

This project consists mainly of programs for the analysis of cyclic graphs to allow the enumeration of the ring structures of chemistry. Programs analized the trivalent cyclic graphs. The main objectives are to indicate all the possible graphs, isomorphisms of superficially different graphs, symmetries within a graph, rational description of each item, rational ordering of the graphs, rational numbering of the vertices and paths and compact, computable notation for each feature.

Each graph is represented as a Hamilton Circuit projected n the boundary of a regular polygon with N vertices. oining these N vertices and N/2 chords, since each vertex is rivalent. The locations of these chords are specified by /2 characters.

Grant No. FR 00311-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
J. Hwang	GENETICS	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION:	PROJECT TITLE:
GENETICS	GENLIB1

AMOUNT OF RESOURCE USAGE:

20,079

PROJECT DESCRIPTION

(Approximately 300 words)

This project contains the statistical and miscelleanous programs use by the Genetics Department.

Statictical 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.

Grant No. FR 00311-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
R.E.Jones	Biochemistry	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION	PROJECT TITLE:
Protein structure	Nanosecond fluorimetric methods for protein structure determination

AMOUNT OF RESOURCE USAGE:

57,050

PROJECT DESCRIPTION

(Approximately 300 words)

The project under consideration involves the use of a nanosecond fluorimeter designed originally by Bunkley, Osborne, Stryer, and Gardner (Rev. Sci. Inst. 30, 488 (1967)). With this instrument the course of fluorescence of various compounds in solution can be followed directly as a function of time, thus furnishing a method for the direct investigation of emission kinetics (through the observation of the total fluorescence) as well as rotational characteristics (through observation of fluorescence depolarization) of the fluorescent moiety. In the case where a fluorescent label is bound covalently or through Van der Waals interaction to a biological macromolecule, characteristics of the macromolecule can be investigated through the behavior of the fluorescence kinetic properties of the small fluorescent label.

In this project the ACME facility is used for both data collection and data reduction. Data collection is implemented with the 1800 Data Acquisition System and on-line experiments: output from a photomultiplier is projected onto a sampling oscilloscope, the output of which is transmitted to the 1800 after a digital pulse from the 1800 triggers a time sweep in the oscilloscope system. Analog data thus collected is digitalized, stored, and finally the light intensity versus time data is averaged over a series of scans. Further data reduction is accomplished in the 360 by several programs encompassing several data reduction routines. In general, this consists of determining the true course of emission versus time, as the observed emission is convolution of the light source-detector system with the true emission kinetics:

(where F is light intensity and p is the source light pulse as seen by the detection system.)

Grant No. RR-00711-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
J. Lederberg	GENETICS	STANFORD COMPUTATION CENTER STANFORD MEDICAL SCHOOL

FIELD OF INVESTIGATION:	PROJECT TITLE:
Genetics	MEMOPAD

AMOUNT OF RESOURCE USAGE:

41,972

PROJECT DESCRIPTION
(Approximately 300 words)

A program for information retrieval interfacing with the Sanders 720 display. Programs work with multiple files. Files is created by program and store on disk.

Program is called in by IBM 2741 terminal thru ACME. After the compilation by ACME, the excution of the program is initiated on the terminal, all the communication to and from the computer is turned over to Sanders 720 display via the display keyboard.

Program features the option of working with any files, also provides selection of the following actions - create new file, addition of records to the existing files, alter content of any record, delete or insert records, listing any portion of the existing file and search for key words in the file. After each selection is processed user has option of rerunning the program without recompiling. While execution is in progress, in addition of the information displayed on the scope, a list of options and selections is printed on the IBM 2741 terminal to keep track of what has been done during each run.

Grant No. FR 00311-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
SIDNEY LIEBES, JR.	GENETICS	STANFORD MEDICAL SCHOOL STANFORD COMPUTATION CENTER

FIELD OF INVESTIGATION:	PROJECT TITLE:
MASS SPECTRAL DATA HANDLING	MS (MASS SPECTOMETRY)

AMOUNT OF RESOURCE USAGE:

55,760

PROJECT DESCRIPTION

(Approximately 300 words)

The computer has been used to provide various support functions for research in the area of mass spectral microanalysis of organic materials. The mass spectrometer is run in either of two different modes. The data derived while running in one of these modes is transmitted automatically to the ACME system for storage. The other mode requires operator participation in the transmission.

