



LARS · Purdue University · Vol. 5 · No. 1 · January 19, 1979

PETERSON RECEIVES AGRONOMIC SERVICE AWARD

It was with pride and gratitude that the American Society of Agronomy recognized JOHN PETERSON with the Agronomic Service Award for outstanding contributions to agronomy through education, national and international service, and research.

This award, one of six major awards given out, was presented at the 70th Annual Meeting of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America, held in Chicago, Illinois, on December 3-8.

JOHN B. PETERSON, Associate Director of the Laboratory for Applications of Remote Sensing (LARS), Purdue University, holds degrees from Oregon State and Iowa State Universities. He was a postdoctoral National Research Fellow (Rockefeller Fellow) in geology and geography, University of California-Berkeley.

He has served as a teaching and research staff member of the Agronomy Department, Iowa State University and Head, Department of Agronomy, Purdue University.

Dr. Peterson has consulted in Latin America for FAO, USAID, and the Ford and Rockefeller Foundations, and in Greece and Saudi Arabia. He has devoted much of his career to acquainting people with the significance and utility of scientific advances made in agronomy. He is a Stevenson Award Winner in Soil Science; a Fellow of ASA, SSSA, and AAAS; and a past president and Honorary Member of ASA.

REMOTE SENSING IN AGRONOMY/SOILS PRESENTED

LARS staff members working in agronomy and soil survey recently presented remote sensing research at two annual meetings and through journal publications.

Prepared by the Laboratory for Applications of Remote Sensing for distribution at Purdue. Contact Susan Ferringer, SCAN LINES editor, to be placed on the mailing list (749-2052, ext. 290).

The 70th Annual Meeting of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America, was held in Chicago, Illinois, on December 3-8. MARVIN BAUER, CRAIG DAUGHTRY, and their graduate students JEFF KOLLENKARK and GREG WALBURG attended, along with SUE KAST, ERIC STONER, JOHN PETERSON, MARION BAUMGARDNER and STEVE KRISTOF. The following papers were presented (* indicates speaker):

"Delineating Soil Map Units by Digital Analysis of Satellite Data Acquired in Winter" S.J. KRISTOF*, M.F. BAUMGARDNER, F.R. KIRSCHNER

"Remotely Sensed Data Analysis Techniques Designed to Aid a County Soil Survey" S.A. KAST*, R.A. WEISMILLER, F.R. KIRSCHNER

"Methods of Correlating Soils and Soil Conditions to Spectral Classes Derived by Digital Analysis of Landsat Data" E.J. HINZEL*, R.A. WEISMILLER, F.R. KIRSCHNER

"Mapping and Estimating Areal Extent of Severely Eroded Soils of Selected Sites in Central and Northern Indiana" C.F. SEUBERT*, S.A. KAST, F.R. KIRSCHNER

"Estimations of Wheat Canopy Variables from Reflectance Measurements" J.S. AHLRICHS*, M.E. BAUER, C.S.T. DAUGHTRY, M.M. HIXSON

"Field Measurement of Reflectance Characteristics of a Typic Argiaquoll and an Aeric Ochraqulf With and Without Surface Corn Residue" E.R. STONER, M.F. BAUMGARDNER, R.A. WEISMILLER

The 94th Annual Meeting of the Indiana Academy of Science was held at Anderson College, Anderson, Indiana, on November 2-3. These two papers were presented from LARS (* indicates speaker):

"Detection of Soil Moisture Variation from Vegetative Cover Analysis of Multitemporal Landsat Data" S.J. KRISTOF*

"Predictability of Change in Soil Reflectance on Wetting" R.H. BECK*, J.B. PETERSON, B.F. ROBINSON

Two related articles have also been published in the following technical journals:

"Application of Remote Sensing Technology to Soil Survey Research", R.A. WEISMILLER and S.A. KAST, Journal of Soil and Water Conservation, November-December 1978.

"Map Unit Composition Assessment Using Drainage Classes Defined by Landsat Data", F.R. KIRSCHNER, S.A. KAST, R.A. WEISMILLER, H.R. SINCLAIR, and E.J. HINZEL, Soil Science Society of America Journal, September-October 1978.

NEW BOOK ON REMOTE SENSING EDITED AND AUTHORED BY LARS PERSONNEL

Remote Sensing - The Quantitative Approach provides an integrated and comprehensive introduction to numerical remote sensing. This monograph, edited by PHILIP SWAIN and SHIRLEY DAVIS, is published by McGraw-Hill International Book Company. It contains materials prepared by the following contributing authors: DAVID LANDGREBE, TERRY PHILLIPS, ROGER HOFFER, JOHN LINDENLAUB, LEROY SILVA, as well as by PHILIP SWAIN and SHIRLEY DAVIS

The text begins by outlining the ways in which information about the earth is captured in remote sensing data and contrasts two different approaches for recovering that information. One of these approaches, the quantitative or numerical approach, is shown to be particularly attractive for a large class of applications. Detailed treatment of this approach is, of course, the subject of this book.

The physical basis for remote sensing is presented in Chapter 2, with detailed attention given to those aspects which support the quantitative approach. Chapters 3 and 4 are devoted to the computer-

oriented technology for remote sensing data handling and data analysis. The remainder of the book provides the reader with the critical links between the available technology and its practical applications. It treats the physical properties of natural materials, presents some applications examples, and provides a basis for judging future developments and potentials.

In addition to the expository material, each chapter contains statements of educational objectives and thought-stimulating questions and problems. To further aid the reader, the book includes lists of references to the literature and a glossary of remote sensing terminology.

The material is presented at a level suitable for graduate and advanced undergraduate students as well as professionals new to the field of remote sensing. It assumes the reader has only a general scientific background.

HOFFER ELECTED OFFICER OF ASP DIVISION

ROGER HOFFER was recently elected Vice-President of the Western Great Lakes Region of the American Society of Photogrammetry. This region includes the states of Indiana, Illinois, and Wisconsin. Dr. Hoffer and his fellow officers were installed by ASP President Clif Crandall in Milwaukee, Wisconsin, on the evening of November 17.

SPECIAL SEMINARS FEATURED IN LARS TRAVELOG

DAVID LANDGREBE recently presented two seminars at Purdue on earth resources. On November 16, he presented an EE400 undergraduate seminar entitled, "Electrical Engineers and Earth Resources." Dr. Landgrebe also presented an EE694 graduate seminar entitled, "Observation of the Earth's Surface from space: Where Do We Stand?"

A series of special presentations were given at Houston, Texas, during the SR&T Quarterly Review held in late November. Their purpose was to summarize the state of the art of the various parts of remote sensing technology. Speakers were: MARVIN BAUER, JIM KAST, PAUL ANUTA, MARION BAUMGARDNER, ROGER HOFFER, PHIL SWAIN, JOHN PETERSON, LEROY SILVA, and DAVID LANDGREBE, Chairman.

LEROY SILVA and BARRETT ROBINSON continue to travel for the Multiband Radiometer project. Robinson reviewed the design and specifications of the multi-band radiometer at Stamford, Connecticut on December 9-10, with Silva joining him at Johnson Space Center, Houston, Texas, on December 14-16.

PAUL ANUTA, DAVE FREEMAN, and DICK MROCYNSKI attended the FRIS Review at NASA/JSC on November 14-16. While there, Anuta also consulted with JSC personnel about digitization of forest resources.

The United Nations Development Programme sponsored DICK WEISMILLER'S visit to South America from November 27, to December 12. He reviewed and assisted in the development of a remote sensing project in Argentina.

FRANK KIRSCHNER returned to LARS December 20, after being in Saudi Arabia for three months. He was working with Dick Gilbert on the use of Landsat imagery in preparing a general soils map of the Kingdom.

CALL FOR PAPERS EXTENDED

The Fifth Purdue Symposium on Machine Processing of Remotely Sensed Data will be held on June 27-29. Both long and short papers are still being accepted.

THE DEADLINE FOR SUBMITTING LONG PAPERS HAS BEEN EXTENDED TO JANUARY 31. Authors wishing to contribute long papers should submit four copies of a 1000 word summary to:

Dr. Luis A. Bartolucci or
Dr. LeRoy F. Silva
Laboratory for Applications of
Remote Sensing (LARS)
Purdue University
1220 Potter Drive
W. Lafayette, IN 47906 USA
317 729-2052

Selection of papers will be made by a committee of nationally prominent workers in the area on the basis of originality, usefulness to others in the field, and clarity of presentation.

A limited number of short papers describing recent results will be accepted for presentation at the symposium. These papers will be selected on the basis of a one page double spaced typed abstract which must be received by March 1. Accepted ones will be included as submitted.

VISITING SCIENTIST PROGRAMS

N. V. Madhavan Unni, from the National Remote Sensing Agency, India, was at LARS from November 6, to January 3. Dr. Unni worked with RON BOYD during his program which began with the study of major aspects of machine processing and analysis systems. Landsat digital data covering a portion of north-eastern India was processed, analyzed, and interpreted using this technology.

Tsuyoshi Akiyama, Ministry of Agriculture and Forestry, National Grasslands Research Institute, Ecology Division, Japan, will be with LARS for nine months as a visiting scientist. For the first two months Dr. Akiyama will be working with Technology Transfer staff members learning the basics of machine processing technology. The remaining seven months will be spent in on-the-job training under MARVIN BAUER. He will be working on several LARS projects in order to evaluate alternative procedures for training, stratification, classification, and aggregation of Landsat multispectral scanner data for identification and area estimation of corn and soybeans for test sites in the midwest United States.

VISITORS

The following people attended the December and January Short Courses (* indicates hands-on):

Alfredo Mendoza (land cover classification), Jet Propulsion Laboratory, Pasadena, California

Marilyn Sloan (software), Technical Systems, Cities Service Company, Tulsa Oklahoma

John Mylin (applications), University of Illinois, Champaign, Illinois

Lorin Schwartz (land survey), Bureau of Land Management, Office of Scientific Systems Development, Denver, Colorado

*Cirilo Vista (mapping), Department of Surveys & Lands, Gaborone, Botswana

Roy Woods (water), Department of Water Resources, Austin, Texas

Several visitors from Oficina Nacional Evaluacion Recursos Naturales (ONERN), of Lima, Peru, met with LUIS BARTOLUCCI on November 7, to discuss possible training programs. These visitors included: Dr. Fritz DuBois, director of ONERN, Luis Negron, Jesus Echenique, Cesar Calderon, Raul Gutierrez, Dante Loayza, Herman Corbera, and Elias Campbell.

Juan Tasso and Guido Vassallo, National Commission for Special Investigations - Remote Sensing Group, Argentina, visited with MARION BAUMGARDNER and DICK WEISMILLER on November 13-14. They discussed a planned remote sensing project in Argentina.

NEW PROJECTS FUNDED

Title: Distribution of LACIE Field Measurement Data, Sponsor: General Electric, Principal Investigator: LARRY BIEHL, Duration: 10/1/78-12/31/78.

Title: Spectral Mapping - Coronado National Forest, Sponsor: USDA, Principal Investigator: DICK WEISMILLER, Duration: 10/1/78-5/31/79.

Title: Measurement of Spectral
Bi-Directional Reflectance Factor
for Alabama A & M, Sponsor: Alabama
A & M, Principal Investigator: BARRETT
ROBINSON, Duration: 8/7/78-8/12/78.

Title: Data Processing Remote
Terminal Project, Sponsor: Alabama
A & M - NASA, Principal Investigators:
J. KAST and S. SCHWINGENDORF, Duration:
10/15/78-10/14/79.

Title: Research in Remote Sensing
of Agriculture, Earth Resources and
the Environment, Sponsor: NASA,
Principal Investigator: D. LANDGREBE,
Duration: 12/1/78-11/30/79.

Title: Technical Coordination and
Implementation of Remote Sensing
Experiments for Analogous Vegetation Areas
in the United States and the Soviet
Union, Sponsor: NASA, Principal
Investigator: M. BAUER, Duration:
11/16/78-11/15/79.

Title: Training for DiPaolo -
Bureau of Land Management, Sponsor:
Bureau of Land Management, Principal
Investigator: M. BAUMGARDNER, Duration:
9/1/78-8/31/79.



NEW LARS TECHNICAL REPORTS

062678 An Overview of Remote Sensing as Related to Soil Survey Research by R. A. WEISMILLER and S. A. KAMINSKY.

An inventory of the advances made in the application of remote sensing technology to soil survey research and application is presented. Emphasis is placed upon the usefulness of computer-aided analysis of Landsat multispectral scanner (MSS) data as an aid to the soil survey effort. The capability of the Landsat satellites to gather MSS data which provide a synoptic view of the earth's surface affords soil scientists enhanced capabilities with which to map soils.

The research described in this report was sponsored by NASA under Grant Number NGL 15-005-186.

011178 Mapping Vegetative Cover by Computer-Aided Analysis of Satellite Data by R. M. HOFFER and M. D. FLEMING.

Several techniques involved in digital analysis of data from satellite scanner systems are discussed. Major cover types for a mountainous test site of approximately one million hectares were mapped with an accuracy of over 85% using both Landsat and Skylab data. Acreage estimates based on computer analysis of satellite data were compared to photo interpretation estimates, resulting in correlation coefficients ranging from 0.93 to 0.97. Topographic data (elevation, slope, and aspect) were digitally overlaid onto the satellite data, creating a data base that enabled various map products to be produced for resource management purposes.

The research reported in the paper was sponsored by NASA under Contract Numbers NAS 5-20948, NAS 9-14970.

112378 Land Cover Study for the Pulawy Region Poland, by Digital Analysis of Landsat Data by J. J. Domanski and S. J. Morawski.

Computer-aided technique was applied for the analysis of Landsat MSS data acquired over the central part of Poland in June, 1975.

The objective of this analysis was to determine the possibility of using satellite data to detect agronomic crops within small fields. Two methods of analysis, non-supervised technique and supervised technique, were performed.

As a result, 14 different land cover classes were distinguished: water, 3 classes of forests, industry, urban, open area and 7 agricultural classes.

The work presented in this report was sponsored by the Institute of Geodesy and Cartography, Warsaw, Poland.

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SYSTEM SERVICES

January 19, 1979

APPLICATIONS NEWS FROM JEANNE ETHERIDGE

SPSS SUPPORT

In the past, MARILYN HIXSON, BARBARA DAVIS and NANCY FUHS have consulted with users on problems and questions concerning statistical techniques and routines. Computer Facility personnel installed SPSS and Marilyn kept track of SPSS usage. Projects that were heavy users of SPSS split the SPSS maintenance fee, cost of disk space, etc.

Usage of SPSS is increasing and many users have expressed a need for more statistical services. Also, it is more equitable to charge every user for costs involved than to simply charge projects that are heavy users of SPSS. Finally, the people at LARS who were answering questions in many cases had to keep the time spent at a minimum, if possible.

Thus, Computer Facility is offering two new "products" called statistical services and statistical consulting. CAROL JOBUSCH will be providing both of these beginning January 1, 1979. All users of the LARS computer should have received Carol's memo by now; a copy of it is included on page 16 of this issue of Scan Lines. Carol is very capable and interested in helping users. Be sure to contact her when you have questions, requests, or suggestions.

LARSYS AND EXOSYS SUPPORT

Users have also requested support of EXOSYS and more support of LARSYS. At the present time, LARSYS is supported at a minimal level, and a very small amount of time is spent on correcting serious LARSYSDV problems. Any additional features implemented into LARSYS, LARSYSDV, or EXOSYS are paid for by projects needing those features.

As with SPSS, there will be rates established to charge for usage of LARSYS and EXOSYS. However, the rates will not be implemented until there is an adequate number of personnel to support these software systems. The necessary personnel for both these systems should be available sometime during this coming summer. The support of LARSYS at that time will include LARSYSDV.

COMPUTER USE EXPERIMENT

The computer use experiment conducted in October and November 1978 was designed to help identify specific problems associated with using the night and weekend shifts. Since the computer is heavily loaded during the daytime hours, it was desirable to see if night and weekend shifts could be used more.

Userids in this experiment were put into one of the following four groups: 2.4 Houston project, all other SR&T projects, computer facility, and all other projects. The following table summarizes the computer usage by these four groups.

Group	Experimental Computer Usage by Hours	
	CPU	Local Terminal
2.4 Houston	15.1	4.5
Other SR&T projects	53.5	111.7
Computer Facility	3.5	11.6
Other projects	<u>28.4</u>	<u>84.4</u>
Totals	100.5	212.2

The following table was included to emphasize which userid in each of the above groups used the largest amount of CPU time.

Userid	Experimental Computer Usage by Hours	
	CPU	Local Terminal
EXP215(JSC215)	11.1	1.9
EXPMAlZE(MAlZE)	31.0	19.3
EXPRFM40(REFORM40)	2.1	.5
EXPCTRAM(Cen. Amer)	<u>12.1</u>	<u>36.2</u>
Totals	56.3	57.9

Thus, four userids accounted for over half of the CPU time used in the experiment. All userids in the experiment accounted for approximately 1/4 of the total CPU hours for the two-month period (432 hours).

Most of the problems with the experiment occurred during the last week in November due to loading problems during the midnight to 8 am shift. But because 1/4 of the total CPU time was used and other problems were minor, it certainly seems that time users could continue to use the night and weekend shifts more heavily than they have in the past. Let JEANNE ETHERIDGE know if you have any suggestions for increased usage during these shifts or if you encountered any problems.

COMPUTER CONSULTING SERVICE

Beginning Tuesday morning, January 23, 1979, JEANNE ETHERIDGE will be in the LARS Library at Flex 1, ready and willing to talk to anyone about anything to do with usage of the computer or System Services. If you have questions, problems, nice suggestions, or even not so nice suggestions, just walk over to the library and talk to her. Every Tuesday morning thereafter, either Jeanne, LUKE KRAEMER, SUE SCHWINGENDORF, or BILL SHELLEY will be available in the library to discuss user comments. Initial plans call for a three month trial of this program to see how it goes.

REMOTE HIGHLIGHTS FROM SUSAN SCHWINGENDORF

NEW REMOTE TERMINAL

During November, Dr. Oscar Montgomery, from Alabama A & M University, was at LARS for a one week LARSYS training course, in preparation for the installation of a remote terminal in Alabama during January. Working with BUD GOODRICK, Oscar was able to review the materials of the LARSYS Education Package and complete several analysis tasks. He will return to LARS in January for additional training on other capabilities of the Purdue/LARS computer.

SRTNEWS

A news facility to provide current information on system modifications and upgrades, developed to support the SR&T research tasks, is now available. It consists of short news paragraphs stored on the computer which are printed at the user's terminal or batch terminal printer. As items accumulate, less current news articles will be listed by title only for the user to request as desired.

The SRTNEWS facility may be accessed from CMS370 by typing the command:

SRTNEWS

If you prefer to have the news paragraphs printed at your batch terminal printer, use the following form of the command:

SRTNEWS PRINT location HOLD
NOHOLD

where HOLD is the default and doesn't have to be specified. Use a valid batch terminal designation for "location" such as JSCTEXAS, FLEXLAB1, etc.

Anyone having information or news items which would be of interest to users of the Purdue/LARS computer should contact Kitty Havens (at JSC) or SUSAN SCHWINGENDORF (at LARS) with the news information, references to further documentation, and a person users may contact to answer questions or provide further information.

DATA REFORMATTING NEWS FROM DAVE FREEMAN

Varian plotter output is now available to the user on a 24-hour turnaround basis. Operators are on duty weeknights, Monday through Friday, to process that days plots, with output available by noon of the next day.

Plots needed during the same day may be obtained by special request if the personnel are available. There is a slight extra charge to cover the increased personnel costs.

Contact DAVE FREEMAN or MIKE COLLINS for either special requests or inquiries regarding standard plotter operations and products. Interruption of this schedule may occur infrequently because of operator illness, machine failure, or supply shortages.

Varian plotter paper comes from two suppliers. Recently the LARS supplier changed and the plots are not the same. The previous supply of paper provided decent plots with some smudging to touch regardless of humidity. Current paper supplies provide non-smudging plots with varying ink saturation during times of low humidity. Let Dave know which you find most useful.

MR. TERMINAL SAYS . . .

In order to increase life-time and decrease down-time, please leave terminals on at all times. It has been found that reliability is increased tremendously while the increased electricity usage is minimal.

Also, if there are any problems with the DECwriter in Flex 1, please call LUKE KRAEMER (259) instead of playing with the keys marked U and D.

THE DECLINE & FALL OF THE FORTRAN G COMPILER

The FORTRAN compiler presently installed on the LARS system is an old version (OS Release 21.6) of the G compiler for which an interface routine has been written to allow operation under CMS370.

