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

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Professor of Anesthesia

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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	per user		13	290	1776	$ 88.81

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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	6012	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
SILVERSIA_	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
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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

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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
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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
Roson, R.	Disc electrophoresis of lung secretions in oxygen toxicity.	Perinatal Pathology	7710
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