The stored data is subjected to a variety of interpretative manipulations. In one running mode the mass peak locations are quadratically related to the real running time parameter. Linearization of the mass peak displacement has been performed with the aid of the computer thus simplifying the identification of individual peaks.

A computer driven television unit has been used to facilitate the visual comparison of pairs of mass spectra. The unit incorporates a manual control that positions a spot on the screen. The coordinate of the spot location may be entered into the computer by activation of a switch. The basic display format for the program consists of a central area surrounded by a marginal pattern of zones. A wide selection of program decisions can be made in program execution by directing the spot to different zones. This flexibility enables selection, for example, of the spectra (identified by file numbers) to be displayed for each spectrum; the normalization to be used in the peak height display; the identification of the mass numbers associated with various peaks, etc.

Grant No. FR 00311-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT	INSTITUTION:
Liere, Raymond O.	ACME	Stanford Computation Center; Stanford Medical School

FIELD OF INVESTIGATION	PROJECT TITLE:
Consulting	User Program Consulting

AMOUNT OF RESOURCE USAGE:

25,134

PROJECT DESCRIPTION

(Approximately 300 words)

Consultant and programmer. Programs written so far include a scatter plotting routine which plots as many different sets of data as is desired on one graph using a different symbol for each plot; array size checking procedures for approximately 35 statistical subroutines to keep users from writing over the system; and sample programs for an ACME publication which introduces the new user to ACME.

Grant No. FR 00511-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
John A. Luetscher, M.D.	Medicine - Metabolic Research	Stanford Medical School Stanford Computation Center

FIELD OF INVESTIGATION:
Clinical Investigation

PROJECT TITLE: Hormones and pressor factors in arterial hypertension.

AMOUNT OF RESOURCE USAGE

41,535

PROJECT DESCRIPTION

(Approximately 300 words)

The Endocrine Unit of the Department of Medicine is engaged in a study of circulating pressor substances, measured under standardized conditions in patients with hypertension. The effects of sodium loading, sodium depletion, and diuretic administration, as well as changes in posture are observed. We have used ACME in several different ways to increase the efficiency of our laboratory work (for example, in the time-consuming calculations of aldosterone measured by the double isotope derivative method). Statistical analysis is being applied to the results. There appear to be several populations of patients with hypertension, some correlated with clinical findings, and others which require further characterization. Correlation between various factors, such as plasma electrolyte concentrations, circulating catecholamine levels, plasma renin activity, and aldosterone secretion, have been calculated. Curve-fitting methods are applied to certain functions which can be described as the sum of exponentials. With the present programs and files, we can organize and use the data from this expanding group of patients, interpreting and utilizing the information for on-going studies.

Grant No. FR 00311-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Roy H. Maffly, M.D.	Medicine	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION:	PROJECT TITLE:
Ion transport	Relationship of Metabolism to Sodium Transport

AMOUNT OF RESOURCE USAGE:

14,700

PROJECT DESCRIPTION

(Approximately 300 words)

We are measuring simultaneously the rate of sodium transport and the rate of CO_2 production by the urinary bladder of the toad. Rate of sodium transport is measured as the short circuit current. Rate of CO_2 production is measured as the rate of decrease in conductivity of a dilute NaOH solution as CO_2 is trapped. Outputs proportional to each measure are recorded on a dual channel Varian recorder.

The computer is used to facilitate "continuous" (4 minute interval) comparison of the two variables. By means of the computer we calculate (1) rate of CO_2 production from change in conductivity (not a proportional factor); (2) ratio of short circuit current to rate of CO_2 production a) at each 4 minute interval, b) as increments following change of rate by adding variables (hormones, substrates, drugs), expressed as absolute numbers and as percentage change. We can thus compare changes in metabolism to changes in sodium transport to see how they interrelate. In particular we are studying which changes first in different siutations and the different ratios obtained in different situations.