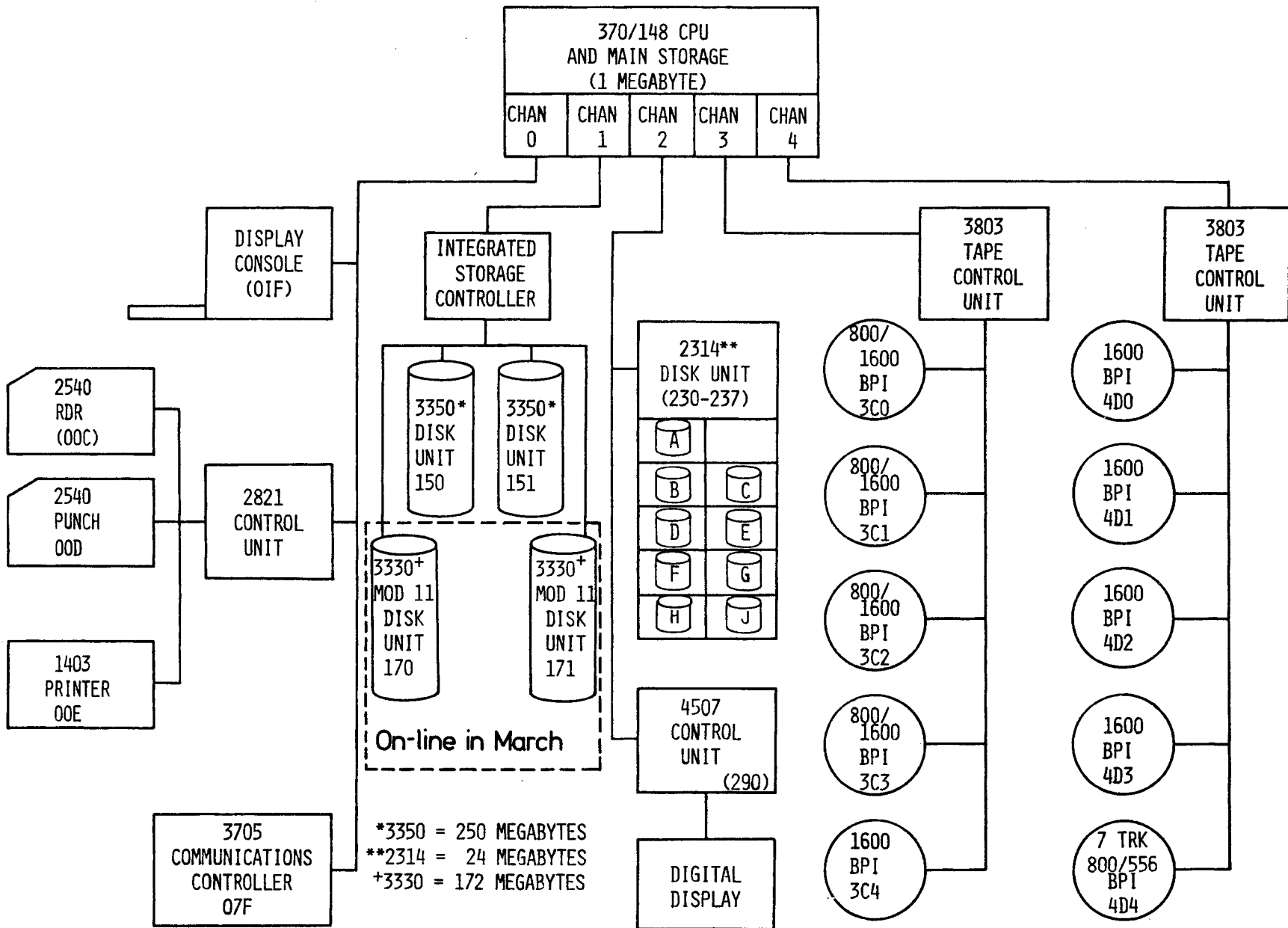
There are plans to install the current version of the FORTRAN H compiler in the mid-December 1978 through mid-January 1979 time zone. The new H compiler offers several advantages over the old G compiler. The new

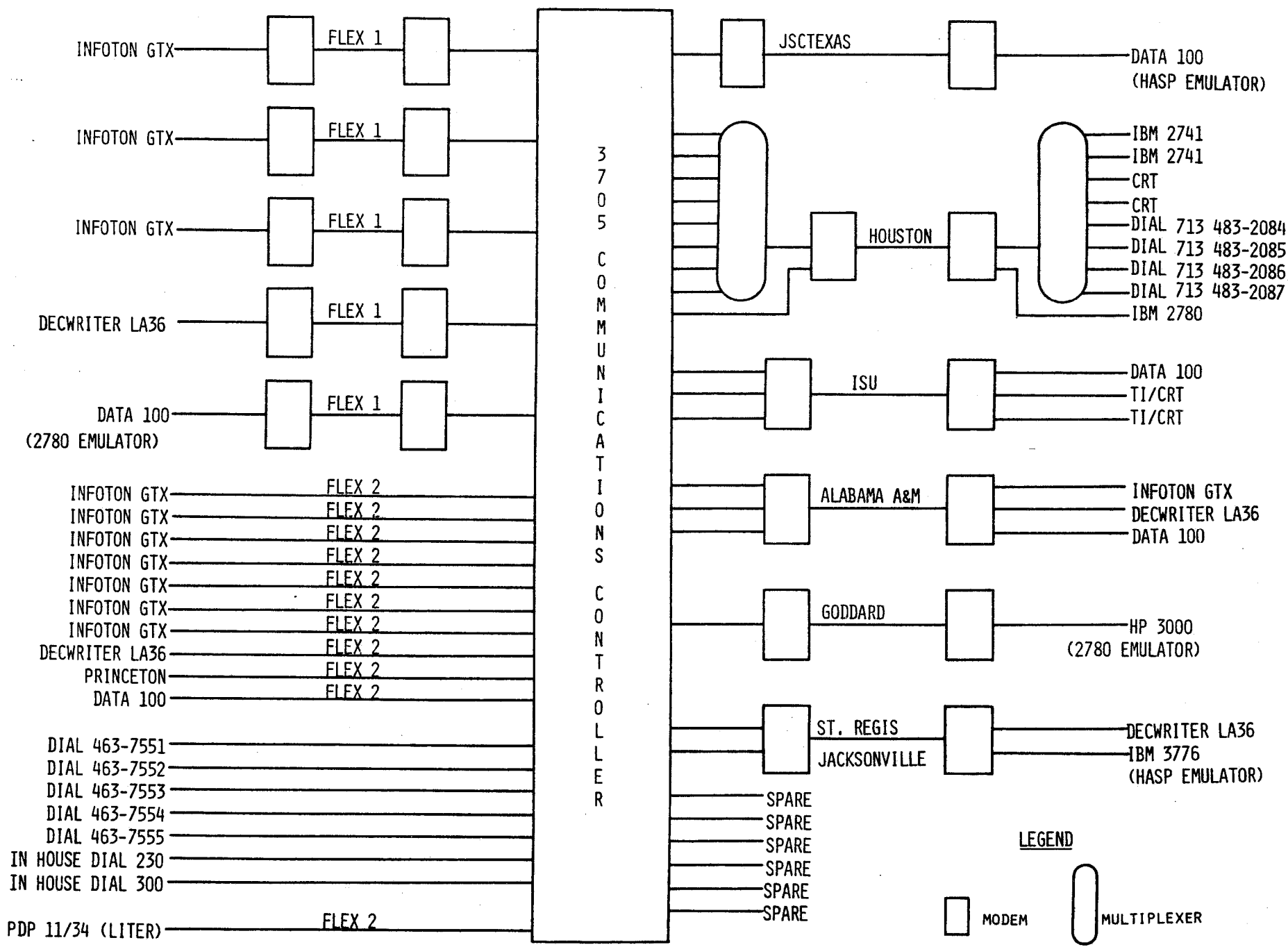
compiler will be supported by IBM so that compiler errors will be fixed by IBM. New I/O routines and library routines will be supplied with the compiler and these will also be supported by IBM.

The H compiler is designed as a true production compiler. As such, it has the capability of optimizing the produced code. When full optimization is used, the CPU time required to run a given job will be decreased. Preliminary timing tests indicate that on the average, CPU time will be reduced by approximately 15 percent. The H compiler supports two new data types, REAL*16 and COMPLEX*32, which allow extended precision when needed. The compiler has an option which will automatically increase variables from single to double precision in a program, thus eliminating the necessity for a programmer to modify extensively program code when higher computational precision is needed.

CPU AND TERMINAL CONFIGURATIONS

On the following two pages current CPU and terminal configurations of the LARS 370/148 (as of January 1, 1979) are provided.







LARS NOW HAS A NEW STATISTICAL SERVICE

- Support of SPSS (a Statistical Package of computer programs) including installation, testing, and debugging of each new release.
- Development or conversion of FORTRAN routines that produce generally useful statistics.
- Creation and maintenance of a central file of user documentation for statistical routines.
- Training and assistance in the use of statistical routines.

This service is funded by a surcharge of \$150 per CPU hour on the time used by SPSS programs (starting 1 January 1979). It includes assistance in the use of SPSS and other statistical routines. It does not include development of special purpose statistical programs or other work that would be of use only to one project. However, specialized statistical/computer consulting is available separately, charged according to the person-hours spent on the project.

If you have questions, requests, or suggestions, please call:

Carol Jobusch (ext. 246)

EXOSYS NEWS FROM LARRY BIEHL

EXOSYSDV was updated on October 12, December 18 and December 20. Notebooks entitled EXOSYS REFERENCE are available in the terminal areas; they include nearly all of the available user documentation.

In the near future we want to phase out EXOSYS and replace it with EXOSYSDV in preparation for the conversion to CMS370. Contact JEANNE ETHERIDGE with any problems or changes that you feel will need to be made before EXOSYS is replaced with EXOSYSDV.

FEATURES ADDED OR CORRECTED OCTOBER 12

Cluster capability was added to the DSEL processor. See the DSEL control card listing for the description of control cards.

- limits are 15 classes and 30 bands.
- the option for cluster grouping according to SWAIN/FU distance.
- option for table of sorted fields/plots identifying the number of observations of each field or plots that are in each cluster group.

The processing time in DSEL for run statistics, class statistics and/or correlation matrices is much faster.

All three processors (DSEL, GSPEC, IDLIST) can handle EXOSYS runs with two different ID header records - a crops header record and a soils header record. See the ID codes or tape format in the EXOSYS Reference in the terminal area.

The one-line ID listing is the default listing for DSEL and GSPEC as well as IDLIST.

The LIST NOLIST control card is available in IDLIST.

In GSPEC, the line types to be plotted on the Varian for each class may be changed using the OPTIONS LINES control cards instead of having an UPSET control card in each class. The default line types for the maximum 10 classes are:

OPTIONS LINES (77,92,9434,32,92943234,9272,3454,9434,12,3234)

See GCS manual for explanation of line type codes.

The search for runs on tape when SELECT RUSE(LL,UL) is used will automatically start with run sequencer LL and stop with run sequencer UL. In other words SELECT RUSE(50,250) will have the same effect as the previous SELECT RUSE(50,250), START(50), STOP(250). The \$REWIND control card will key off of RUSE now instead of STOP.

FEATURES ADDED OR CORRECTED DECEMBER 18

In GSPEC, one can obtain multiple pages of graphs on the Varian, each having more than one plot on a page, without going into debug at the start of second page of plots.

The use of SELECT EP01(a) will find all runs having experimenter parameter #1 equal to a, even if a is less than 255. This problem occurred for only real formatted ID parameters.

Any run in which the selected ID parameter is null will be skipped. For example, if the select card was SELECT EP01(1,600), any runs which have no experimenter parameter #1 (i.e. null) will be skipped. The run was not skipped before for certain SELECT requests with real formatted ID parameters.

A terminal message was implemented in DSEL to indicate when sorting for the FIELD/PLOT HOMOGENEITY table has begun.

A terminal message was implemented in DSEL to indicate when cluster grouping has begun.

An updated EXOSYSDV control card listing was put on the EXOSYS disk. The control card listing may be obtained by initializing EXOSYS and typing:

REFERENCE EXOSYSDV	for special action monitor control card listing
REFERENCE 'functionname'	for control card description for function 'functionname' (DSEC,GSPEC, or IDLIST)
REFERENCE ALL	for all of the above

An EXOSYS control command NEWS was set up to print the latest EXOSYS update information to the line printer.

Two options were added to the RUN EXOSYSDV control command pertaining to temporary disks.

RUN EXOSYSDV	TEST	25 CYL	
	<u>NOTEST</u>	<u>10 CYL</u>	<u>CLEAR</u>
		5 CYL	NOCLEAR
		2 CYL	

TEST, NOTEST Place copy of load map on P disk (TEST). No load map will be placed on P disk (NOTEST).

25CYL, 10CYL,
5CYL, 2CYL Identifies the size of the temp disk to be attached during execution. Default is 10 cylinders.

CLEAR, NOCLEAR

Any temp disk (192) that is attached when execution starts will be detached, attached and cleared (CLEAR).

Any temp disk (192) that is attached when execution starts will not be detached and cleared.

An option was added to the EXOSYS control command PUNCH to put punched output on either the P or T disk.

PUNCH DISK P
 T

Any punched output obtained during execution will be put on the T (or P) disk under the filename PUNCH FILE.

While in the EXOSYS control command environment any CMS command will be executed by just entering the CMS command. In other words, the command does not have to be prefaced with CMS. Example - STAT will work the same as CMS STAT.

FEATURES ADDED OR CORRECTED DECEMBER 20

The total dry biomass ID parameter code was changed from DBTC to DBTO.

The problem of going into debug when listing any ID information was corrected.

SUMMARY OF 370/148 COMPUTER USAGE FOR NOVEMBER 1978

<u>Overall Usage</u>	- Basic Rate CPU Time Used	46.55
	Priority Rate CPU Time Used	184.36
	Total CPU Time Used	230.91
	Terminal Sessions	3453
	Batch Jobs	638

Usage by Time of Day - <u>Time Period</u>	<u>Hours of CPU Used</u>	<u>Average Percent CPU Utilization</u>
Mon-Fri midnite-8AM	42.70	27%
Mon-Fri 8AM-4PM	96.71	59%
Mon-Fri 4PM-Midnite	66.89	40%
Weekend	23.66	22%

Batch Job Usage	<u>Batch Machine</u>	<u>Jobs Run</u>	<u>Avg. Clock Time</u>	<u>Avg. CPU Time</u>
	BATQUICK	50	1.50	0.15
	BATSHORT	135	10.17	0.82
	BATMED	112	32.55	3.42
	BATONITE	58	51.84	4.42
	BATLONG	64	47.39	8.40
	TAPTRAN	55	11.74	0.29
	BATEOD	42	22.68	1.96
	BATJSC	105	44.44	15.92

Keyboard <u>Terminals</u> - <u>Location</u>	<u>Port</u>	<u>Terminal Type</u>	<u>Logins</u>	<u>Total Time in Use</u>	<u>Avg. Time Per Session</u>
Flexlab2	30	INFOTON GTX	77	98.45 hrs.	1.28 hrs.
Flexlab2	31	INFOTON GTX	154	154.04	1.00
Flexlab2	32	INFOTON GTX	242	181.03	0.75
Flexlab2	33	INFOTON GTX	155	117.58	0.76
Flexlab2	34	INFOTON GTX	199	198.69	1.00
Flexlab2	35	INFOTON GTX	205	159.15	0.78
Flexlab2	36	INFOTON GTX	231	208.86	0.90
Comp. Room	37	DECwriter	240	81.17	0.34
Flexlab1	40	INFOTON GTX	164	119.94	0.73
Flexlab1	41	INFOTON GTX	230	197.62	0.86
Flexlab1	42	INFOTON GTX	181	150.67	0.83
Flexlab1	43	SUPERTERM	91	64.11	0.70
Dial-up	50	First in Use	33	32.73	0.99
Dial-up	51	Second in Use	10	9.15	0.91
Dial-up	52	Third in Use	5	3.32	0.66
Dial-up	53	Fourth in Use	9	6.53	0.73
Dial-up	54	Fifth in Use	5	3.45	0.69
Houston	60	Hazeltine 2000	147	97.51	0.66
Houston	61	Hazeltine 2000	146	112.65	0.77
Houston	62	2741	61	77.55	1.27
Houston	63	2741	94	151.70	1.61
ISU	66	(various)	164	51.44	0.31
ISU	67	(various)	215	91.99	0.43
Houston	6A	Dial-1st in Use	194	157.53	0.81
Houston	6B	Dial-2nd in Use	151	115.61	0.77
Houston	6C	Dial-3rd in Use	110	74.77	0.68
Houston	6D	Dial-4th in Use	62	55.03	0.89

SUMMARY OF 370/148 COMPUTER USAGE FOR DECEMBER 1978

<u>Overall Usage</u>	- Basic Rate CPU Time Used	38.18
	Priority Rate CPU Time Used	157.46
	Total CPU Time Used	195.64
	Terminal Sessions	2566
	Batch Jobs	555

Usage by Time of Day - <u>Time Period</u>	<u>Hours of CPU Used</u>	<u>Average Percent CPU Utilization</u>
Mon-Fri midnite-8AM	30.66	21%
Mon-Fri 8AM-4PM	74.67	49%
Mon-Fri 4PM-Midnite	66.46	44%
Weekend	23.84	21%

<u>Batch Job Usage</u>	<u>Batch Machine</u>	<u>Jobs Run</u>	<u>Avg. Clock Time</u>	<u>Avg. CPU Time</u>
	BATQUICK	79	0.38	0.07
	BATSHORT	97	11.18	1.33
	BATMED	83	10.27	1.07
	BATONITE	82	28.90	3.87
	BATLONG	26	78.39	44.98
	TAPTRAN	11	26.95	7.23
	BATEOD	119	15.67	2.03
	BATJSC	42	32.04	14.73

<u>Keyboard Terminals</u> - <u>Location</u>	<u>Port</u>	<u>Terminal Type</u>	<u>Logins</u>	<u>Total Time in Use</u>	<u>Avg. Time Per Session</u>
Flexlab2	30	INFOTON GTX	102	107.51 hrs.	1.05 hrs.
Flexlab2	31	INFOTON GTX	92	107.77	1.17
Flexlab2	32	INFOTON GTX	120	122.17	1.02
Flexlab2	33	INFOTON GTX	204	165.77	0.81
Flexlab2	34	INFOTON GTX	141	118.94	0.84
Flexlab2	35	INFOTON GTX	140	165.49	1.18
Flexlab2	36	INFOTON GTX	209	160.37	0.77
Comp. Room	37	DECwriter	169	28.54	0.17
Flexlab1	40	INFOTON GTX	108	112.64	1.04
Flexlab1	41	INFOTON GTX	134	134.55	1.00
Flexlab1	42	INFOTON GTX	146	109.32	0.75
Flexlab1	43	SUPERTERM	34	17.74	0.52
Dial-up	50	First in Use	13	9.18	0.71
Dial-up	51	Second in Use	5	5.65	1.13
Dial-up	52	Third in Use	2	0.30	0.15
Dial-up	53	Fourth in Use	-	-	-
Dial-up	54	Fifth in Use	-	-	-
Houston	60	Hazeltine 2000	128	70.76	0.55
Houston	61	Hazeltine 2000	120	73.45	0.61
Houston	62	2741	75	89.39	1.19
Houston	63	2741	86	43.56	0.51
ISU	66	(various)	87	28.49	0.33
ISU	67	(various)	115	67.50	0.59
Houston	6A	Dial-1st in Use	139	130.73	0.94
Houston	6B	Dial-2nd in Use	158	111.46	0.71
Houston	6C	Dial-3rd in Use	125	69.78	0.56
Houston	6D	Dial-4th in Use	82	35.93	0.44

INTERLAB NOTES

PERSONNEL CHANGES

In December 1978, ERIC HINZEL, received his M.S. degree in Agronomy from Purdue University. Upon completion of his thesis, entitled, "Correlation of Spectral Classes Derived from Landsat MSS Data to Soil Series and Soil Conditions for Jasper County, Indiana," Eric left to begin work for the State of Wyoming. He will be working with strip mining for the Department of Environmental Quality, Land Quality Division, Cheyenne, Wyoming.

JO ALBERT is the new secretary for Crop Inventory under MARV BAUER. She has just recently moved to the area from Indianapolis with her husband and two children.