Grant No. RR00311-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT	INSTITUTION:
Emmanuel Mesel, M. D.	Pediatric Cardiology	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION	PROJECT TITLE:
Direct Measurement of Intracardiac Blood Flow	V S D

AMOUNT OF RESOURCE USAGE

45,523

PROJECT DESCRIPTION

(Approximately 300 words)

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 differentid pressure between the left and right ventricles and with the electrocardiogram (ecg); and flow measured by an electromagnetic flow probe (which we consider a primary standard) is compared with flow measured by other techniques used on people (Flick, 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 (eg, 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.

Grant No. FR 00311-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Emmanuel Mesel	Pediatrics	Stanford Medical School Stanford Computation Center

FIELD OF INVESTIGATION:	PROJECT TITLE:
Medical Diagnosis	WFR

AMOUNT OF RESOURCE USAGE:

49,504

PROJECT DESCRIPTION

(Approximately 300 words)

The project is an investigation of mathematical modeling techniques applicable to medical diagrams. The plan is ultimately to apply the cause-effect modeling techniques developed in reference 1 in an environment that allows online interaction between physician and computer model.

Currently programmed is the congenital heart disease model of Warner and his collaborators[2]. Also programmed are text editor routines that are being used to speed the preparation of reference 1.

Though a program has been written to implement the cause-effect modeling techniques of reference 1 using a Burroughs B5500 computer, adapting even that program to ACME will require considerable effect as the program depends heavily on the nearly unique ability of the B5500 to efficiently handle recursion and treat overlay automatically. It is felt that the ability to experiment with the models constructed in a way available only in an online system and that the increased interest and criticism that will result from testing the models produced in a clinical environment justify the effort.

1. W.F. Rousseau, A Method for Computing Probabilities in Complex Situations, Doctoral Dissertation, Stanford University (in preparation).

2. H.R. Warner, A.F. Toronto, L.G. Veasy, R. Stephenson, "A Mathematical Approach to Medical Diagnosis," JAMA , Vol. 177, July 22, 1961, pp 177-183.

Grant No. RR 00711-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Emmanuel Mesel, M.D.	Pediatrics	Stanford Medical Center Stanford Computation Center

FIELD OF INVESTIGATION	PROJECT TITLE:
On-line analysis of cardiac catheterization data.	Carcat

AMOUNT OF RESOURCE USAGE

186,106

PROJECT DESCRIPTION

(Approximately 300 words)

Project "carcat" analyzes cardiac catheterization pressure tracings in children. From catheters in the right and left heart, pressure tracings are transmitted to the ACME computer, converted to digital data, and analyzed 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 sytem 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 eh ACME computer. Research into methods of storing and recalling data for analysis of clinical information will be an important part of our future efforts.

Grant No. FR 00311-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Emanuel [illegible]	Pediatrics	Stanford Medical School Stanford Computation Center

FIELD OF INVESTIGATION:	PROJECT TITLE:
Indicator Dilution Measurements of Pulmonary Blood Flow	[illegible]

AMOUNT OF RESOURCE USAGE

27,923

PROJECT DESCRIPTION

(Approximately 300 words)

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 single 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. [illegible] in [illegible] accumulated so much error during execution that it was [illegible]. Thus if we are to achieve our goal using [illegible], we must go to a [illegible] precision than is now available. Our current efforts are directed at this problem of insufficient precision.

Grant No. FR 00311-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
STEPHEN, JON MORRIS	GENETICS	Stanford Medical School Stanford Computation Center

FIELD OF INVESTIGATION:	PROJECT TITLE:
BRAIN PROTEIN BIOCHEMISTRY	EXPT4

AMOUNT OF RESOURCE USAGE:

123,74

PROJECT DESCRIPTION

(Approximately 300 words)

An inexpensive, easy to realize interface for a Packard # 3314 liquid scintillation counter - IBM 1800 was built and tested. Several support programs written in 1800 Assembly Language and PI/1 complete the interface. (A full description is available in ACME Note #TRA-1). The interface makes possible direct reading of data into ACME data files from the counter output.