LARS CHRISTMAS PARTIES

The annual LARS Christmas Party was held on December 9, 1978, at the 4-H A-Frame. A total of 85 people were in attendance. All enjoyed a delightful sit-down dinner of fresh roasted turkey with gravy and dressing, scalloped potatoes, green bean casserole, tossed salad with home-made dressings, whole cranberry sauce, rolls and butter, and make-your-own sundaes. The door prize, a Christmas candle made by RUTH JARRET was won by Nancy Russell. Hats off to a fine committee!! RUTH JARRET, Ch., JEANNE ETHERIDGE, VIC FLETCHER, and BRENDA PRATHER.

The annual LARS Children's Christmas Party was held on Thursday, December 21, at 3:30 in the Flex Lab 2 Conference Room. Twenty-six lively children plus their parents were in attendance. While awaiting the arrival of Santa, the children decorated Christmas cookies and listened to Christmas stories by DOUG MORRISON. An array of cookies and punch was enjoyed by one and all. A special thank you to the

committee: IDA TENDAM and SUE SCHWINGENDORF (and Santa, MARION BAUMGARDNER!)

On December 20 Flex II staff entertained Flex I staff with a pitch-in dinner in the Flex II Conference Room. Baked ham, bread & butter, and iced tea were provided with everyone bringing their favorite dish. A scrumptious time was had by all!

There was a pitch-in Christmal luncheon in the Flex I Conference Room on December 21, 1978. Those attending were DONNA SCHOLZ, MARILYN HIXSON, MARLENE HODGE, Millie Moore, CHRIS STELLON, GLENDA BAUER, PAM JOHNSON, GLORIA PETERSON, MARTA DZIUBINSKYJ, NANCY KLINE, BRENDA PRATHER, JULIE HANOVER, JO ALBERT and SHARON WHITLOCK. A special thanks goes to JO ALBERT for her expertise in planning and organization. THANKS JO!!

Many thanks to all those at Flex I who contributed toward a Christmas tree. a 5-foot artificial tree was purchased at after-Christmas sale prices.

TELEPHONE SYSTEM

We now have conference call capability on our phone system. Dial "0" if you wish to set-up one of these calls with NANCY KLINE, the LARS receptionist.

We ask that you maintain a toll call record even if you are using Purdue Dial 7. Please continue to use the toll call log sheets as we have in the past. These are available from MARTA DZIUBINSKYJ.

CONSULTING SERVICES/OUTSIDE ACTIVITIES

If you plan to do outside consulting, please remember to complete President's Office Form 32 (Application for Permission to Engage in an Outside Activity) at least four weeks in advance. These are available from PAM JOHNSON.

Also, if you plan to hire a consultant to work on a sponsored research project, please anticipate this need well in advance. Consultant services must be requisitioned and Department/School approval is now required. Contact GLORIA PETERSON for more information.

SEMINAR SCHEDULE

Technology Transfer will be taking over the responsibility of arranging and announcing seminars. Contact DOUG MORRISON if you would like to give a seminar.

A schedule of upcoming seminars is listed below.

LABORATORY FOR APPLICATIONS OF REMOTE SENSING SEMINAR SCHEDULE

<u>Date</u>	<u>Time</u>	<u>Speakers</u>	<u>Topic</u>	<u>Location</u>
P-1 Seminar Series				
Thursday Jan. 18	7:30 pm	MARILYN HIXSON, DONNA SCHOLZ	P-1 Software: Principles and Use	Flex 2 Conference Room
Thursday Feb. 15	3:30	MARILYN HIXSON, PHIL SWAIN	History and Fundamentals of Procedure 1	Flex 1 Conference Room
Thursday Feb. 22	3:30	MARILYN HIXSON PHIL SWAIN	Crop Identification Using Image Interpretation-LIST	Flex 1 Conference Room

Crop Inventory Seminar Series				
Thursday March 1	3:30	MARILYN HIXSON	Sampling Strategies	Flex 1 Conference Room
Thursday March 15	3:30	PHIL SWAIN	Development of Training Statistics	Flex 1 Conference Room
Thursday March 29	3:30	PHIL SWAIN	Classification Methods	Flex 1 Conference Room

RECENT ACQUISITIONS IN THE LIBRARY

PHOTOGRAMMETRIC ENGINEERING and REMOTE SENSING

Volume XLIV November 1978 Number 11

COVER PHOTO — The confluence of the Potomac and Monocacy Rivers, recorded on Kodak Ektachrome Infrared Film by a hand-held 35 mm SLR camera having an Asanuma K2 yellow filter fitted to its 50 mm, F/1.8 Canon lens. The Monocacy River (crossed by the bridge) is heavily laden with sediments washed from rich crop lands of the Hagerstown Valley following several days of torrential rains. False color film records the relatively clear Potomac River as dark blue, while the "muddy" Monocacy River records as light blue. Exposure was made at 1/500 second, F/5.6 from a Century Aviation Cessna 150 flying at a height of 500 feet. Photo courtesy of Norman T. Crandell II.

TECHNICAL ARTICLES

A Comparison of Satellite Sensor Bands for Vegetation Monitoring <i>Compton J. Tucker</i>	1369
Quantifying Gypsy Moth Defoliation <i>R. L. Talerico, J. E. Walker, and T. A. Skratt</i>	1385
Texture-Tone Analysis for Automated Land-Use Mapping <i>Shin-yi Hsu</i>	1393
Penetration Depth at Green Wavelengths in Turbid Waters <i>C. H. Whitlock, W. G. Witte, J. W. Usry, and E. A. Gurganus</i>	1405
A Radar Investigation of North Louisiana Salt Domes <i>Louis F. Dellwig and Janét E. Bare</i>	1411
Reservoir Surface Area from Landsat Imagery <i>Mike E. White</i>	1421

PHOTOGRAMMETRIC ENGINEERING and REMOTE SENSING

Volume XLIV December 1978 Number 12

COVER PHOTO — This image is a portion of a LANDSAT-2 scene of the city of Halifax, Nova Scotia, recorded on May 31, 1977. Special digital processing by the Canada Centre for Remote Sensing in Ottawa resulted in the enhanced appearance of roads, bridges, docks, airport runways and taxiways, ships and other sub-pixel sized features. The processed imagery, at a scale of approximately 1:150 000, has been reduced to 1:200 000 for the cover.

TECHNICAL ARTICLES

ASP DTM Symposium <i>James B. Case</i>	1477
Digital Terrain Models: An Overview <i>Frederick J. Doyle</i>	1481
Panel Discussion: The Future of DTM <i>E. M. Mikhail (Moderator), U. V. Helava, J. R. Jancaitis, F. J. Doyle, R. J. Helmering, F. Ackermann, and A. K. Turner</i>	1487
A Flexible Approach to Digital Stereo Mapping <i>Dale J. Panton</i>	1499
DTM Application in Topographic Mapping <i>Dr. M. M. Allam</i>	1513
Production Mapping with Orthophoto Digital Terrain Models <i>William H. Young and Douglas M. Isbell</i>	1521
Experimental Investigation into the Accuracy of Contouring from DTM <i>F. Ackermann</i>	1537
Use of Digital Terrain Data in Meteorological and Air Quality Modeling <i>T. W. Tesche and R. W. Bergstrom</i>	1549
A Decade of Experience in Computer Aided Route Selection <i>Dr. A. Keith Turner</i>	1561
Applications of DTM in the Forest Service <i>Terry W. Gossard</i>	1577

ITC Journal 1978-3 Contents/Sommaire

SLAR for forest type-classification in a semi-deciduous tropical region <i>G Sicco Smit</i>	385
Results of a two-stage unequal probability (PPS) sampling for timber volume using an orthophoto mosaic <i>D A Stellingwerf</i>	402
A comparative test of unrestricted, stratified, two-phase and two-stage PPS timber volume sampling using an orthophoto mosaic <i>D A Stellingwerf</i>	415
Forest road planning from aerial photographs A new, simple technique for road design in steep terrain <i>J M Remijn</i>	429
Microrelief and stone distribution patterns in land type and soil genesis Fieldwork carried out in Extremadura, Spain <i>E Nieuwenhuis and N A Trustrum</i>	445
The use of random stone count for the evaluation of physiographic analysis <i>A A Faghani</i>	465
The contribution of ordination procedures to natural resource surveys An example from grazing lands in S E Spain <i>T C D Dargie</i>	487
On the nature of base flow and groundwater occurrences in the Serayu River basin <i>A M J Meijerink</i>	503
Preadjustment error detection in independent model blocks Part One A testing procedure for tiepoints in independent model blocks <i>M Molenaar</i>	514
Part Two A testing procedure for ground control in planimetric independent model blocks <i>M Molenaar and T Bouloucos</i>	527
Specifications for cartographic reproduction units: installation and equipment <i>A Kers, H A W Scholten and H Weinreich</i>	542

IBM Systems Journal

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Distributed data processing <i>A. L. Scherr</i>	324
National Westminster Bank mass storage archiving <i>C. M. Gravina</i>	344
The development of software systems to aid in physical planning <i>B. S. Smedley</i>	359
Data Stream Linkage Mechanism <i>J. P. Morrison</i>	383
Performance investigations with a DOS/VS-based operating system model <i>W. Kraemer</i>	409
A performance model of MVS <i>Willy W. Chiu and We-Min Chow</i>	444



LARS · Purdue University · Vol. 5 · No. 2 · March 2, 1979

ASP HONORS ROGER HOFFER

LARS congratulates Dr. ROGER HOFFER on his selection as the 1979 recipient of the Alan Gordon Memorial Award.

The American Society of Photogrammetry (ASP) selected Roger for his accomplishments in advancing the state-of-the-art of remote sensing and interpretations, which provided a foundation upon which much other work has been based.

It was felt that Roger's overall positive impact on the development of computer-aided data analysis techniques has not been surpassed by anyone in the field. His leadership within ASP has had far-reaching benefits both in the technical field and in the education of more than 1000 in the subject of photogrammetry.

The award will be presented at the ASP Business and Awards Meeting on Wednesday, March 21, in the Lincoln Room of the Washington D.C. Hilton Hotel.

SYMPOSIUM UPDATE

The Preliminary Program for the 1979 Machine Processing of Remotely Sensed Data Symposium, to be held June 27-29, is now being printed.

The large quantity and excellent quality of long papers submitted this year will be presented in three concurrent technical sessions Wednesday afternoon, June 27, and Thursday, June 28, both morning and afternoon. In addition, an Opening and Closing Plenary Session will be presented.

Dr. Earl Butz will be the featured Banquet speaker.

VISITORS

Twenty-five foreign visitors from the Fort Benjamin Harrison Foreign Liaison Office began their tour of Purdue University facilities with a program at Flexlab 2.

Prepared by the Laboratory for Applications of Remote Sensing for distribution at Purdue. Contact Susan Ferringer, SCAN LINES editor, to be placed on the mailing list (749-2052, ext. 290).

DOUG MORRISON and ERIC STONER presented an overview of LARS activities, and a tour of the computer and measurement area on February 23. Several of the countries represented included: Argentina, Ghana, Jordan, Kuwait, Lebanon, Malaysia, Pakistan, Thailand, and Tunisia.

Ben Smallwood, SCS, and two other IDNR personnel from Jasper County, Indiana, were at LARS January 31, for a training meeting with DICK WEISMILLER. Utilization of the data from classification of spectral soil characteristics was discussed.

A. Osman met with FRANK KIRSCHNER and MARION BAUMGARDNER on February 7, to discuss the usage of Landsat imagery for developing base maps of 18 Arab countries for further soil studies. Mr. Osman is Director of the Soil Science Division of the Arab Center for the Studies of Arid Zones and Dry Lands, funded by the Arab League, which represents 18 Arab countries.

Dr. Glenn Robinson, of JECORE, an Arabian agency interested in developing a remote sensing program in Saudi Arabia, was at LARS on February 22-23. Dr. Robinson, a 1978 June short course alumnus, renewed his contacts with DOUG MORRISON, FRANK KIRSCHNER, MARION BAUMGARDNER, and JOHN PETERSON, and discussed new developments in remote sensing technology.

LARS TRAVEL LOG

LUIS BARTOLUCCI has been travelling recently as a member of an eight scientist team from the United States sponsored by AID. On January 29, Luis was in Washington, D.C. to discuss the AID/Latin American Remote Sensing Regional Center.

During the month of February the team of scientists visited 17 Latin American countries to assess the requirements and capabilities of each, and to make recommendations for the establishment of a Latin American remote sensing center.

MARVIN BAUER was at NASA/Johnson Space Center on February 5-6, and again on February 20, to work on experimental design for the field research program to conduct support of production inventory of corn and soybeans.

CRAIG DAUGHTRY and MARILYN HIXSON were at NASA/JSC on February 13-15, to participate in discussion with JSC staff on the tasks dealing with corn and soybean identification, area estimation, and assessment of crop condition from spectral data.

DAVID LANDGREBE, TERRY PHILLIPS, JIM KAST, and MARVIN BAUER were at NASA/JSC on February 20, to confer on the SR&T computer processing support task.

NEW PROJECTS FUNDED

Title: Remote Sensing Videotapes,
Sponsor: Continuing Education Administration, Purdue University, Principal Investigators, JIM RUSSELL and SHIRLEY DAVIS, Duration: 2/1/79 - 1/31/80.

Five LARS experts will be working with Shirley, Jim, and the Purdue Telecommunication Center on producing five educational videotapes, each about 30 minutes long. DAVID LANDGREBE and ROGER HOFFER are authors of the first two videotapes, to be completed during the first half year. The other three authors have not yet been finalized. These tapes will be used in the monthly short course, and will be sold through Continuing Education, Division of Independent Study.

Title: Digital Processing of Landsat MSS and Topographic Data to Improve Capabilities for Computerized Mapping of Forest Cover Types, Sponsor: NASA, Principal Investigator: ROGER HOFFER, Duration: 1/15/79 - 1/15/80

PROJECT UPDATES

NANCY FUHS recently became project manager of the US/USSR Bilateral Agricultural Remote Sensing project. She recently completed a year-end report summarizing the accomplishments of the project in data acquisition, preprocessing, and analysis. Data for the second year of the project have been prepared for exchange with the Soviets.

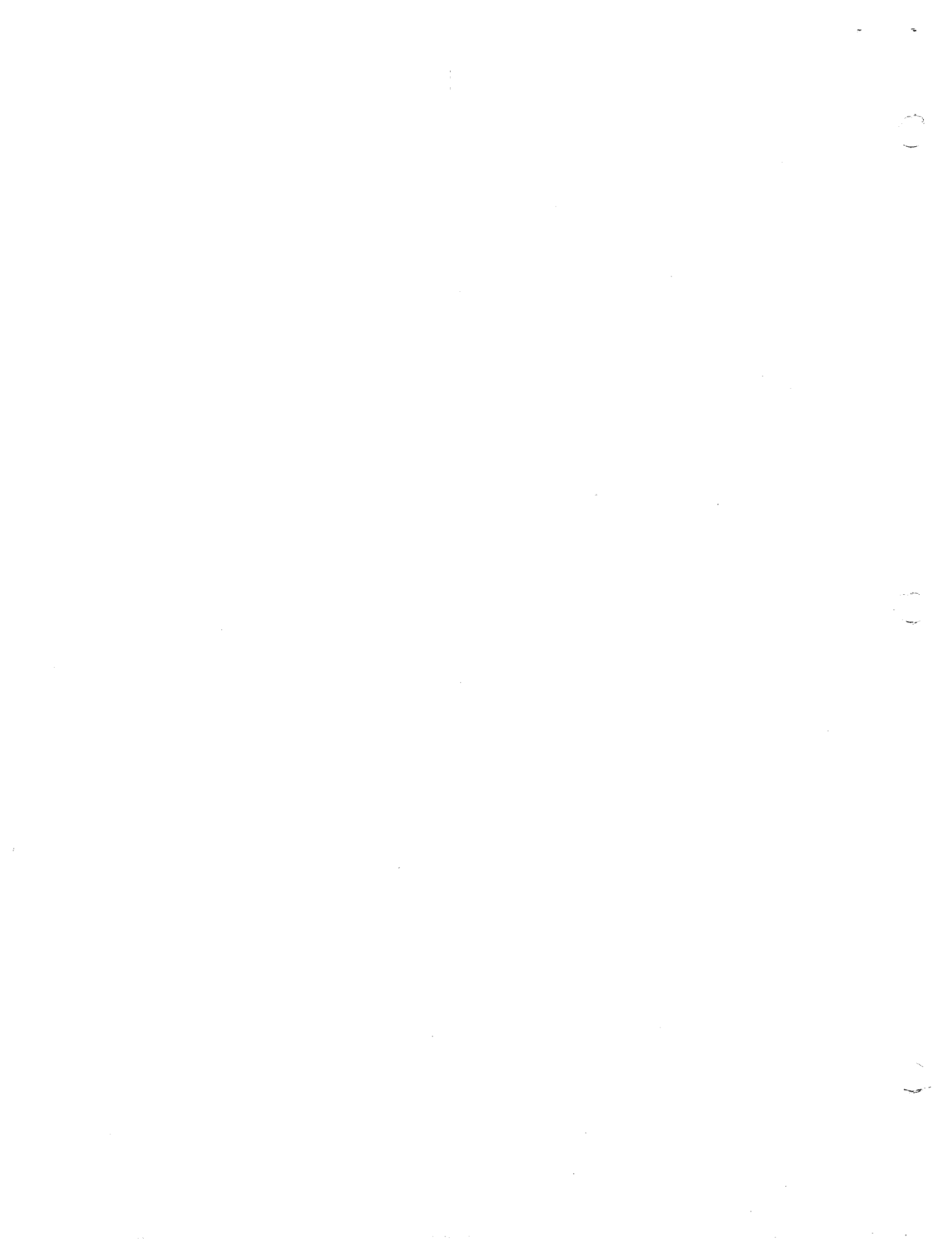
SHIRLEY DAVIS, JIM RUSSELL, and NANCY HYNES are completing preparation for four new minicourses about to be student tested. They would welcome volunteers to review any of the following. Each takes about one hour.

"Geologic Applications of Satellite Remote Sensing Data" by D. K. SCHOLZ and S. M. DAVIS.

"Interpretation of Thermal Images" by L. F. SILVA and J. D. RUSSELL

"Principles of Photo-interpretation" by R. M. HOFFER and S. M. DAVIS

"Determining Spectral Characteristics through Field Research" by L. F. SILVA, L. L. BIEHL, and J. D. RUSSELL



SYSTEM SERVICES

March 2, 1979

RATE CHANGES

Retroactive to January 1, 1979, the rate for Computer Service will be reduced to \$200/CPU hour from \$250. Also, the rate for 7-track tape attach time went from \$15/hour to \$50/hour. The CPU rate was changed because the usage experienced in recent months was higher than that anticipated for the fiscal year; 7-track tape usage was lower than expected.

Mike Collins will be adjusting your computer accounts for these charges, so be sure and notice these charges on your billing statements at the end of February.

EXOSYS NEWS FROM JEANNE ETHERIDGE

EXOSYSDV BECOMES EXOSYS

At the beginning of April, the developmental EXOSYS system (EXOSYSDV) will replace the "old" EXOSYS. Currently, users type 'run exosysdv' to access EXOSYSDV and 'run exosys' to access EXOSYS. In April, users will only be able to type 'run exosys' and they will be accessing developmental EXOSYS.

EXOSYS UPDATE FEBRUARY 21, 1979

A user can now use 2 or more tapes in one session under all circumstances.

EXOSYS UPDATE FEBRUARY 20, 1979

Set up EXOSYSDV to run without using the Reformatting Library or the old EXOSYS Library.

GSPEC error will be printed when number of classes is greater than 10.

Format changes for list output in IDLIST, DSEL, and GSPEC:

- soil moisture tension changed from F4.2 to F9.2
- erosion factor changed from F3.1 to F4.2

When using BATCH mode, load map will be printed only if there are errors.

EXOSYS UPDATE FEBRUARY 14, 1979

The list information for 'FINE SILT' (soil header) will be printed properly.

Format changes for list output in IDLIST, DSEL, and GSPEC:

- base saturation (soil header) changed from I2 to I3.
- compression index (soil header) changed from F4.1 to F6.3.
- cation exchange capacity (soil header) changed from F4.1 to F5.1.

Print and punch terminal commands to JSCTEXAS and Alabama will work properly.

EXOSYS UPDATE FEBRUARY 8, 1979

GSPEC control card file corrected.

GSPEC bugs corrected.

- program will handle a change in the sample interval on the XRSCALE card while in interactive mode properly.

- bug corrected which gave erroneous wavelength-BRF data correspondance for single run graphs in interactive mode. (Occurred in only certain situations).

When using BATCH mode, user won't get separate listing with batch time. It will be at end of EXOSYS printout.

EXOSYS UPDATE FEBRUARY 6, 1979

Add reference file for EXOSYS terminal commands. File can be obtained by entering 'REFERENCE COMMANDS'.

Change name of EXOSYSDV initialization cards from EXOSYSDV to INITIALIZATION. File can be obtained by entering 'REFERENCE INITIALIZATION'.

Punch disk terminal command works properly.

EXOSYSDV DSEL bugs corrected:

- statistics runstats works properly as default.
- bands similar to X.XX-Y.YY where Y.YY is > 2.4 are handled properly.
- the class cards for two or more DSEL jobs set up consecutively are handled properly.
- a DSEL job with one band will work correctly.

EXOSYSDV DSEL improvements:

- the bands card(s) does not have to be repeated for consecutive DSEL jobs.

EXOSYS GSPEC improvements:

- execution speed of bands/ID type graphs improved slightly.

List changed (IDLIST, DSEL, GSPEC)

- shrinkage ratio (soil header) changed from integer to read F5.1.
- volumetric shrinkage (soil header) changed from F5.2 to F6.2.
- water content (soil header) changed from F5.2 to F6.2.

Control card listings for the processors on EXOSYSDV may be obtained by entering:

REFERENCE COMMANDS	- For EXOSYS terminal commands
REFERENCE INITIALIZATION	- For initialization cards
REFERENCE DSEL	- For DSEL control cards
REFERENCE GSPEC	- For GSPEC control cards
REFERENCE IDLIST	- For IDLIST control cards
REFERENCE ALL	- For all of the above

Any suggestions or problems with EXOSYS or EXOSYSDV should be referred to JEANNE ETHERIDGE.

EXOSYSDV will replace EXOSYS within the next year. If this will cause you any problems, contact JEANNE ETHERIDGE.

SUMMARY OF 370/148 COMPUTER USAGE FOR JANUARY 1979

<u>Overall Usage</u>		- Basic Rate CPU Time Used		37.15		
		Priority Rate CPU Time Used		235.13		
		Total CPU Time Used		272.28		
		Terminal Sessions		3575		
		Batch Jobs		698		
Usage by Time of Day	<u>Time Period</u>	<u>Hours of CPU Used</u>	<u>Average Percent CPU Utilization</u>			
	Mon-Fri midnite-8AM	50.38	30%			
	Mon-Fri 8AM-4PM	104.08	59%			
	Mon-Fri 4PM-Midnite	102.81	58%			
	Weekend	15.01	14%			
Batch Job Usage	<u>Batch Machine</u>	<u>Jobs Run</u>	<u>Avg. Clock Time</u>	<u>Avg. CPU Time</u>		
	BATQUICK	110	0.65	0.06		
	BATSHORT	196	16.62	1.21		
	BATMED	52	16.63	1.38		
	BATONITE	54	30.80	5.56		
	BATLONG	55	24.32	9.94		
	TAPTRAN	20	22.13	2.83		
	BATEOD	59	9.34	1.20		
	BATJSC	116	19.03	6.94		
Keyboard Terminals	<u>Location</u>	<u>Port</u>	<u>Terminal Type</u>	<u>Logins</u>	<u>Total Time in Use</u>	<u>Avg. Time Per Session</u>
	Flexlab2	30	INFOTON GTX	81	173.09 hrs.	2.14 hrs.
	Flexlab2	31	INFOTON GTX	137	130.85	0.96
	Flexlab2	32	INFOTON GTX	174	163.29	0.94
	Flexlab2	33	INFOTON GTX	268	197.20	0.74
	Flexlab2	34	INFOTON GTX	164	152.24	0.93
	Flexlab2	35	INFOTON GTX	213	160.46	0.75
	Flexlab2	36	INFOTON GTX	260	196.36	0.76
	Comp. Room	37	DECwriter	217	82.48	0.38
	Flexlab1	40	INFOTON GTX	206	176.72	0.86
	Flexlab1	41	INFOTON GTX	194	198.95	1.03
	Flexlab1	42	INFOTON GTX	217	210.76	0.97
	Flexlab1	43	SUPERTERM	110	72.83	0.66
	Dial-up	50	First in Use	37	41.18	1.11
	Dial-up	51	Second in Use	3	1.27	0.42
	Dial-up	52	Third in Use	--	--	--
	Dial-up	53	Fourth in Use	--	--	--
	Dial-up	54	Fifth in Use	--	--	--
	Houston	60	Hazeltine 2000	205	104.71	0.51
	Houston	61	Hazeltine 2000	216	92.05	0.43
	Houston	62	2741	90	94.33	1.05
	Houston	63	2741	109	60.93	0.56
	Alabama	64	DECwriter	1	0.07	0.07
	Alabama	65	DECwriter	28	27.96	1.00
	ISU	66	(various)	125	82.88	0.66
	ISU	67	(various)	159	99.89	0.63
	Houston	6A	Dial-1st in Use	178	180.64	1.01
	Houston	6B	Dial-2nd in Use	173	106.26	0.61
	Houston	6C	Dial-3rd in Use	115	79.50	0.69
	Houston	6D	Dial-4th in Use	62	50.30	0.81

INTERLAB NOTES

POWER OUTAGE REPORTING PROCEDURES

If power goes out at LARS only, call the Purdue Police, 4-8221.

If power goes out in West Lafayette, call Public Service Indiana, 742-5051.

In the event of commercial power failure, only the following stations will be able to originate or receive outside calls: 201, 219, 254, and 299.

To place an outside call: Listen for Purdue dial tone. There is no need to hook s itch. Dial desired Purdue number. You cannot place internal lab calls when on power failure.

EVERYONE'S USING THEM . . . OR THE WHOLE WORLD'S A COMPUTER

Chronicle of Higher Education, January 29, 1979. The University of Cincinnati's Provost John McCall, who is also an English teacher, sent a memo to the university's vice-presidents, deans, and other administrators that anyone caught writing "input" or "feedback" this month would be fined 25 cents. Further he warned:

"Any person who writes these words in a multiple-copy communication will pay an additional 25 cents for every 25 copies duplicated."

Mr. McCall says he'll send out a memo a month, listing newly banned words. Some likely candidates for his future lists: hopefully, interface, bottom line, facilitate, utilize, and proactive.

PERSONNEL CHANGES

Three new student programmers joined the Computer Facility recently. SCOT AURENZ returns to LARS after a semester's absence to work under DAVE FREEMAN; JOE WHALEN and DOUG FOREHAND are additions working under JIM KAST.

Prof. DON HOLT, Agronomy, will be working with MARVIN BAUER and CRAIG DAUGHTRY on the development of approaches to use of spectral measurements to assess crop condition and predict yield.

MINI-LARSIANS

Congratulations to Kathi and DAVE FREEMAN on the birth of their daughter, Michelle Ruth, on February 22, 1979. Michelle came into the world at 8½ pounds and 20 inches.

RECENT ACQUISITIONS IN THE LIBRARY

PHOTOGRAMMETRIC ENGINEERING and REMOTE SENSING

Volume XLV

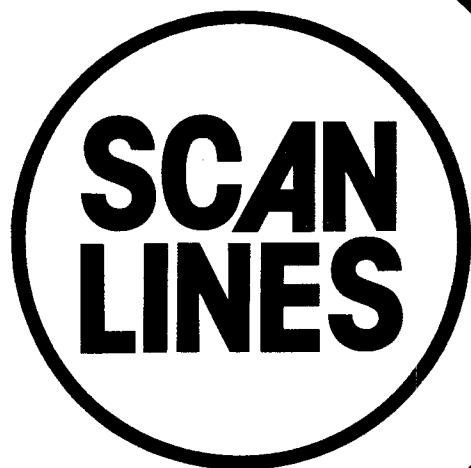
January 1979

Number 1

COVER PHOTO — TOPOIMAGE™ showing the Traverse City Quad in Michigan. This image, produced from digital terrain data, exaggerates relief over the entire 2° × 1° topographic quad, which has elevations ranging from 589 feet to 1,580 feet above sea level. The scale is approximately 1:850,000. An artificial sun is assigned to a position 30° above the eastern horizon (east is to the right). TOPOIMAGE™ is a registered trademark of GeoSpectra Corporation of Ann Arbor, Michigan, who submitted the image.

TECHNICAL ARTICLES

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LARS · Purdue University · Vol. 5 · No. 3 · April 2, 1979

NASA ADMINISTRATORS BRIEFED ON BOLIVIAN LANDSAT PROGRAMS

Significant results of applications of remote sensing in Bolivia were reported to top NASA Administrators by Dr. Carlos Brockmann, Director of the Bolivian Remote Sensing Programs, and Dr. LUIS BARTOLUCCI, Technical Director of Training at the Laboratory for Applications of Remote Sensing, on March 19, in Washington, D.C.

Dr. Robert Frosch, NASA Administrator, Dr. Tony Calio, Associate Administrator for Applications, Mr. Pitt Thome, Program Manager for Earth Observations, Mr. Arnold Frutkin, Associate Administrator for External Relations, and Mr. Kenneth Pederson, Director of NASA Internal Affairs Division, learned that Bolivia is the only Latin American country which is using remote sensing on an operational basis.

Major accomplishments through photo-interpretation of Landsat data are being integrated with new capabilities in computer-aided analysis. Through a technology transfer

relationship with LARS of over 4 years, the Bolivian Remote Sensing Program has implemented LARSYS Version 3.1 in a DEC system 10 computer.

Prior to meeting with NASA officials in Washington, D.C., Dr. Brockmann and Milton Suarez and Carlos Valenzuela, two of 17 full-time remote sensing specialists from the Bolivian Remote Sensing Program, attended the monthly short course on Remote Sensing Technology and Applications at LARS. Brockmann, Suarez, and Valenzuela lengthened the usual week of short course activities from March 5-18, by participating in an extended version of the Hands-On Computer Option using their own data over the Salt Flat of Coipasa, Andes Mountain Plateau.

Copies of the first national Bolivian Land Use Map and Geological Map were left with Dr. Bartolucci. These maps, scale 1:1,000,000, are based on photo-interpretation and extensively field checked. Utilization of Landsat data enabled these maps to be completed in 2 years instead of

Prepared by the Laboratory for Applications of Remote Sensing for distribution at Purdue. Contact Susan Ferringer, SCAN LINES editor, to be placed on the mailing list (749-2052, ext. 290).

the 20-30 years required by conventional methods. Their information is in use from grade school education, all the way to major governmental policy decisions.

Other significant accomplishments of the Bolivian Remote Sensing Program include:

- (1) \$12 million saved by rerouting a planned highway and gas pipeline on the basis of Landsat data.
- (2) lithium deposits showing unusually high concentrations (1,600 parts per million compared with 300 parts per million concentrations being mined in the United States) discovered using Landsat data. The Bolivian government is now conducting further studies to plan the extraction of the lithium from the site.
- (3) the entire country being remapped at much less cost and time than traditional methods, and with more accuracy (some bends in rivers found to be as much as 24km from those indicated on previous maps). According to the Inter-American Development Bank, a soil map of Bolivia is being made for 1/20 the cost and 1/4 the time of a conventional soil map that was made by a British contract team working 8 years for \$400,000; the Landsat map will be completed in 2 years for about \$20,000.
- (4) using Landsat data to map the Upper Amazon and Paraguay River basins in eastern Bolivia for the first time. These areas were thought to contain deposits of exploitable iron ore. Through digital analysis, an iron-rich formation and sandstone outcrop were identified. This identification was verified with aerial photography and ground information.
- (5) the 1976 national census survey, where Landsat data was the main source of information for drawing basic maps in five states required for undertaking a pre-census of homes. These maps were then supplemented by field information and final maps prepared to be used by the census personnel.

LATIN AMERICAN DEVELOPMENT HIGHLIGHTED

In addition to meeting with NASA Administrators in Washington, D.C., on March 19, LUIS BARTOLUCCI and Carlos Brockmann discussed the technical aspects of a potential Bolivian project to be funded by IBM with Pierre Adrien.

Bartolucci and Brockmann then met with Ing. Roberta Arce, Bolivian Ambassador to the United States, and Dr. Charles Paul, Director of Remote Sensing Programs, AID/ Washington, to discuss future implementation of the regional Latin American remote sensing center.

SYMPOSIUM UPDATE

A close look at the Program reveals that over 50 long papers (9 international) and two dozen short papers, divided into two plenary and nine technical sessions will be presented June 27-29, during the 1979 Purdue/LARS Symposium on Machine Processing of Remotely Sensed Data.

Dr. Earl Butz will be the featured speaker at the banquet to be held Thursday, June 28, at The Trails, 6:00-8:30 pm.

Registration for the three day meeting is \$150, and includes one copy of the Proceedings and participation in the conference. Advance registration may be made by contacting:

Continuing Education Business Office
Room 110 Stewart Center
Purdue University
West Lafayette, Indiana 47907

Meal reservations must be made by noon on Monday, June 25. Final registration will be in the East Foyer, Stewart Center, on June 27, from 7:45-8:30 am.

A special pre-symposium offering of the short course: "Remote Sensing Technology and Applications" which is regularly

offered the first week of each month will be presented June 18-22, primarily for the benefit of international participants. Seats will be filled on a first-come, first-serve basis, so those interested should contact DOUG MORRISON at LARS promptly. (Final offering at current rates!).

The course content is divided into two parts: core material taken by all participants and optional units designed to allow the participants to tailor the course to their particular professional needs.

Features of the course are:

- * Individually tailored subject matter
- * Specially designed instructional materials
- * Optional Hands-On computer experience
- * Landsat data analysis workshops
- * Limited enrollment
- * Offered first full working week of each month

LARS TRAVEL LOG

PAUL ANUTA, MARVIN BAUER, CRAIG DAUGHTRY, MARILYN HIXSON attended and made presentations at the SR&T Project Quarterly Review at NASA/JSC, Houston, Texas, March 5-8. JIM KAST also attended.

Several LARS staff members combined travel to Washington, D.C. to attend the American Society of Photogrammetry Convention, March 18-24, with visits to neighboring agencies.

PHIL SWAIN attended the ASP Convention from March 20-23, then met with Bill Alford at NASA/Goddard. ROGER HOFFER, MIKE FLEMING, ROSS NELSON, and LISETTE ERNST combined their trip to the ASP Convention with a visit to Darrel Nelson at Goddard. PAUL ANUTA also attended the International Society of Photogrammetry committee meeting while in Washington, D.C.

SHIRLEY DAVIS represented Technology Transfer at the ASP Convention March 20-23. Various educational programs were displayed; Shirley was available to answer questions.

RON BOYD participated in a NASA/Earth Resources Laboratory sponsored short course on remote sensing, held at the University of Georgia, Atlanta, on March 25-30.

ADVANCED DEGREES

Congratulations to DAN WIERSMA on passing his Ph.D. final exam on March 19. Dr. Wiersma presented a seminar on March 21, at Flex I, entitled: "The Analytical Design of Spectral Measurements for Multispectral Remote Sensor Systems."

VISITORS

Visitors from the Republic of China have been frequent in recent months. Two professors, after travelling to San Francisco, California, to attend an International IEEE Conference, completed their trip with a visit to Purdue University and LARS.

On April 9, eight department heads of various Chinese Universities will visit Purdue to learn about teaching techniques. They will be touring several Purdue departments, including LARS, where they will learn about remote sensing education. Another large group of Chinese scientists is expected to follow in middle April.

Dr. Martin Seger, University of Bildungswissenschaften Klagenfurt, Institut fur Geographie, Klagenfurt, Austria, visited DOUG MORRISON, DAVE FREEMAN, and the LARS Library, on March 21. Dr. Seger was here to investigate LARSYS' compatibility with the ISI image processing and display system currently implemented at Klagenfurt.

A visiting professor at the University of Maine at Orono, Institute for Quaternary Studies, visited LARS on

March 23. Dr. Bengt Luden is a Swedish researcher in remote sensing, especially infrared thermography, working for the Department of Physical Geography, University of Stockholm, Sweden. While at LARS, Dr. Luden discussed the possibilities of using infrared photography for applications in geoscience, primarily for soil moisture studies, but also for mapping of bedrock outcrops and hot springs. He met with DOUG MORRISON, LUIS BARTOLUCCI and MARION BAUMGARDNER.

NEW PROJECTS FUNDED

Title: Preparation of a Spectral Map Delineating Soil Features for Ford County, Illinois. Sponsor: USDA/Soil Conservation Service, Illinois. Principal Investigator: DICK WEISMILLER. Personnel Involved: FRANK KIRSCHNER and STEVE KRISTOF. Duration: March 12, 1979 to September 30, 1979. Funding: \$29,000

BUSINESS ADMINISTRATOR NAMED PRESIDENT-ELECT

GLORIA PETERSON is the new 1979 president-elect of the Purdue University chapter of Phi Delta Kappa, an International Educational Honorary Fraternity.

The fraternity's membership encompasses college and university education faculty, as well as elementary and secondary educators and administrators. The education, research, and service organization is best known for its publications and research.

Ms. Peterson was initiated into Phi Delta Kappa as a graduate student in Continuing Education in 1974. She chaired the Ethics Committee in 1977, was in charge of the chapter's audit in 1978, and will assume the presidency in 1980.

PROPOSALS SENT OUT

Title: Addendum to the Goddard Space Flight Center Earth Resources Data Processing Remote Terminal Support Proposal. Sponsor: NASA/Goddard Space Flight Center. Principal Investigator: SUSAN SCHWINGENDORF and TERRY PHILLIPS. Duration: March 1, 1979 to August 30, 1979.

Title: The Application of Remote Sensing Technology to the Solution of Problems in the Management of Resources in Indiana. Sponsor: NASA. Principal Investigator: DICK WEISMILLER and DICK MROCZYNSKI. Duration: June 1, 1979 to May 31, 1980.

SYSTEM SERVICES April 2, 1979

SYSTEMS ANALYSIS NEWS FROM JEANNE ETHERIDGE

RATES FOR LARSYS AND EXOSYS

Beginning April 1, LARSYS and EXOSYS will be supported by the Systems Analysis Group in the Computer Facility. Users will be charged \$150/CPU hour of LARSYS usage and \$3.55/CPU minute of EXOSYS usage. BILL SHELLEY will be responsible for LARSYS support and JEANNE ETHERIDGE for EXOSYS support. The LARS Directors and Program Leaders have approved the rates.

During the past few years, the 18 standard LARSYS processors have been supported to a minimal extent; LARSYS DV processors have not been supported, but major problems have been corrected. Most additional processors and major modifications in both EXOSYS and LARSYS have been supported by projects outside the Computer Facility. Since both these systems are used by many projects, and new processors and modifications are made available to all projects, users have requested, and it is more reasonable, that all users of the 2 systems contribute towards the financial support.

Support of the systems will not immediately solve all problems. It can be said, though, that users should be able to enumerate changes that will have occurred due to the increased level of support after one year from now.

The memo entitled, "Request for LARSYS Rate" was previously distributed to all program leaders and professional staff, and a seminar was presented for the discussion of the memo. The memo for "Request for EXOSYS Rate" was previously distributed to major users of EXOSYS. The first two sections of these memos are reproduced here.

MEMO - Request for LARSYS Rate

1. Name of Product: LARSYS
2. Description of Product:
 - a. Word Description

LARSYS is a system of programs designed to support user software requirements for the analysis of data collected by various multispectral scanner systems. A large quantity of Landsat satellite data exists, but there is also aircraft and Skylab data. The system is divided into 2 parts: standard LARSYS and developmental LARSYS or LARSYS DV. Standard

LARSYS consists of 18 processors and some additional routines which were incorporated into Release 3 in 1973. LARSYSDV came into existence about 1975 and includes modified LARSYS and additional processors. LARSYS programming standards have been, to a great extent, maintained in the LARSYSDV processors, but program abstracts and user documentation may or may not exist. There is in every case, though, a control card description for the processor on the system disk.

The 18 standard LARSYS processors are:

1. PICTUREPRINT - histograms and displays the data in picture form on the line printer for each channel at a time.
2. IMAGEDISPLAY - same as PICTUREPRINT but the output device is the digital display.
3. CLUSTER - using reflectance values from all channels, groups the data into classes and displays the results on the line printer.
4. STATISTICS - calculates statistics on fields of data which the user has grouped into classes.
5. SEPARABILITY - calculates transformed divergence between all class pairs and performs these calculations for every set of channels the user requests.
6. CLASSIFYPOINTS - assigns each pixel in the data to a class, using the maximum likelihood algorithm. The results are written to tape or disk.
7. SAMPLECLASSIFY - assigns each field in the input deck to a class and displays the results on the line printer only.
8. PRINTRESULTS - using the classification results located on tape or disk, prints a map and tabulates the number of pixels classified into each class.
9. IDPRINT - prints most of the information contained in the MSS data header record.
10. DUPLICATERUN - duplicates a data run from tape to tape.
11. TRANSFERDATA - prints the actual data values on the tape for any number of channels.
12. COPYRESULTS - copies classification results from disk or tape to another tape.
13. LISTRESULTS - prints some information located in the header records of the classification results stored on tape.