Grant No. FR 00311-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT	INSTITUTION:
W. Nye	Medical Microbiology	Stanford Medical School Stanford Computation Center

FIELD OF INVESTIGATION	PROJECT TITLE
see below	see below

AMOUNT OF RESOURCE USAGE:

31529

PROJECT DESCRIPTION

(Approximately 300 words)

The usage of this terminal under this name actually represents usage by several investigators in this department. Mr. Nye has written most of the programs and his field of usage has been calculation of equilibrium constants of antibody-hapten reactions and structural studies. Dr. Rosenberg has used it for genetic studies of complement in mice. Dr. Stocker has used it for genetic studies in bacteria, and Dr. Amkraut for statistical studies of the immunologlobulins in man. It has also been used in a pedagogic sense by students of these men as well as for manuscript editing. As the advantages of time sharing and data files become more evident, and directly connected instrumentation becomes more commonplace, it is expected that there will be considerably more usage by this department.

Grant No. FR 00311-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Dr. Petralli	Infectious Diseases	Stanford Medical School Stanford Computation Center

FIELD OF INVESTIGATION:	PROJECT TITLE:
	Med-Data

AMOUNT OF RESOURCE USAGE:

43,922

PROJECT DESCRIPTION

(Approximately 300 words)

This project deals with the data collected in the Hospital Bacteriology Laboratory, quality control of the input as well as storage in a form suitable for later analysis.

As conceived the project will proceed as follows: the secretaries will type the information at the terminal. The data will be placed in a temporary file from which it will be analyzed for quality control. Data not consistent with previous data will be questioned and perhaps the laboratory test repeated. The data will then be placed in a complete file and a sorted file, each of which may be used for later analysis. The temporary file will be used to put out the daily laboratory reports. This step will include some calculations such as conversion of sensitivity zone size to "sensitive" or "resistant".

Using the computer to put on daily reports allows the project to proceed without addition of personnel to type in information. The input time of the secretary will be less than the time usually required to type reports.

The data analysis will give us information about the sensitivities of various bacteria to antibiotics. This information will help us to decide which treatment to use in certain cases. We will also be able to detect significant changes in sensitivity as well as major trends.

Grant No. FR 00311-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Robert W. Porter	Biochemistry	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION:	PROJECT TITLE:
Kinetics of Aspartate Transcarbamylase	ATC_KIN

AMOUNT OF RESOURCE USAGE:

38,012

PROJECT DESCRIPTION

(Approximately 300 words)

ATC_KIN contains six programs used for the study of the reaction catalyzed by the enzyme, aspartate transcarbamylase. Program LstSq simply calculates a least-squares linear fit and standard deviation. Program DataFit calculates initial rates of reaction from experimental data. These data are time points and counts per minute of product at each time point. Initial rates are calculated by a least-squares linear fit; rates are taken from the fitted slopes, converted to molar values using a value for specific radio-activity, and also corrected for enzyme concentration. This program, like the others in Project ATC_KIN, has been written so that it can be operated easily by other workers in the research group without experience in using computers.

Other programs are used to fit the various kinetic equations which describe the relation of initial rate to substrate concentration. Program HyperFit fits the simple hyperbolic equation, called the Michaelis-Menten equation. The curve fitting procedure is very crude. For the two constant parameters in this function, initial estimates are provided, with ranges to be tested for both. In a first step, a coarse fit is obtained by testing all the combinations of the trial values for the two parameters, in coarse steps covering the two ranges. In succeeding steps, the operator provides new, smaller ranges to be tested, repeating this procedure until achieving a sufficiently defined pair of values. Next the data points are scanned for deviations from this fitted curve, and the point with the largest deviation may be rejected, at the option of the operator. If the point is rejected, the fitting process is repeated, giving new values of the two parameters for the best curve.

Program DataFit 2 simply gives a least-squares linear fit for the linear equation obtained from the reciprocal form of the Michaelis-Menten equation, first calculating reciprocal values of the data points, and also calculating the kinetic parameters from the fitted slope and intercept. These values are then used as the initial estimates for use in Program HyperFit.