14. PUNCHSTATISTICS - punches a copy of the statistics deck located on a classification results tape.
15. LINEGRAPH - graphs a line MSS data on the line printer.
16. COLUMNGRAPH - graphs a column of MSS data on the line printer.
17. HISTOGRAM - histograms data and may punch a deck of the histogram information.
18. GRAPHHISTOGRAM - on the line printer, displays the histogram produced by PICTUREPRINT, IMAGEDISPLAY or HISTOGRAM processors.

At this time, there are 8 new processors and some modified LARSYS processors in LARSYSDV which will be supported. Any other processors on the disk will be maintained at a very minimal level until personnel time is available to investigate the processor. They exist solely for users' convenience. The modified LARSYS processors are located on the LARSYSDV system disk for the users' convenience. When the standard LARSYS system disk is updated, they will be erased from the LARSYSDV system disk. The 8 new processors are:

1. ECHO Classifier - groups the data into homogeneous cells and classifies each cell as if it were a single pixel.
2. Layered Classifier - using a tree designed to indicate which classes and channels should be used for each layer, assigns each pixel to a class which is in a terminal node in the tree.
3. Minimum Distance Classifier - assigns each pixel to the class whose mean vector is closest (Euclidean distance) to the pixel.
4. Mergestatistics - combines more than one statistics deck into one deck.
5. Browse - searches the LARSYS runtable and prints out the list of MSS data runs which satisfy the user's request.
6. Ratio - using the mean vectors of classes in a statistics deck, calculates and prints the ratio of the values for the specified channels and the sum for each class.
7. Gdata - derived from PICTUREPRINT in standard LARSYS. Output is generated for the printer-plotter.
8. Gresults - derived from PRINTRESULTS in standard LARSYS. Output is generated for the printer-plotter.

The purpose of LARSYS support is to maintain and modify the software system to the extent provided by the budget. Specifically, the service provides the following:

1. Software problems occurring in the 28 processors described above will be investigated within 2 days and corrected within 5 additional days if there are no extenuating circumstances, if,
 - a. they produce erroneous results and the problem cannot be circumvented.
 - b. output requested is missing (i.e., the function terminated abnormally).
2. Software problems occurring in other processors will be investigated within a month and corrected, if feasible.
3. Consult with users on questions, problems, or suggestions concerning LARSYS.
4. Control card descriptions for each processor will be available to the user through files located on the system disk and notebooks located in the terminal areas.
5. Software modifications will be planned and carried out to the extent of available funding.
6. Provide documentation for processors beyond control card description files. This will be done for those processors determined to be in demand by users. The documentation will follow documentation standards existing for standard LARSYS.
7. Update the Program Library each year for LARSYS routines.
8. During the first year, the person responsible for LARSYS support will write a document describing procedures for investigating and correcting software problems, modifying existing processors, implementing new processors, and updating LARSYS.
9. Investigate "minimally supported" processors.

b. Availability of Service

The LARSYS programs are available for use at all times when the LARS computer is in operation. They can be run in either interactive or batch mode. User problems and requests should be brought to the attention of the person responsible for the support of this service.

c. Measure of Service

LARSYS support is measured in CPU hours used by the program.

MEMO - Request for EXOSYS Rate

1. Name of Product: EXOSYS
2. Description of Product:
 - a. Word Description

EXOSYS is a system of programs designed to support the basic user software requirements for the analysis of data collected by various spectroradiometers. These field instruments have been used to collect spectral data on both crops and soils. The first instrument used was the Exotech Model 20C and, hence, the name EXOSYS (Exotech System) was created. EXOSYS provides the basic analysis aids for the experimenter in the form of three processors: IDLIST, GSPEC, and DSEL.

1. Data Identification List Processor (IDLIST)

This processor is used to provide descriptive information for purposes of identifying data observations. A subset or the complete set of available descriptive parameters can be listed for selected observations. An additional feature of IDLIST is the ability to output a subset of agronomic or geometric parameters in a format for subsequent data analysis using other software.

2. Data Graph Processor (GSPEC).

This processor provides graphical output of data observations. Plots may represent an individual observation or the average of several observations. GSPEC is used for data verification, exploratory analysis of spectral characteristics, and qualitative assessments of relationships between reflectance and wavelength and/or agronomic or soil characteristics.

Since the plotting routines in GSPEC use GCS (Graphics Compatibility System), the plotting capabilities are numerous. They include the use of polar coordinates, logarithmic scales, redefinition of dependent variables, curvefitting, and general scaling and plot specifications.

3. Data Selection Processor (DSEL).

Data reduction capabilities are incorporated in this processor through several statistical procedures. Initially, average response values (band means) are calculated using the average response of samples collected within the specified wavelength limits.

The band means can be printed along with other descriptive statistics which include standard deviation, range, variance and percent deviation. A matrix of interband correlations can also be requested. Also, a LARSYS-compatible statistics deck can be punched for use with that software system. A second type of deck that can be punched includes the bands means and, optionally, the agronomic and/or geometric parameters (the same set as IDLIST produces); this deck is used as input to other statistical analysis packages.

Spectral subclasses within a crop or soil type can be identified using the clustering option available.

The purpose of EXOSYS support is to maintain and modify the software system to the extent provided by the budget. Specifically, the service provides the following:

1. Existing software problems will be corrected if they produce erroneous results, do not produce output as requested by user control cards, or result in entering the CMS debug environment.
2. Control card formats and descriptions will be available to all users through files located on the system disk.
3. Software modifications will be carried out to the extent of available funding and then usually for minor changes and enhancements. Any specialized user requirements will be directly supported by funds from the project desiring them.
4. The system will be updated to make corrections and modifications available to users. After each update, the EXOSYS system and resource disks will be backed up to magnetic tape. A written record will be kept.
5. Update the Program Library each year for EXOSYS routines.
6. During the first year EXOSYS is supported, a users' manual illustrating the capabilities will be developed. This will provide more extensive documentation than the existing control card description files mentioned in (2).

b. Availability of Service

The EXOSYS programs are available for use at all times when the LARS computer is in operation. They can be run in either interactive or batch mode. User problems and requests should be brought to the attention of the person responsible for the support of this service.

c. Measure of Service

EXOSYS support is measured in CPU minutes used by the programs.

THE IBM 3031 AND CMS370 CONVERSION

As you probably know by now, LARS should have an IBM 3031 by September of this year. It will run under the VM operating system we now have on the 370/148, but be 2 to 2.5 times as powerful, according to IBM. Before the installation of any new computer, user programs must be tested adequately. Before the installation of the 370/148, testing was done at the IBM offices in Chicago.

Because there may not be 2314 disk drives available on a 3031 for testing, it is imperative that some major systems such as LARSYS, EXOSYS, Batch, Geometric Correction, and Landsat Reformatting be converted to CMS370 to the extent that personnel are available for conversion.

There are many reasons why all programs running under CMS360 should be converted to CMS370, but any conversion effort must be planned so that there is a minimal amount of inefficient or duplicated effort. As part of the planning process for the 3031 project, it has been decided that some conversion must be done in time for testing. Also, after installation, 370 conversion will become a Computer Facility project. That is, Computer Facility personnel will complete the conversion of all systems for which they are responsible and assist users in converting to CMS370.

Some of the reasons to convert to CMS370 are:

- 1) CMS360 has not been supported by IBM for about 3 years now.
- 2) The 2314 disk drives, which are required for CMS360, are no longer as reliable as they should be.
- 3) The 2314 disk drives are expensive to maintain and the cost has increased again just this past year.
- 4) Although the capability to run CMS360 on the LARS IBM 370/148 exists, it was intended to be a temporary measure to allow minimal conversion effort for the 370/148 installation.
- 5) We ought to take advantage of some of the new features available in CMS370.
- 6) It is more difficult for us to maintain both CMS360 and CMS370; it is more expensive in terms of personnel to us and therefore in terms of money to you.

- 7) We cannot obtain additional 2314 drives in order to make more disk space available to CMS360 users; we can, though, obtain 3350 and 3330 drives for use by CMS370 users.

Any analysts interested in testing a CMS370 version of the 18 standard LARSYS processors should contact SUE SCHWINGENDORF, BILL SHELLEY or JEANNE ETHERIDGE.

Additional information on the 3031 project, including testing and CMS370 conversion, will be published each month in SCAN LINES, in order to keep you posted.

EXOSYS NEWS

EXOSYS NEEDS A NEW NAME

DAVE LANDGREBE gave his approval of the rate for EXOSYS on the condition that the name be changed. MARV BAUER has been wanting a new name. The name EXOSYS is an advertisement for the company that built the Exotech Model 20C spectroradiometer and does not convey the message that many different radiometers are being used in both crops and soils research.

I want to recommend a new name by April 30 and am asking for your suggestions. The user who suggests the winning name will receive a prize that he will remember forever. And, of course, the winner and the new name will be published in SCAN LINES!

OLD EXOSYS IS GONE

When you type 'run exosys', you'll be using the only EXOSYS system available; old EXOSYS is gone and EXOSYSDV is now EXOSYS. You'll be reminded of this when you IPL EXOSYS.

REMOTE HIGHLIGHTS BY SUSAN SCHWINGENDORF

ALABAMA A&M TERMINAL

Drs. Oscar Montgomery and MacArthur Floyd from Alabama A&M completed their initial training at LARS March 13-16, 1979 under the direction of RON BOYD. Included in their studies were the LARSYS, LARSYSDV, and EXOSYS systems. During this time, a hardware problem in the modem was also corrected. The Alabama A&M remote terminal configuration currently consists of a Data 100 printer/card reader/card punch, a DECwriter terminal and an Infoton GTX terminal connected to the Purdue/LARS computer via two Codex modems and a direct telephone line.

CP/CMS370 COURSE AT JSC

During the week of February 5-9, 1979, BILL SHELLEY, LUKE KRAEMER and SUSAN SCHWINGENDORF presented a series of seminars at JSC about using the Purdue/LARS computer. Topics covered included CMS370 commands, editing files, entering and testing programs, availability of software such as SPSS, BMD, LARSYS, EXOSYS, TIMELIMIT, etc..., converting from CMS360 to CMS370 and writing EXEC routines. A number of users were given individual assistance in testing, running or writing programs they wanted to use on the Purdue/LARS computer. Anyone at JSC interested in copies of course materials, or setting up a LARS computer account, should check with Don McGee at JSC.

Plans are underway to have someone from LARS travel to JSC sometime in April to assist computer users with any new or continuing problems.

SRTNEWS

This is a reminder for all users of the Purdue/LARS computer that a news facility is available on the LARS computer to provide current information on system modifications and upgrades, both hardware and software. (See January 19, 1979 issue of SCAN LINES). The SRTNEWS facility may be accessed from CMS370 by typing the command: SRTNEWS.

If you have news items which you would like to appear in SRTNEWS, please contact Kitty Havens (at JSC) or SUSAN SCHWINGENDORF (at LARS).

BASIC SYSTEMS NEWS FROM ROSS GARMOE

ADDITIONAL DISK STORAGE SPACE

As you may recall, one of the advantages of installing a 370 computer was the ability to add disk space to the system at a reasonable cost. The Computer Facility has now taken advantage of this ability and added two CDC 3302-11 disk drives to the 370/148. These drives are plug-compatible replacements for the IBM 3330-11 drives. These drives use a mountable pack which can contain a maximum of 200 megabytes per pack (equal to the total storage of our 2314 disk). In the CMS format used by VM370, each pack contains 808 cylinders with 266 blocks per cylinder. This gives 212,800 characters per cylinder, or 171.9 megabytes per pack. As a comparison, each 2314 cylinder contains 120,000 bytes, and each 3350 cylinder contains 456,000 bytes.

The normally mounted packs are called VMUSR1 and VMUSR2. However, in response to special requests, other packs can be mounted if such a need arises, and users of the packs to be demounted are not adversely affected. Please contact Operations before such a request is made.

Please note that disk space on these drives is not available for use from CMS360. If you need additional disk space under CMS360, you must request storage on the 2314 disk drives. We encourage all CMS370 users to migrate to the new disk drives in order to free up space on the 2314 disks and help the CMS360 user. Also, if you are a CMS360 user, please read the following section.

CMS370 SUPPORT

As you are aware, CMS360 is not supported by IBM, and the ability of System Services personnel to maintain this system is decreasing with respect to its ability to maintain CMS370. Therefore, CMS370 has officially become a supported system of System Services. As a supported system, System Services guarantees the availability and correct operation of CMS370, in addition to CMS360. Upgrades to these systems, and correction of user-encountered errors in them, will be performed by System Services personnel at no charge to the user. If errors are encountered, please notify ROSS GARMOE at extension 261. After verification of the problem, personnel will be assigned based on the severity of the problem and availability of personnel time.

PHASE-OUT OF CMS360

When the 360/67 was replaced by the 370/148, the CMS360 was installed under VM370. You probably are aware that there are disadvantages to using CMS360. One of these is that the only disk storage space it can use is the 2314 disk system. Since the 2314 system in use at LARS is obsolete and beginning to experience reliability problems, there are risks to using CMS360. Also, new software purchased by LARS (such as the FORTRAN H Optimizing Compilers), is only available under CMS370.

System Services personnel are in the process of converting internal software such as LARSYS, EXOSYS from CMS360 to CMS370 as time is available. We hope to have all such software converted by the end of 1979.

You should be aware that it is the intention of System Services personnel to remove CMS360 from the system by the end of 1980. We strongly advise all users to develop new applications under CMS370, and to convert all current programs to CMS370 as time is available. If this causes any hardship for any project, or you need advice concerning CMS370 conversion, please contact either JEANNE ETHERIDGE or ROSS GARMOE.

VM370 REL.5, PLC 11

Basic Systems personnel are currently upgrading the VM370 Rel. 5 system from Program Level Change (PLC) 5 to PLC 11. These PLC upgrades are corrections to errors encountered in the current release. PLC tapes are released by IBM on a monthly basis. Basic Systems, in general, plans to install a new PLC tape approximately every six months. We are planning to have the PLC 11 upgrade installed by April 7, 1979. All users will be notified via the LOGMSG as the installation plans become definite. PLC 11 does not change the functional specifications of CP, CMS or RSCS and should effect no user programs.

VM370 Rel. 5, PLC 11 is the system that will be used for all testing on the 3031 computer and will be the system first installed on the 3031.

IBM 3031 INSTALLATION

LARS has ordered an IBM 3031 computer to be installed in August. This machine has approximately 2 to 2.5 times the power of the 370/148. In addition, there will be 2 megabytes of real memory as opposed to the 1 megabyte on the 370/148. We expect that the 3031 will greatly improve the computational facilities available to users of the LARS system.

We have been told by IBM that few changes will be required to convert VM370 and our software to the 3031 and that all of the changes are restricted to the CP component of VM370. No changes will have to be made to user programs.

Further information on the 3031 installation is available in this SCAN LINES and in future SCAN LINES as the installation date approaches. For further information on the 3031 installation, contact JIM KAST or ROSS GARMOE,

MR. TERMINAL PUTS IN HIS TWO BITS

The two new TI 745 portable terminals have just arrived! Each lab will have one for general use. Sign-out procedures for the terminals will be strictly enforced. From 8 a.m. to 5 p.m., the FLEX1 terminal can be checked out by contacting JULIE HANOVER and the FLEX2 terminal by MARY ELLEN PIERSON. For a trial period, the old TI 735 will be kept at FLEX2. This terminal as well as the new one will be available for checkout during the hours the computer is in operation. If you require a terminal between 5 p.m. and 8 a.m., then one can be checked out with the computer operator at FLEX2.

LACIE DATA BASE

The Segment Catalog for the LACIE Landsat data stored at LARS has been placed on the system. Information for LACIE Phases II and III is currently implemented in the data base. Software to access and search the data base has also been made available. For more information and an example of the data search capabilities, type, under CMS

```
'GETDISK JSCDISK 19A B'
```

Then print the files 'SEGFO INFO B' and 'GETACQ INFO B'. The SUBSET data search system is also available and can be accessed by typing 'GETDISK JSCDISK 19B F'. Then print the file 'SUBSET INFO F'. If there are any questions, contact LUKE KRAEMER (LARS).

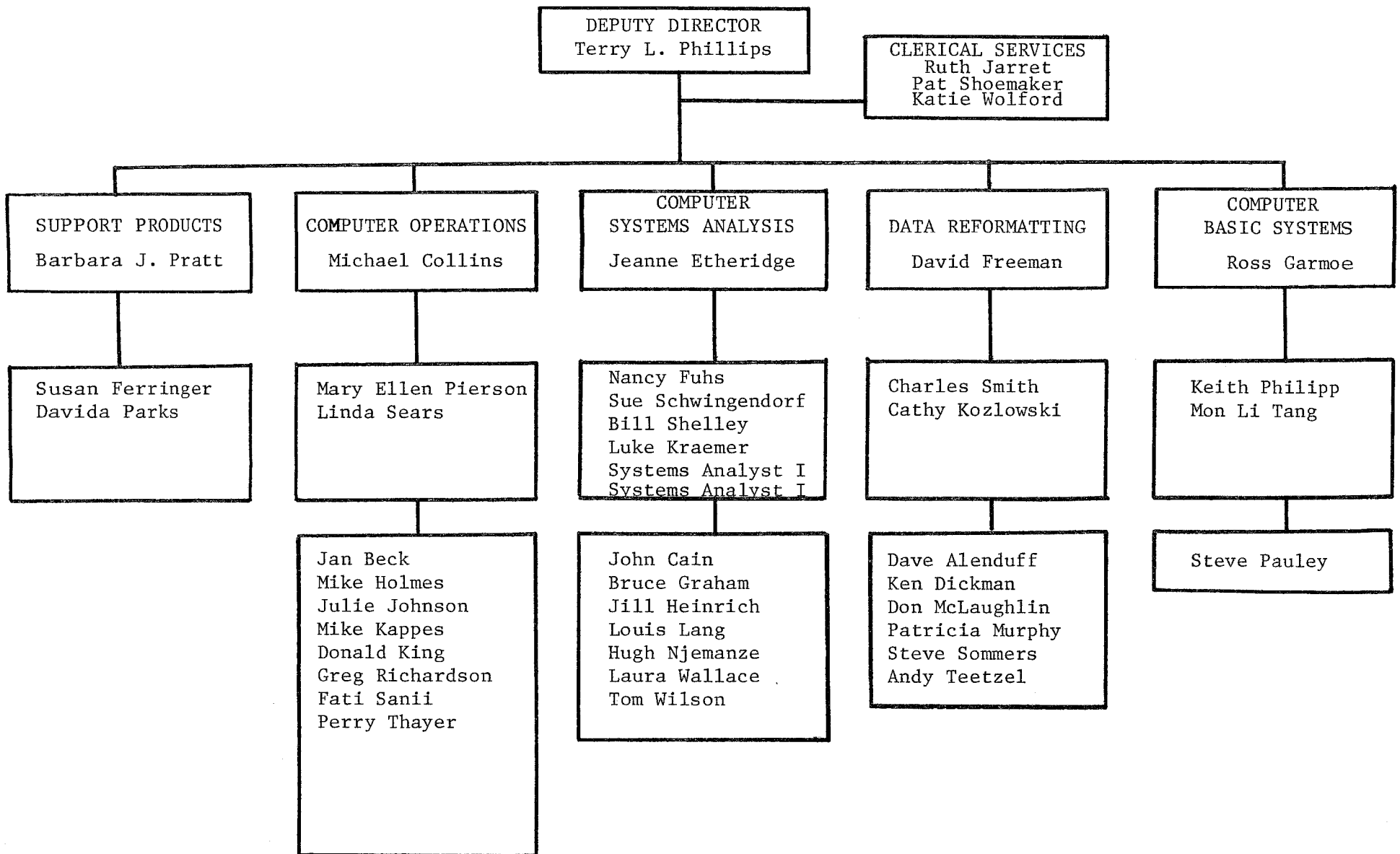
DIGITAL DISPLAY UPDATE

The Digital Display Primary Staff (DAVE FREEMAN, chairman, LARRY BIEHL, LUKE KRAEMER, BARBARA PRATT, PHIL SWAIN, CHUCK SMITH, and DICK WEISMILLER) and the Resource Staff (JEANNE ETHERIDGE, NANCY FUHS, BUD GOODRICK, FRANK KIRSCHNER, CATHY KOZLOWSKI, TERRY PHILLIPS and DONNA SCHOLZ) have been meeting on a somewhat regular basis to determine which Digital Display and peripheral equipment should be purchased. To date the display system hardware specifications have been reviewed and the functional specifications have been looked at. We have requested bids on the hardware and are expecting input from the various vendors during the last week of March. Some

feedback clarifying specifications and indicating alternatives have been received.