Program DataFit 1 fits the much more complicated equation which describes the kinetics of the two substrate reaction, or the similar equation for the kinetics in the presence of inhibitor. The equation fitted is in the simpler reciprocal form, which predicts a family of straight lines having a common intersection. The program is designed to select the values for the coordinates of the common intersection point which gives the lowest value for the deviations of all the experimental points from their corresponding best lines. The fitting procedure is similar to the crude trial-and-error method described for program HyperFit. It should be noted that this curve-fitting procedure requires the use of an on-line communication system.

Finally, Program ATCase 11 is a manuscript in preparation for publication of these kinetic studies.

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Walter E. Reynolds	Genetics - Instrumentation Research Lab	Stanford Medical School Stanford Computation Center

FIELD OF INVESTIGATION:	PROJECT TITLE:
Computer instrumentation of basic research instrumentation	S007

AMOUNT OF RESOURCE USAGE:

23,650

PROJECT DESCRIPTION
(Approximately 300 words)

The "S007" project is a subset of the general work of the Instrumentation Research Laboratory, Genetics Department, in the field of instrumentation research conceived to answer the question, "What kind of automated basic biological instrumentation would be suitable for interplanetary probes of exobiological life forms?" Actual accomplishments of this laboratory have shed light upon that area and have immediate here and now applications in conventional biological and medical research. An example is the computer-directed mass spectrometer implemented by this laboratory and reported in this laboratory's Technical Report No. IRL 1062. A quadrupole mass spectrometer was uniquely controlled by a computer to achieve a high order of instrument efficiency.

The "S007" account supports technical and engineering development. Programs to help in engineering design have been written and used. Two such programs are "RCs" and "Dblfocus." The first of these examples was a straightforward electrical engineering circuit analysis aid and the second was an evaluation of the accuracy and complexity of instrumentation needed for a contemplated mass spectrometer purchase. Other "S007" files have experimental data useful in the development of algorithims to be used in the control or data acquisition modes of ACME. "TRACE" and "PICKER" are examples of this type.

This investigator's prime interest is in the time-shared instrumentation capability that ACME is to develop. This is the direct digital connection of the ACME computer to laboratory instruments. All of this investigator's usage of ACME

has been directly or indirectly in pursuit of this goal. To this date usage has been in anticipation of ACME's ability to serve these direct instrumentation needs of this laboratory, primarily in the field of mass spectrometers.

Once principal goal is the integration of an Associated Electronic Industries (AEI) model MS-9 mass spectrometer into the ACME data system. This work is being supported by NIH grant 5 RO1 AM 04257-07.

Grant No. RR 00511-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
A.M. SAUNDERS M.D.	PATHOLOGY	Stanford Medical School Stanford Computation Center

FIELD OF INVESTIGATION:	PROJECT TITLE:
QUANTITATIVE CYTOLOGY	MAST CELL

AMOUNT OF RESOURCE USAGE:

25,456

PROJECT DESCRIPTION

(Approximately 300 words)

Individual objects, cells or standard spheres, are measured at a magniffication of 1000-3200x in a microscope for size and flourescence intensity at a specified wave length. Data thus tabulated forms the basis for statistical analysis by computer. The computer is used similarly in calculating corrections when the microscope is used as a spectroflourimeter. Two manuscripts have been accepted and two are in preparation using these facilities.

The computer is also used to write the text of the MS.

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT	INSTITUTION:
F. M. Scudo	Genetics	Stanford Medical School Stanford Computation Center

FIELD OF INVESTIGATION:	PROJECT TITLE:
Population Genetics	Migra

AMOUNT OF RESOURCE USAGE:

14,655

PROJECT DESCRIPTION

(Approximately 300 words)

The program tabulates the results of models for the genetical variability among populations in a linear array, with migration between adjacent colonies.

The basic quantity is given by the symmetric recursion

$$\alpha(F_{d+2} + F_{d-2}) + \beta(F_{d-1} + F_{d+1}) + \gamma F_d = 0;$$

its proper, special solution has the form

$$F_d = A_1\alpha_1^d + A_2\alpha_i^d$$

where A_1, A_2 are very complicated algebraic functions of the parameters. The final quantity is a linear combination of F_d's, d up to a few hundred. Thus, with the precision of this computer, a too large error would result from its direct application.