The Basic Implementation Plan has been developed. A more complete plan is expected by mid-April at which time a presentation detailing plans and progress will be made to all LARS staff.

SYSTEM SERVICES ORGANIZATIONAL CHART



SUMMARY OF 370/148 COMPUTER USAGE FOR FEBRUARY

Overall Usage	Basic Rate CPU Time Used	24.36
	Priority Rate CPU Time Used	144.03
	Total CPU Time Used	168.39
	Terminal Sessions	3318
	Batch Jobs	834

Usage by Time of Day-- <u>Time Period</u>	<u>Hours of CPU Used</u>	<u>Average Percent CPU Utilization</u>
Mon-Fri midnite-8AM	21.00	13
Mon-Fri 8AM-4PM	77.88	53
Mon-Fri 4PM-Midnite	49.97	32
Weekend	18.53	17

Batch Job Usage	<u>Batch Machine</u>	<u>Jobs Run</u>	<u>Avg. Clock Time</u>	<u>Avg. CPU Time</u>
	BATQUICK	76	.92	.07
	BATSHORT	380	9.38	0.84
	BATMED	110	17.46	1.22
	BATONITE	73	24.09	2.93
	BATLONG	56	33.07	12.93
	TAPTRAN	17	46.58	5.73
	BATEOD	67	21.05	2.52
	BATJSC	28	33.22	11.66
			<u>Total</u>	<u>Avg. Time</u>

<u>Keyboard Terminals</u> - <u>Location</u>	<u>Port</u>	<u>Terminal Type</u>	<u>Logins</u>	<u>Time in Use</u>	<u>Per Session</u>
Flexlab2	30	INFOTON GTX	119	156.69	1.27
Flexlab2	31	INFOTON GTX	114	149.87	1.31
Flexlab2	32	INFOTON GTX	186	142.84	0.77
Flexlab2	33	INFOTON GTX	187	212.42	1.14
Flexlab2	34	INFOTON GTX	154	167.02	1.08
Flexlab2	35	INFOTON GTX	187	197.23	1.05
Flexlab2	36	INFOTON GTX	188	203.05	1.08
Comp. Room	37	DECwriter	248	62.68	0.25
Flexlab1	40	INFOTON GTX	181	179.73	0.99
Flexlab1	41	INFOTON GTX	227	172.61	0.76
Flexlab1	42	INFOTON GTX	182	206.08	1.13
Flexlab1	43	SUPERTERM	126	63.64	0.51
Dial-up	50	First in Use	60	37.98	0.63
Dial-up	51	Second in Use	1	0.15	0.15
Dial-up	52	Third in Use	---	---	---
Dial-up	53	Fourth in Use	---	---	---
Dial-up	54	Fifth in Use	---	---	---
Dial-up	5E	In-House First	8	5.24	0.65
Dial-up	5F	In-House Second	2	2.45	1.23
Houston	60	Hazeltine 2000	192	101.88	0.53
Houston	61	Hazeltine 2000	188	93.62	0.50
Houston	62	2741	123	63.42	0.52
Houston	63	2741	140	58.73	0.42
Alabama	64	DECwriter	2	2.93	1.46
Alabama	65	INFOTON GTX	25	42.81	1.71
ISU	66	(various)	73	43.60	0.60
ISU	67	(various)	93	60.52	0.65
Houston	6A	Dial-1st in Use	175	108.89	0.62
Houston	6B	Dial-2nd in Use	124	81.95	0.66
Houston	6C	Dial-3rd in Use	66	49.77	0.75
Houston	6D	Dial-4th in Use	37	15.21	0.41



INTERLAB NOTES

PERSONNEL

A big welcome is extended to MONLI TANG who joined the staff on March 12. MonLi received her BS in Mathematics and Computer Science from the City College of New York and her MS in Computer Science from Purdue. She brings several years experience in marketing, manufacturing management, and scientific programming to the Software Analyst position in the System Services Group. Currently, she shares an office with LUKE KRAEMER, extension 259.

KATIE WOLFORD joined the staff of Flex II as Secretary/Receptionist on March 7. She is located in the main reception area, ext. 288.

MINI-LARSIANS

Congratulations to Irene and MIKE COLLINS on the birth of their son, Trevor Michael on March 3 and to Debbie and CHUCK SMITH on the birth of their son, Bruce Alan, on March 3.

RECENT ACQUISITIONS IN THE LIBRARY

The moving and setting up of the Flex I Library has been completed and staff are invited to come and browse. Books and periodicals which staff would like to contribute to the Library are welcomed. Please see MARLENE HODGE. Library materials may be checked out for a 2 week time period through NANCY KLINE, our receptionist. If a longer time period is needed, please make special arrangements with Nancy.

The order in which staff may find library materials is as follows: (starting with the 1st bookcase located to the right of the front door).

- 1st bookcase Courtesy Corner - Purdue maps, Focus Series, Bibliography, Program Leaders Booklet, LARS Annual reports, LARS Information Notes in notebooks.
- 2nd bookcase Proceedings
- 3rd bookcase Final reports from other institutions shelved in alphabetical order.
- 4th bookcase Authored Texts and LARS Information Notes for check out.

- 5th bookcase Related texts and outdated periodicals on lower shelves.
- 6th bookcase Periodicals and outdated periodicals on lower shelves.
- 7th bookcase Periodicals
- 8th bookcase Water Resources texts.

The following is a list of periodicals and newsletters (indicated with *) which are contained in the LARS Library.

- * Agricultural Research
 - Agronomy Journal
 - Applied Optics
 - Aviation Week & Space Technology
 - Computer Decisions
- * Cornell Remote Sensing Newsletter
 - Crop Science
 - Datamation
 - Data Comm. User
 - Down to Earth Views
 - Electronic Design
 - Electronics
- * Extrapolations
 - GEO Abstracts
 - Geological Survey
 - IBM Research & Development
 - IBM Systems Journal
- * IDB News
 - ITC Journal
- * Kansas RS. Newsletter (KARS)
- * Landsat Date Users Notes
- * Landsat Newsletter
 - Mosaic
- * NASA Activities
- * NASA Data Users Bulletin
 - Oceanic Engineering
 - Optical Engineering
 - Photogrammetric Engineering
- * Pixel Facts
- * Plain Brown Wrapper
 - Prairie Farmer
 - Purdue Agr. Reports
 - RSEMS
- * Remote Sensing in Canada
- * Satellite Data Collection Newsletter
- * Scan Lines
 - Science
 - Secretary
 - Soil Science of America
 - Spectrum
 - Successful Farming
- * TAC News
- * Tech Tran
- * Tekscope
 - Water Resources Research Center
 - Water Spectrum



LARS · Purdue University · Vol. 5 · No. 4 · May 4, 1979

FARMER ENTHUSIASM HIGH - REMOTE SENSING USED FOR THE INDIVIDUAL

Illinois' farmers have been reporting enthusiastically about a pioneer program using remote sensing data to help in management of individual farms. The Ford County Extension Office has made visible color infrared photography available to farmers interested in participating.

James Shearl, former Ford County Extension Advisor on Agriculture, now Associate Director of the Illinois Crop Improvement Association, presented a discussion of this innovative remote sensing program for Purdue University staff.

Attendees from Purdue included members of the Remote Sensing Committee for Agriculture: JOHN PETERSON, Associate Director of LARS and chairman, Donald Holt, Agronomy, Gregory Shaner, Botany, Carl Noller, Animal Sciences; LARS staff: MARVIN BAUER, CRAIG DAUGHTRY, DICK MROCZYNSKI, FRANK KIRSCHNER; Craig Dobbins, Ag Econ, Dave Mengel, Agronomy, and Ellsworth Christmas,

Associate Director of Extension. Robert Bentz, Associate State Leader of Illinois Cooperative Extension Programs, Ronald Moore, Ford County farmer, and Stanley Murdock, Agronomy, University of Illinois, also participated.

In describing the Ford County educational program, Shearl explained the interaction between participating farmers and specialists as they studied the color infrared photographs. Soil types, tile drainage, as well as wet spots, plant stress, and other problems were identified, solutions proposed and implemented. Charles Orcutt, current Ford County Extension Advisor, who is now coordinating the project, emphasized the positive reactions of participating farmers to the use of remote sensing data for farm management.

FRANK KIRSCHNER responded by presenting a slide talk on LARS/SCS work in mapping Clinton and Jasper Counties in Indiana. This was of particular interest as a joint project between LARS and Ford County will

Prepared by the Laboratory for Applications of Remote Sensing for distribution at Purdue. Contact Susan Ferringer, SCAN LINES editor, to be placed on the mailing list (749-2052, ext. 290).

produce a base map for soil survey based on Landsat data similar to those made in Jasper County.

AGRICULTURAL APPLICATIONS ON REMOTE SENSING FEATURED

Strong interest is growing in the use of remote sensing data for agricultural extension education.

The outstanding example of remote sensing extension programs in the United States is in Missouri. Chris Johannsen, Extension Land Use Specialist, Agronomy Department, University of Missouri, has successfully introduced remote sensing techniques as an aid in land and natural resource planning and farm management.

Johannsen, former LARS Associate Program Leader, was in West Lafayette to discuss plans with MARION BAUMGARDNER for two international conferences to be held in 1980. The first would combine the Purdue/LARS Machine Processing Symposium with sessions on remote sensing soil survey and soil information systems. The second meeting is planned to be larger in scope, encompassing general agricultural applications of remote sensing.

VISITORS

Ing. Aberto Viola, president, and Charles Viola, vice-president of Aeroterra, an aerial photography consulting firm, visited LARS on April 4. Viola, a professor of photogrammetry at the University of Buenos Aires, Argentina, and his son discussed LARS programs in machine processing and numerical analysis with LUIS BARTOLUCCI, DOUG MORRISON, and ROGER HOFFER. Charles Viola will expand Aeroterra's knowledge in remote sensing by participating in a visiting scientist program at LARS during December and January.

Four educators from the Peoples Republic of China visited LARS on April 9. The visitors: Jiou-Sze Chu, Director of Huaznuon Institute of Technology, Keh Fu, Deputy Director, Ministry of Education,

Sze-Lin Tang, Deputy Department Head, Kirim University, and Po-Tian Li, Deputy Department Head, South China Institute of Technology, attended a series of presentations beginning with an introduction to LARS by JOHN PETERSON. PHIL SWAIN continued about remote sensing technology, FRANK KIRSCHNER spoke on soils mapping, LUIS BARTOLUCCI spoke about remote sensing applications in developing countries, and JIM KAST conducted a tour of the computer facilities.

The Agricultural Research Institute Study Panel on Remote Sensing met at Purdue University on March 27-28. MARION BAUMGARDNER participated with representatives of agricultural industries, universities, the Department of Agriculture in the two-day planning session on research priorities in remote sensing.

Dr. R. Mallikarjunan, Head, Center of Engineering Studies in Resources, Indian Institute of Technology, Bombay, and his wife, visited LARS on April 25-26. MARION BAUMGARDNER and Mallikarjunan discussed items of mutual interest and the possibility of future training programs.

LARS TRAVEL LOG

MARION BAUMGARDNER's travel for April included: A trip to Annapolis, Maryland, on April 2-6, to participate in a workshop on Environmental and Societal Consequences of Possible CO₂-Induced Climate Changes, sponsored by the Department of Energy and the American Association for the Advancement of Science. Another trip was to Washington D.C. to participate in a meeting of the Space and Terrestrial Applications Advisory Committee held at NASA Headquarters on April 19-20. On April 25, Baumgardner attended the spring meeting of the Board of the United Methodist Committee on Relief, in Cincinnati, Ohio.

CONFERENCES

DAVE LANDGREBE participated in the annual Image Processing Short course sponsored by Electrical Engineering at Purdue University on April 18-19. Landgrebe presented a workshop paper entitled: "Processing Theory and Techniques for Multispectral Earth Observational Data."

MARILYN HIXSON, NANCY FUHS, BUD GOODRICK, TERRY PHILLIPS and JEANNE ETHERIDGE attended the ERIM Symposium on April 23-25. Marilyn and Nancy presented a poster paper co-authored with DONNA SCHOLZ entitled: "Evaluation of Several Classification Schemes: Their Parameters and Performance."

PHIL SWAIN will be presenting an invited paper at II Seminario Internacional sobre el uso de los Sensores Remotos, May 7-10 in Mexico City. Swain will be presenting an "Analysis of Multivariable Remote Sensing Data: Are We Ready for Landsat D?" at the IBM Mexico sponsored meetings.

ADVANCED SHORT COURSE TO BE OFFERED

The Advanced Topics in the Analysis of Remote Sensing data short course will be held May 14-18. Purdue staff members are invited to sit in on the course at no charge (but will not receive notebooks or luncheon on the first day). For a schedule of subject matter covered, please contact PHIL SWAIN. Swain commented that the enrollment is looking very international.

PROPOSALS SENT OUT

Title: Preparation of a Natural Resource Inventory for the Seguenega Project Area in Upper Volta. Sponsor: Africare. Principal Investigator: M. F. BAUMGARDNER. Duration: July 1 - December 31, 1979.

PROJECT EXTENSION

Title: Goddard Space Flight Center Earth Resources Data Processing Remote Terminal Support. Sponsor: NASA/Goddard. Principal Investigators: T.L. PHILLIPS and S. SCHWINGENDORF. Duration: Extend to 8/22/79.

NEW PROJECTS FUNDED

Title: Preprocessing and Analysis of Geophysical Remote Sensing Data. Sponsor: National Science Foundation. Principal Investigator: P.E. ANUTA. Duration: April 1, 1979 - March 31, 1981.

NEW LARS TECHNICAL REPORT

031379 Identification and Area Estimation
of Agricultural Crops by Computer
Classification of Landsat MSS Data
by M. E. Bauer, J. E. Cipra,
P. E. Anuta and J. B. Etheridge.

Landsat Multispectral Scanner (MSS) data covering a three-county area in northern Illinois were classified using computer-aided techniques as corn, soybeans, or "other." Recognition of test fields was 80% accurate. County estimates of the area of corn and soybeans agreed closely with those made by the USDA. Results of the use of a priori information in classification, techniques to produce unbiased area estimates, and the use of temporal and spatial features for classification are discussed. The extendability, variability, and size of training sets, wavelength band selection, and spectral characteristics of crops were also investigated.

The research reported in this paper was sponsored by NASA under Contract number NAS5-21773.

SYSTEM SERVICES

May 4, 1979

DIGITAL DISPLAY ORDERED

After many hours of evaluation and much deliberation, the Digital Display Committee has decided upon the COMTAL Vision One/20 Display. The order was placed on Friday, April 20th and everyone is anxiously awaiting its arrival.

The estimated hardware budget is listed below:

<u>Component</u>	<u>Vendor</u>
Digital Display	COMTAL
512 x 512 x 8 x 3 images	
4 Graphics Overlays	
Microprocessor	
Trackball	
Field Upgrade/Mtn	
Hard Disk Drive	System Industries
Dual Drive w/controller	
67 mbyte per pack	
Camera & Tripod	Canon/Pentax
Long Lens 85mm	
Autowind	
Data Recording Pack	
User CRT Terminal	Infoton
Upper/Lower Case Font	
Prog Function Keys	
PDP 11/34 Support Hardware	
Unibus Micro-Channel I/O	DEC
CPU Memory	Abel
	Monolithic
Miscellaneous	DEC, Abel
User Storage	
Dual Floppy Drive w/controller	DEC
512 bytes per diskette	
Graphics Terminal	Tektronix
Storage Tube 19" Diagonal	
High Resolution	
Hardware Line-drawing enhancement	

The committee thanks all personnel who took time to express needs, discuss alternatives, etc., prior to placing the order.

SYSTEMS ANALYSIS NEWS FROM BILL SHELLEY

LARSYS DV UPDATES

Corrections were made to DUPLICATERUN so the proper number of lines would be contained in the ID record and so the generated data set would contain the correct line sequence numbers. A correction was also made to GDATA to properly handle anomalies in data sets such as spikes in the histogram.

SOFTWARE SUPPORT

Our apologies for the misprint in last month's SCAN LINES, the LARSYS rate is \$100/CPU hour of LARSYS usage not \$150. Currently the support being provided consists of working on corrections to known bugs and the production of thorough user documentation for MERGESTATISTICS. We are also in the design stages of an analyst aids processor that would allow the graphical representation of data, statistics, and histograms. If you have some ideas you would like to see included, please contact BILL SHELLEY.

OPTRONICS EXPERIMENT

Currently LARS has the opportunity to temporarily acquire an Optronics System C-4300 Colorwrite filmwriter for a period of two months starting in early May. This filmwriter would be used to produce imagery of data currently maintained by LARS. This imagery would minimally consist of false color imagery and color classification products. The experiment would have a two-fold purpose. Primarily, it could be used as a measure of the need or desire of projects to permanently acquire a filmwriter. Secondly, it could be used to evaluate this particular filmwriter. In order to provide this service, a rate of \$90 per unit of experiment support has been requested. To request imagery for a supporting project, the following form will be used. If you have any questions or can provide some support, please contact BILL SHELLEY.

OPTRONICS FILM PRODUCT REQUEST

TO: BILL SHELLEY

FROM: _____

ACNT: _____

DATA DESCRIPTION (MUST BE SUPPLIED FOR ANY FILM PRODUCT)

Please check appropriate line

Uncorrected Landsat _____

Geometrically Corrected Landsat (Printer Aspect) _____

Geometrically Corrected Landate (Display Aspect) _____

Other _____

If Other, please provide:

Horizontal pixel resolution _____ meters

Vertical pixel resolution _____ meters

FALSE COLOR IMAGE

Run _____ Tape _____ File _____
(Run only if in Runtable)

Lines _____ to _____ (default is all lines)

Columns _____ to _____ (default is all columns)

Channels to be used with

blue filter _____ green filter _____ red filter _____
(default is channels 1, 2, & 4)

COLOR CLASSIFICATION PRODUCT

Tape _____ File _____

Lines _____ to _____ (default is all lines)

Columns _____ to _____ (default is all columns)

<u>CLASS</u>	<u>COLOR SELECTED</u>	<u>CLASS</u>	<u>COLOR SELECTED</u>	<u>CLASS</u>	<u>COLOR SELECTED</u>
1	_____	21	_____	41	_____
2	_____	22	_____	42	_____
3	_____	23	_____	43	_____
4	_____	24	_____	44	_____
5	_____	25	_____	45	_____
6	_____	26	_____	46	_____
7	_____	27	_____	47	_____
8	_____	28	_____	48	_____
9	_____	29	_____	49	_____
10	_____	30	_____	50	_____
11	_____	31	_____	51	_____
12	_____	32	_____	52	_____
13	_____	33	_____	53	_____
14	_____	34	_____	54	_____
15	_____	35	_____	55	_____
16	_____	36	_____	56	_____
17	_____	37	_____	57	_____
18	_____	38	_____	58	_____
19	_____	39	_____	59	_____
20	_____	40	_____	60	_____

TO BE COMPLETED BY LARSYS SUPPORT PERSONNEL

DATE REQUEST RECEIVED: _____

OPTRONICS OUTPUT TAPES _____, _____, _____

DATE OPTRONICS TAPES GENERATED: _____

DATE FILM PRODUCT PRODUCED _____

REMOTE TERMINAL HIGHLIGHTS BY SUSAN SCHWINGENDORF

NEW EDITION OF THE IMSL LIBRARY

A new release of IMSL (Edition 7) has been compiled and installed on JSCDISK 29E. This set of Fortran modules, designed to be used in the development of scientific and engineering application programs, now consists of approximately 460 subroutines covering the general fields of mathematics and statistics.

Current users will be quick to notice several major changes. Additions have been made to the library including thirty-eight basic linear algebra codes (Chapter V) as well as several routines to make the library easier to use. The documentation has been substantially improved with an example for every routine. Subroutine names and argument lists have been further standardized across hardware types to aid those who change computers or who have access to various types of hardware.