To avoid this an equivalent direct procedure has been applied to the vector $F_0, F_1, \ldots, F_d$, making use of the asymptotic property $F_{d+1} \approx X_1 F_d$. Initial vectors were calculated by an approximate formula and iterated to determine if they were increasing or decreasing. The two nearest ones of each kind were stored and, as new trial vectors, their average was used. The process was repeated till oscillations of the last digit, due to truncation, were observed. Thus final precisions of the order of 10^{-5}, determined by perturbation of the parameters, were obtained. Time required for each calculation varied from a few minutes to more than one hour, according to the value of the parameters.

Grant No. FR 00311-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Abraham Silvers, Ph.D.	Medicine	Stanford Medical School Stanford Computation Center

FIELD OF INVESTIGATION:	PROJECT TITLE:
Metabolism	Lipid Research (PAT_DATA)

AMOUNT OF RESOURCE USAGE:

41,522

PROJECT DESCRIPTION

(Approximately 300 words)

Our laboratory has used extensively the ACME computer. We used the computor for two major purposes:

A. ACME is used for considerable statistical computations and for the processing of laboratory data. We have been able to improve our insulin assay significantly, and have obtained calculated values in a fraction of the time ordinarily spent on these computations in the past. The ACME statistical library has given us many programs which have proven to be very useful.

B. The ACME system has been helpful in the investigation of problems of glucose, insulin and triglyceride metabolism.

1. It has enabled us to obtain an initial mathematical formulation for the transport mechanism of glucose across the cell membrane when modified by insulin.

2. We have been able to obtain approximate answers for the kinetic constants describing 2 and 3 pool models.

3. It has been helpful for obtaining simulations of theoretical curves and therefore has given us insights into the possible mechanism operating in a particular metabolic situation.

We expect in the near future to utilize the analog digital conversion abilities of ACME and to expand our use of ACME considerably.

Grant No. FR 00311-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT	INSTITUTION:
R. Smallwood	Dean's Office	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION	PROJECT TITLE
Medical Facility Planning	MEDIPLAN

AMOUNT OF RESOURCE USAGE:

101,849

PROJECT DESCRIPTION
(Approximately 300 words)

The Stanford Medical Facilities Planning Group is carrying out a system planning study for the design of the new Stanford Medical Care Facilities. The project is dependent upon the services of ACME for two important functions. The first of these is as a data gathering vehicle for acquiring medical information from the Medical School faculty and community physicians. In the evaluation of alternative design strategies for the Medical Care Facilities it is important that the medical care demands of the patients be known. To acquire this information a computer dialogue system has been programmed on ACME for interviewing doctors and encoding their standards of high quality medical care. This dialogue system has been completed and an extensive data gathering experiment is currently getting under way.

The second important use of ACME to the Medical Planning project will be in the evaluation via simulations of alternative macro organization strategies for the facility design. These simulation programs will use the data gathered via the dialogue system plus some estimate of patient mix to simulate the total patient care demands that will be made on the major units of a particular design. In this way estimates of the relative efficacy of particular designs can be obtained. Some preliminary programs toward this end are in the process of development. Later work under this project will very likely involve a much more extensive development of these simulation programs.

Grant No. FR 00311-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Robert Stenson, M.D.	Cardiology Division Dept. of Medicine	Stanford Medical School Stanford Computation Center

FIELD OF INVESTIGATION:	PROJECT TITLE:
Cardiac catheterization	Cath Lab

AMOUNT OF RESOURCE USAGE:

233,453

PROJECT DESCRIPTION

(Approximately 300 words)

The Cardiology Division is currently employing the Acme computer system to develop a reliable, on-line method for analysis of cardiac catheterization data. At present four lines of analog data are being transmitted from transducers and a dye densitometer located in the catheterization laboratory to the IBM 1800 process control computer where the information is digitized at a rate of 100 samples per second. After completion of the sampling the information is transferred to the IBM 360/50 digital computer where analysis of atrial, ventricular, pulmonary artery, aortic, wedge and brachial artery pressures and cardiac output are performed. The results of the analysis permits of computation of various points of interest in the ventricular and arterial pressure waveforms such as end diastolic and maximum systolic pressures, diastolic and systolic time intervals, and A-V and semilunar valve gradients and areas. A preliminary description of the system and methods of analysis is contained in the articles entitled Computer Analysis of Cardiac Catheterization Data which has been accepted for publication in the American Journal of Cardiology and A Time-Shared Digital Computer System for On-Line Analysis of Cardiac Catheterization Data which has been submitted for publication to Computers in Biomedicine.