Edition 7 has many changes in structure and many routines were deleted or significantly altered although the functional characteristics of the package were not reduced. The majority of the deletions were (for portability reasons) to eliminate multiple entry codes and to change the seeds for the random number generators from INTEGER to DOUBLE PRECISION. The codes deleted from Edition 6 (on JSCDISK 19E) have no name conflicts with Edition 7. Edition 6 will be maintained on JSCDISK 19E for a period of 9 months to enable users to modify current programs or incorporate codes deleted from Edition 6 directly into their main programs. A user may use both old and new codes by accessing both JSCDISK 19E and JSCDISK 29E. Users are encouraged to examine the Edition 7 Reference Manual available from Glen Prow at JSC and SUE SCHWINGENDORF at LARS.

LARS CONSULTANT AT JSC

BILL SHELLEY will be visiting Houston from May 7 to May 11 to assist Purdue/LARS terminal users at JSC with any problems or questions they have. This would be a good time for any IMSL users to convert to the new edition of IMSL, and for any CMS360 to CMS370 conversion to be completed. If you have specific requests for a short seminar on some aspect of using the Purdue/LARS computer, please let Ken Baker know as soon as possible.

GRAPHICS COMPATIBILITY SYSTEM (GCS) NEWS FROM LARRY BIEHL

GCS has to be converted to operate under CMS370. To obtain the disk which contains the CMS370 version of the GCS subroutines, enter (in CMS370):

```
GETDISK PLTDSK
```

PLTDSK will be attached as a Z disk.

If the GETDISK PLTDSK command hasn't been set up as of the time that SCAN LINES comes out, an alternate set of commands is (in CMS370):

```
LINK EXOSYS 10B 10B
ACCESS 10B Z
```

The GCS exec is on PLTDSK, therefore, you will not need to have one on your A disk.

The command to run a program using GCS subroutines is:

```
          PRT
GCS      VAR   'filename'
          TER
```

where 'filename' is the name of the main program. The main program and all subroutines should be in TEXT format. The GCS EXEC will attach disks as necessary and begin execution.

PRT specifies graphs to be printed at the line printer.

VAR specifies graphs to be printed on the Varian printer/plotter.

TER specifies graphs to be printed on the terminal.

Refer to the 2D GCS Reference in the terminal areas for more information. You may contact LARRY BIEHL if you have any questions.

SUMMARY OF 370/148 COMPUTER USAGE FOR MARCH, 1979

Overall Usage	Basic Rate CPU Time Used	72.25
	Priority Rate CPU Time Used	188.69
	Total CPU Time Used	260.94
	Terminal Sessions	3894
	Batch Jobs	958

Usage by Time of Day - Time Period	Hours of CPU Used	Average Percent CPU Utilization
Mon-Fri midnite-8AM	66.13	38
Mon-Fri 8AM-4PM	98.13	56
Mon-Fri 4PM-midnite	69.94	37
Weekend	30.45	23

Batch Job Usage	Batch Machine	Jobs Run	Avg. Clock Time	Avg. CPU Time
	BATQUICK	133	0.62	0.06
	BATSHORT	190	7.83	0.54
	BATMED	109	16.42	2.20
	BATONITE	319	12.79	0.86
	BATLONG	10	24.49	9.45
	TAPTRAN	33	27.09	3.39
	BATEOD	37	13.76	2.24
	BATJSC	107	56.37	35.04

Keyboard Terminals - Location	Port	Terminal Type	Logins	Total Time in Use	Avg. Time Per Session
Flexlab2	30	INFOTON GTX	176	185.32	1.05
Flexlab2	31	INFOTON GTX	156	185.64	1.19
Flexlab2	32	INFOTON GTX	215	173.72	0.81
Flexlab2	33	INFOTON GTX	271	243.27	0.90
Flexlab2	34	INFOTON GTX	207	204.33	0.99
Flexlab2	35	INFOTON GTX	217	227.24	1.05
Flexlab2	36	INFOTON GTX	228	267.09	1.17
Comp. Room	37	DECwriter	351	108.74	0.31
Flexlab1	40	INFOTON GTX	240	210.50	0.88
Flexlab1	41	INFOTON GTX	270	199.46	0.74
Flexlab1	42	INFOTON GTX	237	233.73	0.99
Flexlab1	43	DECwriter	150	149.88	1.00
Dial-up	50	1st in Use	59	57.73	0.98
Dial-up	51	2nd in Use	8	7.14	0.89
Dial-up	52	3rd in Use	1	1.96	1.96
Dial-up	53	4th in Use	-	--	-
Dial-up	54	5th in Use	-	--	-
Dial-up	5E	In-House 1st	25	15.43	0.62
Dial-up	5F	In-House 2nd	1	0.02	0.02
Houston	60	Hazeltine 2000	188	71.24	0.38
Houston	61	Hazeltine 2000	144	66.61	0.46
Houston	62	2741	152	82.71	0.54
Houston	63	2741	150	77.83	0.52
Alabama	64	DECwriter	32	57.24	1.79
Alabama	65	INFOTON GTX	27	43.39	1.61
ISU	66	(various)	76	28.40	0.37
ISU	67	(various)	176	67.31	0.38
Houston	6A	Dial-1st in Use	175	131.26	0.75
Houston	6B	Dial-2nd in Use	146	117.12	0.80
Houston	6C	Dial-3rd in Use	96	63.37	0.66
Houston	6D	Dial-4th in Use	30	17.04	0.57



INTERLAB NOTES

THE BOOK

Many of LARS staff have been asking about how to get a copy of the LARS textbook Remote Sensing: The Quantitative Approach. For LARS staff members, the book is available through DOUG MORRISON at Purdue University's 20% discount, either paid in cash or check, or charged to a Purdue account number.

CPR COURSE OFFERED

CPR (Cardiopulmonary Resuscitation) could save a life---why not sign up for an almost free (\$1) training at St. Elizabeth Hospital on Saturday, June 23. The 6 hour Class is reserved for 20 persons and we'd like to see LARS folks and their families take advantage of this great opportunity. Sign up sheets are posted by the coffee machines in both buildings. Please sign up by May 17th. For more information contact DONNA SCHOLZ.

MINI-LARSIANS

Congratulations to Diana and PAUL ANUTA on the birth of their 10#4 oz. son, Adam Alexander, on Monday, April 23.

THE PICNIC

June 30 has been reserved for the Annual LARS Picnic. Selter House 1, Happy Hollow Park is the place, Bob Hogue, Animal Sciences' famous chicken bar-b-quer will provide the food. MARLENE HODGE will provide more details at a later date, and could use two more people on her committee. If interested, please contact her.

RECENT ACQUISITIONS IN THE LARS
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CONFERENCES FEATURE INVITED PAPERS BY LARS STAFF

MEXICAN SCIENTISTS PROMOTE REMOTE SENSING

PHIL SWAIN presented an invited paper entitled: "Analysis of Multivariate Remote Sensing Data: Are We Ready for Landsat D?" at II Seminario Internacional sobre el uso de los Sensores Remotos, held May 7-10, in Mexico City, Mexico.

The conference was sponsored jointly by the IBM Scientific Center and the Mathematics and Systems Institute, Computer Sciences Department, University of Mexico.

Members of the Mathematics and Systems Institute have developed a remote sensing image processing and analysis system which is patterned after LARSYS algorithms. The system is in ALGOL on a Burroughs B67100 computer.

These computer scientists are heavily interested in involving potential Mexican users in applying their system. Three people from the Mexican National Water Planning Commission attended the Advanced Short Course as a result of this growing interest in remote sensing technology.

A NEW ERA IN LATIN AMERICAN CARTOGRAPHY

LUIS BARTOLUCCI recently returned from attending a Technology Exchange Week, May 14-19, for Latin America, sponsored by the Defense Mapping Agency and the Inter American Geodetic Survey.

Dr. Bartolucci presented one of several invited papers (the only one in Spanish) entitled: "Digital Processing of Remotely Sensed Multispectral Data." Other invited papers included:

"NASA Remote Sensor Systems" by Dr. John Estes, Resource Observations Division, NASA/HQ, Washington D.C.

Prepared by the Laboratory for Applications of Remote Sensing for distribution at Purdue. Contact Susan Ferringer, SCAN LINES editor, to be placed on the mailing list (749-2052, ext. 290).

"Satellite Imagery Systems" by Dr. Frederick Doyle, Director, EROS Program, U.S. Geological Survey/U.S. Department of Interior, Reston, Virginia.

"Image Data Processing" by Fred Billingsley, NASA/JPL, Pasadena, California

"Reduction of Remote Sensing Data-- An Overview" by Donald Lowe, Vice President, ERIM, Ann Arbor, Michigan

Based on these plenary presentations and other technical sessions, over 400 participants from the Latin American countries discussed the curriculum of the Defense Mapping Agency Cartographic School located in the Canal Zone, Panama. Implementation of new courses in remote sensing technology, including computer-aided analysis of remotely sensed data, was pursued.

LARS TRAVEL LOG

MARION BAUMGARDNER has been invited by the Resource Systems Institute, East-West Center, Honolulu, Hawaii, to be a Research Fellow at the Center for the period of June 4 to July 6. Dr. Baumgardner will give a series of lectures and participate in an International Conference on Forest Land Assessment and Management for Sustainable Uses. He will also consult with staff members of the Institute and the Department of Agronomy and Soils, University of Hawaii.

During May 23-24, MARION BAUMGARDNER and DICK WEISMILLER were in Washington D.C. to brief officials of NASA and USDA on the status of soils research at LARS.

STEVE KIRSTOF and DONNA SCHOLZ attended the Spring Meeting, April 27-28, of the Indiana Academy of Science held at Saint Meinrad College, Indiana.

LEROY SILVA, DAVE LANDGREBE, ROGER HOFFER, and MARVIN BAUER attended the Multi-spectral Resource Sampler Workshop on May 30 to June 1. The workshop was sponsored by NASA and held at Colorado State University.

Dr. Landgrebe also gave a seminar, May 8, at Goddard Space Flight Center, Greenbelt, Maryland, on "A Scanner System Data Variable Study."

Several LARS staff members will travel to NASA/JSC, Houston, Texas, on June 4-6, to attend the SR&T Quarterly Review. PAUL ANUTA, MARVIN BAUER, LEROY SILVA, BARRETT ROBINSON, MARILYN HIXSON, DICK WEISMILLER, and JIM KAST will give status report presentations on their various SR&T Tasks. Jim will also give a report on the 3031 installation.

ADVANCED SHORT COURSE EVALUATED AS EXCELLENT

The Purdue/LARS Short Course on Advanced Topics in the Analysis of Remotely Sensed Data was offered successfully for the third year on May 14-18. Thirty-one people attended, including eleven participants from six foreign countries, representatives of the petroleum industry, U.S. government agencies, and several universities.

The course, which built on basic pattern recognition methods in systems such as Image 100, LARSYS, IDIMS, MDAS, VICAR, ERIP, and others, presented topics in data preprocessing, multitemporal and spatial analysis, and statistical methods for results evaluation.

Participant reaction indicated that the quantitative examples of applications of advanced technology presented by ROGER HOFFER were especially well received.

PHIL SWAIN, chairman, expressed a personal thanks to the course staff: MARVIN BAUER, MARILYN HIXSON, ROGER HOFFER, DAVID LANDGREBE, JOHN LINDENLAUB and CLARE MCGILLEM. Swain commented that "he appreciated the LARS staff who faithfully attended, contributed to the discussions, and earned their certificates of achievement."

Based on the response, it looks like the course will be offered again next year.

SPANISH VISITING SCIENTIST NEWS

Juan Gonzalez, Agricultural Engineer with the Ministry of Agriculture, Madrid, Spain, completed his seven month visiting scientist program at LARS May 28. He is returning to Spain after finishing his studies and the documentation of a Clustering algorithm he developed to group spectral classes. This algorithm is derived from the LARSYS CLUSTER function.

Ramon Bermudez, Electrical Engineer at the Instituto Geographico Nacional, Madrid, Spain, has received an extension of his fellowship from IBM/Madrid. He will continue his research in processing of Landsat calibrated data under the direction of LUIS BARTOLUCCI until July.

VISITORS

Dr. Harold Barrows, National Program Staff of SEA-AR/USDA, Beltsville, Maryland visited with MARION BAUMGARDNER on May 8. Soils, crops, and instrumentation research at LARS were reviewed.

Dr. Richard Phelps, Chief Agronomist for Anderson-Clayton County, Texas, was at LARS on May 17, to discuss applications of remote sensing to agriculture. He discussed work of the ARI Study Panel on Remote Sensing with MARION BAUMGARDNER.

SOIL SURVEY REPORT

A series of spectral maps depicting soil characteristics of Jasper County, Indiana has been prepared from digital processing of Landsat MSS data.

Sponsored by LARS/SCS, the report, entitled: "Spectral Classification of Soil Characteristics to Aid the Soil Survey of Jasper County, Indiana" is currently being used in the field.

DICK WEISMILLER, FRANK KIRSCHNER, SUE KAMINSKY KAST, and ERIC HINZEL were involved in the project.

PROPOSALS SENT OUT

Title: Proposal for Continued Support of the Indiana State University Earth Resources Data Processing Remote Terminal, Sponsor: Indiana State University, Principal Investigator: SUSAN SCHWINGENDORF, Duration: July 1, 1979 to June 30, 1980.

Title: Land Use Change Detection Using Landsat Imagery with Urban Planning Applications, Sponsor: Ohio State University, Principal Investigator: PHIL SWAIN, Duration: September 1, 1979 to August 31, 1980.

NEW LARS TECHNICAL REPORTS

081278

An Approach to the Use of Statistical Context in Remote Sensing Data Analysis
by E. F. Kit and P. H. Swain

A statistical model is developed for using image context in maximum likelihood classification. Experimental results using both simulated and real multispectral remote sensing data demonstrate the utility of the model. Some practical problems associated with the use of the model are discussed.

This research paper was sponsored by the Defense Advanced Research Projects Agency, Department of Defense under Contract Number MDA902-77-G1.

083078

The Evaluation of Landsat Data and Analysis Techniques for Mapping Tropical Forest Areas
by Kuo-Shih Hsu and Roger M. Hoffer

Results of manual interpretation on Band 5, Band 7 and Color IR composites of Landsat data were compared to computer classification results using single and multiple wavelength bands, including Band 5, Band 7, Bands 5 + 7, and Bands 4 + 5 + 6 + 7. The analysis involved the identification and mapping of tropical forest lands and other major cover types for study sites in both Bolivia and Taiwan. A preliminary study concerning the seasonal availability of relatively cloud free Landsat data is included.

The research reported in this paper was sponsored by the Republic of China (with AID coordination) under Account Number 0083-64-12805.

122678

The Analytical Design of Spectral Measurements for Multispectral Remote Sensor Systems
by D. J. Wiersma and D. A. Landgrebe

An analytical procedure is developed which incorporates the design of an optimal sensor as a tool for selecting the spectral channels for a multispectral sensor system. The spectral response functions from a stratum are modeled as a stochastic process and are

represented with arbitrarily small expected mean-square error by the weighted Karhunen-Loeve expansion. The optimal sensor design procedure was implemented on a digital computer, and using data collected from field measurements, a proposed sensor design was developed which performed well in comparison to the optimal design.

The research reported in this paper was sponsored by NASA under Contract Number NAS9-15466.

020279

Computer-Aided Analysis of Satellite and Aircraft MSS Data for Mapping Snow-Cover and Water Resources by R. M. Hoffer

This is a tutorial paper which describes the spectral characteristics of snow and water, and discusses many of the other key principles involving remote sensing of snow-cover and water resources. Many of the capabilities as well as limitations of various sensor systems and platforms are discussed, including mapping water resources using satellite MSS data, including the aerial extent of water bodies, defining water condition and temperature; and mapping water temperatures with aircraft MSS data.

The research reported in this paper was sponsored by the Department of Forestry and Natural Resources.

020179

Computer-Aided Analysis Techniques for Mapping Earth Surface Features by R.M. Hoffer

This paper is a tutorial discussion of some of the basic as well as newly developed techniques for working with multispectral scanner data obtained by aircraft or by satellite. Subject matter discussed includes: (1) Data Reformatting and Pre-processing; (2) Definition of Training Statistics; (3) Computer Classification of Data; (4) Information Display and Tabulation; and (5) Evaluation of Results.

The research reported in this paper was sponsored by the Department of Forestry and Natural Resources.



SYSTEM SERVICES June 1, 1979

REMOTE HIGHLIGHTS BY SUSAN SCHWINGENDORF

LOW-COST REMOTE TERMINAL DEMONSTRATION

On May 22, RON BOYD and SUSAN SCHWINGENDORF travelled to Muncie, Indiana to demonstrate the feasibility of using a portable terminal over dial-up lines to several members of Ball State University's Geography Department. The phone lines were amazingly good and the classification results map printed without even one hesitation! A proposal draft for a one year low-cost remote terminal connection to LARS was then discussed.

VISITING LARSIAN AT JSC

BILL SHELLEY spent the week of May 7 to May 11 in Houston, Texas assisting users of the Purdue/LARS computer at JSC. He also met with various groups of people from NASA, LEC and IBM to consult on problems, lecture on aspects of the LARS computer system, and discuss the IBM 3031 testing. In addition, data base design recommendations were discussed with NOAA representatives.

TECHNOLOGY EXCHANGE STATUS REVIEWED

JIM RUSSELL spent the week of May 7 at JSC exploring the background, current status and future possibilities of using computer technology in the exchange of remote sensing technology. During his visit he met with representatives from NASA, Lockheed and IBM. The trip was very informative and the information and ideas collected will be used in preparing recommendations for increasing capabilities exchange among NASA, support contractors and the research community.

LACIE DATA BASE

The Ground Truth portion of the LACIE Segment Catalog has been added to the data base. This Ground Truth data is part of the Phase III Experiment. The software (GTINFO) to search this data is also on the system and can be accessed by typing:

GETDISK JSCDISK 19A B

Then print the file 'GTINFO INFO B'. This file explains the usage of subroutine GTINFO and gives an example. If there are any questions, contact LUKE KRAEMER (LARS).

SPSS RELEASE 8 NOW AVAILABLE

After months of futile waiting for SPSS Inc. to distribute a CMS version of SPSS Release 8, LARS acquired the Release 8 source code (114,000 lines of FORTRAN and Assembler code) and we have created our own CMS version. SPSS Release 8.0 is now available on LARS computer, running under CMS370. Soon after you read this, it will replace Release 7.1 as the standard 370 version. Release 6, now running under CMS360, will soon disappear from the LARS computer.

DISCRIMINANT and SAVE FILE both work in Release 8, and DISCRIMINANT has been completely rewritten for Release 8 using a new double-precision algorithm. New procedures include a REPORT generator with many options for headings, labels, and summary statistics.

Complete documentation of new procedures and facilities for Releases 7 and 8 is available in one bound manual, SPSS UPDATE, edited by C. Hadlai Hull and Norman H. Nie, McGraw-Hill, 1979, 238 pp.

The only known major problem with Release 8 is that SORT CASES will not work, since it depends on an external utility sort routine that LARS does not have. If there is substantial interest in the ability to SORT CASES in SPSS, please contact CAROL JOBUSCH at LARS -- and we will inquire about acquisition of a SORT routine.

For details about Release 8 command syntax (which is the same as Release 7), type

```
>I CMS370
>LINK SPSS 29F 29F R PASS RSPSS
>ACC 29 F F
>SPSS ?
>PRINT SPSS MEMO F
```

SPSS creates many filedefs that it needs, but pre-existing user filedefs will override them. If you have any filedefs in your PROFILE EXEC (or other source), type

```
FI * CLEAR
```

before running SPSS.

Note to current SPSS users: SPSS Release 7.1 modules are on the CMS disk and thus automatically available whenever you were in CMS370. Release 8.0 modules are on a new SPSS disk which is not automatically a part of your machine. There will soon be a new SPSS EXEC on the CMS disk, which will execute the first time you run an SPSS program in each terminal session. This EXEC will

1. Attach the SPSS disk to your machine as an F disk at address 29F (thereby wiping out any previously attached F disk).

2. Check to see if you have a disk attached at address 192. If not, it will get a 2 cylinder temp disk and access it as a D disk at address 192, to be used for SPSS scratch files. (Therefore, if you already have a D disk attached, be sure you have it at 192 to avoid losing it).
3. Execute the SPSS program.

Please report any problems or bugs to CAROL JOBUSCH, LARS, (317) 749-2052, Ext. 246.

3031 INSTALLATION

SCHEDULING

Below are listed several dates which may be of interest to users of the Purdue/LARS system. This schedule is based on the IBM 3031 Installation Plan. For more information contact JIM KAST.