The ultimate design aims of the program are:

1. Rapid computer-cardiologist interaction
2. Capabilities of performing more detailed analysis of pressure waveforms and transient phenomena than can be conveniently accomplished at present
3. Computer service for peripheral catheterization laboratories
4. Centralized data files containing catheterization data and various important clinical features of patient records for correlation studies.

Grant No. FR 00511-02

Section III-B

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Robert B. Tucker	Genetics (IRL)	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION:	PROJECT TITLE:
Computer -- Instrument Interaction	Computer Control of Mass Spectrometers

AMOUNT OF RESOURCE USAGE:

14449

PROJECT DESCRIPTION

(Approximately 300 words)

The ACME facilities are being used in the development of computer controlled instrumentation. This involves using the 360/50 either to communicate with a small laboratory computer or communicate directly with the instruments in the laboratory.

Data collected by a LINC computer (a small bio-medical computer) from mass spectrometers is being sent to the 360 where calculations are performed on it. The output is then returned to the LINC where it is displayed on a CRT display unit. Utilizing the 360 in this operation increases the speed at which the calculation can be done and provides the opportunity to program for them in a higher level language (PL/1). The communication is done via the 270X-270Y general purpose digital interface.

The 270X-270Y system also provides the ability to communicate directly with laboratory instruments and other devices (for example digital plotters). Programs have been written for testing the capabilities of this equipment and the 1800 Process Controller to compare their capabilities to those of the LINC for instrumentation control. In this instance the instrumentation involved is a GLC/mass spectrometer system. It is intended that with the ACME time sharing system we will have the flexibility and accessibility of the small computer combined with the capacity for data storage and computing of the large computer.

ACME is also being used in a rather conventional sense for time shared data storage and retrieval.

INDIVIDUAL USER PROJECT DESCRIPTION

INVESTIGATOR:	DEPARTMENT:	INSTITUTION:
Jobst von der Groeben, M.D.	Anesthesia	Stanford Computation Center Stanford Medical School

FIELD OF INVESTIGATION:	PROJECT TITLE:
Vector-electrocardiology	Larry[1]

AMOUNT OF RESOURCE USAGE:

79,932

PROJECT DESCRIPTION
(Approximately 300 words)

The programs separate basically into two categories: (1) PDP-8/ACME interfacing and utility routines, and (2) ACME data processing routines.

The PDP-8/ACME programs consist of generalized inter-computer communications, 2-way data transmission and 2-way storage routines which operate with the PDP-8 slaved to ACME. Utility programs provide some PDP-8 capabilities on ACME (e.g. PDP-8 assembly language program listings.)

Some of the major data processing programs are:-

(1) An adaptive digital filtering program for removing muscle tremor in the ECG waveform.

(2) A sorting program which allows re-grouping and listing of patient data stored on disk files by age, sex, diagnostics, etc.

(3) A processing program which given output from the sorting program computes various parameters for any time increment over the ECG waveform (e.g. mean, variance, conversion of rectangular to polar coordinates).

(4) Non-parametric pattern recognition algorithms to dichotomize disease entities collected and pre-processed by the PDP-8. The work is in early stages of development, thus it is premature to predict the eventual power of such procedures applied to the diagnosis of ECG waveforms.

(5) An adaptive classification program is in progress which forms a pattern vector from samples of the P-wave and QRS-wave. The vector is multiplied by a matrix to remove statistically insignificant elements, and the euclidean distance between the vector being classified and a set of vectors with known classification is measured. Using a massive amount of data soon to be collected and transferred from the PDP-8 to the ACME system, it is expected that the program will provide a significant improvement in current diagnostic techniques.