- MAY 23 CMS370 versions of LARSYS 3.1 and LARSPEC (formerly EXOSYS) should be available to LARS users.
- APR 21- Benchmark tests will be run on the 148 during
MAY 26 weekly down periods (Saturday evening to Sunday afternoon).
- JUN 1- Benchmark tests will be run on the IBM 3031 in
JUN 5 Gaithersburg, Maryland
- JULY Benchmark results will be published in July
SCAN LINES.
- AUG 1 Rates for the 3031 will be announced.
- AUG 7 The controller for the CDC disk drives will be installed.
- AUG 24 The 3031 will be shipped.
- SEP 3 3031 will arrive at Purdue.
- SEP 6 or The 148 will be shutdown at 6 PM
SEP 13
- SEP 11 or The 3031 will be available for production at
SEP 18 8 AM.

TESTING

Benchmark testing of the IBM 3031 will be conducted May 30, to June 4, at IBM, Gaithersburg, Maryland. Several LARS staff members: JEANNE ETHERIDGE, JIM KAST, BILL SHELLEY, MIKE COLLINS, CATHY KOZLOWSKI and ROSS GARMOE and Pat Aucoin, representing users of the LARS system at JSC, will be working to accomplish the following goals:

1. Examine a standard job mix to gain understanding of 3031 characteristics.
2. Be in a position to establish software product rates.
3. Be in a position to understand loading characteristics of the 3031, relative to the 148.
4. Be in a position to establish an overall CPU rate.
5. Put JSC in a position to estimate large-scale experiment costs.

Software to be tested during this period includes a Standard Mix Test of LARSYSPl, EDIT, LARSYS, SPSS and the Compiler; a Paging Strain Test using the Geometric Correction processor; a CPU Strain Test using LARSYS-CLUSTER, and LARSYSPl-CLASSIFY; and Other Software Tests of LARSPEC, REFERTS, IMSL running under a batch machine, CP Accounting, TAPTRAN, LARSYS-P2, Law of Minimum for Yield Modelling, Generalized ANOVA.

During the testing MARY ELLEN PIERSON will be responsible for computer operations and MON LI TANG will be responsible for the system.

ERIM JOINS LARS REMOTE TERMINAL NETWORK

A dial-up remote job entry station is planned to be on-line between LARS and the Environmental Institute of Michigan (ERIM) early in June.

Access to the LARS system will be through the ERIM COPE 1200 mini-computer which is used as a HASP Work Station (IBM 360/20) with a printer and card reader, but no punch. This link, used by ERIM to access the Michigan Terminal System, University of Michigan, Ann Arbor, will make the LARS Field Measurement Data Base available to ERIM through LARSPEC (formerly EXOSYS).

During late May, Dan Rice and Bill Malila of ERIM visited Purdue University to attend the Crop Simulation Workshop sponsored by the Agronomy Department, and to talk with JIM KAST and LARRY BIEHL about usage and planned upgrades of LARSPEC (formerly EXOSYS).

LARS welcomes ERIM to the Remote Terminal Network.

NEW NAME FOR "EXOSYS"

After gathering many suggestions of names from users of EXOSYS, MARVIN BAUER, LARRY BIEHL, NANCY FUHS, JEANNE ETHERIDGE, and JILL HEINRICH had a meeting and decided on the new name for EXOSYS: LARSPEC. SPECTRA, SPECTRAN, and SPECTRAL could not be used because they are names of companies; legal problems could have been encountered in the future.

PERSONNEL CHANGES

SYSTEM SERVICES ORGANIZATION

There have been many changes recently in the System Services area of the laboratory. These changes are documented in the organization chart on page 12.

JEANNE ETHERIDGE has assumed the position of Coordinator for Computer Systems; JIM KAST, as Manager of Computer Systems Analysis, has added the administrative duties of the Systems Analysis Group to his responsibilities, and BILL SHELLEY, as Assistant Manager, is in charge of applications software.

NEW PERSONNEL

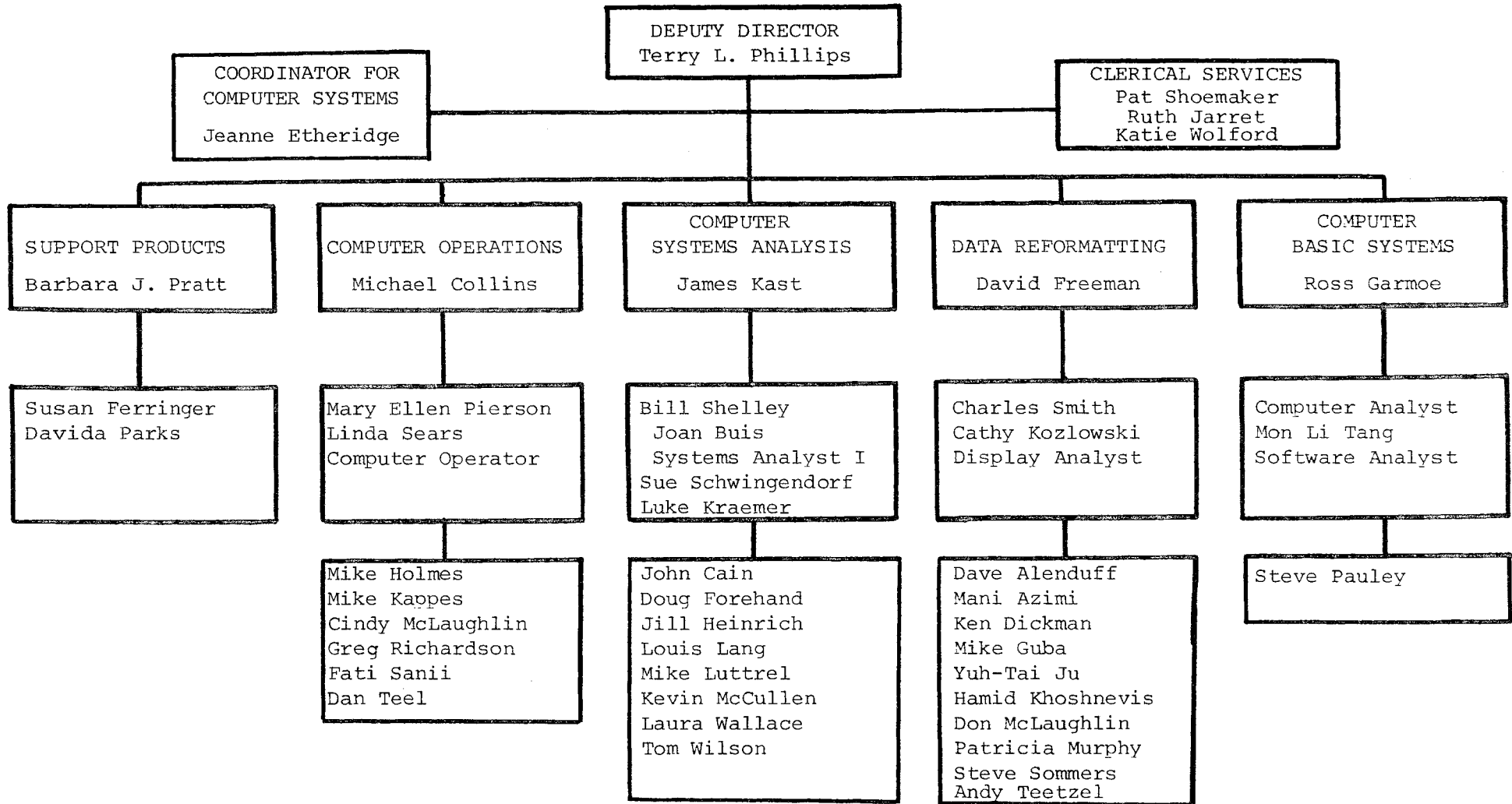
A big welcome is extended to JOAN BUIS who joined the LARS staff as a Systems Analyst I on May 21. Joan received her BS in Mathematics with a Computer Science option from Purdue University. She has worked at the Purdue University Computing Center as a computer operator and at the U.S. Reduction Co. as a statistician. Currently her office is in room B105, extension 298.

Several new students joined the staff in May. CINDY MCLAUGHLIN returned to Operations; MIKE LUTTRELL, JEFF ROGERS, and KEVIN MCCULLEN joined Systems Analysis; MANI AZIMI, MIKE GUBA, YUH-TAI JU, and HAMID KHOSHNEVIS are assigned to Data Reformatting, and MARK LEWIS, JOE TARRANTINO, and ROY TSUCHIDA are working in Field Measurements.

SYSTEMS PROGRAMMER LEAVING

After seven years with LARS, KEITH PHILIPP resigned on May 30, to accept a position with TWA in Kansas City, Missouri. LARS wishes him the best of luck.

SYSTEM SERVICES ORGANIZATIONAL CHART



SUMMARY OF 370/148 COMPUTER USAGE FOR APRIL 1979

Overall Usage	Basic Rate CPU Time Used	69.36
	Priority Rate CPU Time Used	207.13
	Total CPU Time Used	276.50
	Terminal Sessions	4072
	Batch Jobs	753

Usage by Time of Day - Time Period	Hours of CPU Used	Average Percent CPU Utilization
Mon-Fri midnite-8AM	66.07	40
Mon-Fri 8AM-4PM	102.62	61
Mon-Fri 4PM-midnite	75.00	45
Weekend	32.77	28

Batch Job Usage	Batch Machine	Jobs Run	Avg. Clock Time	Avg. CPU Time
	BATQUICK	138	2.24	0.12
	BATSHORT	102	16.64	0.80
	BATMED	89	27.69	2.76
	BATONITE	174	14.60	1.64
	BATLONG	57	24.97	4.91
	TAPTRAN	14	45.86	5.28
	BATEOD	86	40.39	6.45
	BATJSC	93	63.01	37.87

Keyboard Terminals - Location	Port	Terminal Type	Logins	Total Time in Use	Avg. Time Per Session
Flexlab2	30	INFOTON GTX	136	163.84	1.20
Flexlab2	31	INFOTON GTX	150	159.36	1.06
Flexlab2	32	INFOTON GTX	181	162.43	0.90
Flexlab2	33	INFOTON GTX	251	227.73	0.91
Flexlab2	34	INFOTON GTX	188	169.95	0.90
Flexlab2	35	INFOTON GTX	270	200.50	0.74
Flexlab2	36	INFOTON GTX	249	251.27	1.01
Comp. Room	37	DECwriter	293	103.90	0.35
Flexlab1	40	INFOTON GTX	222	184.95	0.83
Flexlab1	41	INFOTON GTX	203	181.37	0.89
Flexlab1	42	INFOTON GTX	258	171.40	0.66
Flexlab1	43	DECwriter	117	75.15	0.64
Dial-up	50	1st in Use	101	89.99	0.89
Dial-up	51	2nd in Use	19	8.54	0.45
Dial-up	52	3rd in Use			
Dial-up	53	4th in Use			
Dial-up	54	5th in Use			
Dial-up	5E	In-House 1st	34	33.92	1.00
Dial-up	5F	In-House 2nd	7	2.86	0.41
Houston	60	Hazeltine 2000	142	52.34	0.37
Houston	61	Hazeltine 2000	167	88.16	0.53
Houston	62	2741	181	109.88	0.61
Houston	63	2741	162	87.04	0.54
Alabama	64	DECwriter	39	53.13	1.36
Alabama	65	INFOTON GTX	21	33.13	1.58
ISU	66	(various)	151	54.54	0.36
ISU	67	(various)	333	88.37	0.27
Houston	6A	Dial-1st in Use	198	142.87	0.72
Houston	6B	Dial-2nd in Use	158	113.82	0.72
Houston	6C	Dial-3rd in Use	126	100.35	0.80
Houston	6D	Dial-4th in Use	78	52.73	0.68
St. Regis	4A	DECwriter	1	0.04	0.04



INTERLAB NOTES

A REMINDER FROM THE BUSINESS OFFICE

Please contact MARTA DZIUBINSKYJ, extension 283, before taking any Purdue University property off campus. LARS is required to purchase special liability coverage for any equipment which is removed from campus in order to do research.

PERSONNEL CHANGES

NANCY FUHS has recently joined the Crop Inventory Research Systems program area. Nancy will continue to be project manager of the Bilateral Project, as well as assist other crop inventory projects with data analysis.

RECENT ACQUISITIONS IN THE LARS LIBRARY

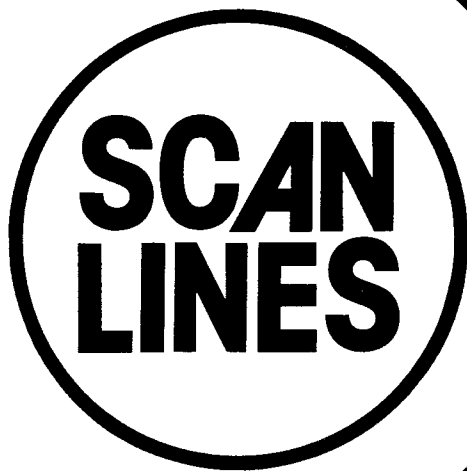
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LARS · Purdue University · Vol. 5 · No. 6 · July 19, 1979

THIRD GENERATION SENSOR IN PLANNING STAGES

Initial plans for building a third generation sensor system--the Multispectral Resource Sampler--were presented at a milestone meeting, May 31 to June 1, held at Colorado State University, Fort Collins, Colorado.

Several Purdue/LARS staff members: MARVIN BAUER, DON LEVANDOWSKI, DAVE LANDGREBE, and ROGER HOFFER, attended this briefing to investigate recent advances in sensor design. The first generation sensor -- multispectral scanner MSS -- has been operational for seven years in Landsat 1, 2, and 3.

The second generation sensor, represented by the Thematic Mapper scanner to be launched aboard Landsat D in 1981, will deliver data with increased resolution from a greater region of the spectrum, including data from the middle and thermal infrared wavelengths. Some problems are already being anticipated as the Thematic Mapper will be pushing fundamental technology now available to the limit.

"Where Do We Go From Here?"

Goddard Space Flight Center personnel proposed some answers to that question at the Colorado State meeting. A third generation sensor--Multispectral Resource Sampler--is being developed to take advantage of advances in solid state linear array technology.

The Multispectral Resource Sampler would be a series of light sensitive sensors on a silicon base which would record data in up to 2000 analog amplifiers and analog/digital converters.

Advantages of such a system include the ability to look at all pixels in a scanline at once and theoretical ground resolution of 15 meters (spatial) and .02 micrometers (spectral). A disadvantage in the use of silicon as a base is its limit of sensitivity to the .4 to 1.0 micrometer range.

Prepared by the Laboratory for Applications of Remote Sensing for distribution at Purdue. Contact Susan Ferringer, SCAN LINES editor, to be placed on the mailing list (749-2052, ext. 290).

AGRISTARS BRIEFING BRINGS PLANE-LOAD OF VISITORS

Over the past several years the United States Department of Agriculture has been evaluating remote sensing technology to determine what USDA needs for information could be met.

From this assessment, the committee, which spanned across USDA, developed a document called the Secretary's Initiative which established the following informational need areas:

1. Early warning
2. Commodity production forecast
3. Land use classification
4. Resources assessment
5. Land productivity assessment
6. Conservation
7. Pollution

Implementation of a new program to meet these informational need areas, AGRISTARS, is currently being planned. It has been compared to LACIE, with corn, soybeans, and several other commodities to be studied in addition to wheat.

AGRISTARS would be a combined effort of research and technology transfer which would take the state-of-the-art technology, put it together for specific users, conduct pilot tests, and then move results of these pilot tests toward actual usage.

On June 13, Purdue staff, LARS Directors and Program Leaders, and the following NASA/JSC personnel participated in a day-long information exchange at Purdue University.

Richard Johnston, Director of Space & Life Sciences Directorate

William Rice, Deputy Director for Earth Resources

Robert MacDonald, Chief Scientist for Earth Observations

Bryan Erb, Chief, Earth Observations Division

Forrest Hall
James Dragg
James Powers
O. Glenn Smith
Richard Heydorn
William Stevenson
William Hensley
Richard Stuff

NASA ADMINISTRATOR VISITS

Pitt Thome, Director of NASA Headquarters Resource Observation Division, visited Purdue University on June 21. He met with LARS Directors and Program Leaders for an informal briefing on past activities and current research projects.

LARS TRAVEL LOG

DAVE LANDGREBE, DAVE FREEMAN, and ROSS GARMOE were in New York City during the week of June 4-10, to attend the annual National Computer Conference sponsored by the American Federation of Information Processing Societies (AFIPS).

Dr. Landgrebe presented an invited paper, titled: "Monitoring the earth's resources from space--Can You Really Identify Crops by Satellite?"

DAVE LANDGREBE also travelled to Washington D. C. to serve on the Advance System Verification Test (ASVT) peer review committee held at NASA/HQ, June 25-26.

VISITING SCIENTISTS

Spanish visiting scientist, Ramon Bermudez de Castro, returned to Madrid, Spain, on July 10, after nine months at LARS on an IBM fellowship.

Ramon spent his first four months in intensive training in numerical analysis theory and applications, publishing a report titled: "Computer-Aided Analysis of Landsat Data Taken Over Spain".

The remaining five months he spent working under LUIS BARTOLUCCI on radiometric calibration of Landsat MSS data and evaluation of the performance of the LARSYS CLUSTER algorithm under a variety of different conditions.

Luis and Ramon will publish the results of this study as LARS Technical Report 060679, "Clustering of Landsat MSS Data--Certain Limitations".

Professor John McDonald, University of Southern California, combined a trip to the LARS Machine Processing of Remotely Sensed Data Symposium with an informal visiting scientist program during the week of June 25-29. McDonald, a November 1978 participant in the Short Course and Hands-On Option, returned to perform a classification of a Landsat frame over Southern California.

SYMPOSIUM FINALE

The 1979 Symposium on Machine Processing of Remotely Sensed Data successfully ended June 29, with an Open House held at LARS, Flexlab 2. Of the 200 registered participants, one-third (excluding Purdue/LARS staff) were from foreign countries.

Highlights of the conference included the Opening Plenary Session on the Thematic Mapper, chaired by Dr. Vincent Salomonson, NASA/GSFC, Landsat D Program Scientist, and a "freewheeling" general discussion session conducted by LEROY SILVA after-hours on June 27.

Banquet speaker, former Secretary of Agriculture, Dr. Earl Butz, spoke on the need for a strong research program to provide a basis for continued advances in remote sensing technology.

Proceedings of the 1979 Symposium, and a limited number of proceedings from prior symposia are available from DOUG MORRISON for \$25 a copy. Please specify the following catalog numbers when ordering:

1976 CH 1103-1 MPRSD
1977 CH 1218-7 MPRSD
1979 CH 1430-8 MPRSD

NEW PROJECTS FUNDED

Title: Evaluation of SLAR and Simulated Thematic Mapper MSS Data for Forest Cover Mapping Using Computer-Aided Analysis Techniques, Sponsor: NASA, Washington, D. C., Principal Investigator: ROGER M. HOFFER, Duration: May 22, 1979 to November 30, 1979.

Title: Goddard Institute of Space Sciences Data Distribution, Sponsor: Goddard Institute of Space Studies, Principal Investigator: LARRY L. BIEHL, Duration: May 1, 1979 to June 30, 1979.

PROPOSALS SENT OUT

Title: A Quantitative Applications-Oriented Evaluation of Thematic Mapper Design Specifications, Sponsor: NASA/Goddard Space Flight Center, Principal Investigator: PHILIP H. SWAIN, Duration: August 1, 1979 to July 31, 1980.

Title: University of Missouri Data Distribution, Sponsor: University of Missouri, Principal Investigator: LARRY L. BIEHL, Duration: June 1-30, 1979.

Title: Landsat Digital Data Processing for Various Areas in Arizona, Sponsor: University of Arizona, Principal Investigator: R. A. WEISMILLER, Duration: June 15, 1979 to September 15, 1979.

Title: The Application of Remote Sensing Techniques for Waterfowl Habitat Inventory, Sponsor: Ducks Unlimited, Principal Investigator: R. P. MROCYNSKI, Duration: September 1, 1979 to June 30, 1980.

Title: An Addendum to Research in Remote Sensing of Agriculture, Earth Resources and the Environment, Sponsor: NASA, Principal Investigator: D. A. LANDGREBE, Duration: August 23, 1979 to November 30, 1979.



NEW LARS TECHNICAL REPORTS

040479

Digital Processing of Remotely Sensed Multispectral Data by L.A. Bartolucci.

Although it is well recognized that photo-interpretation of the Landsat imagery can provide adequate information for mapping broad categories of land cover at a reconnaissance level, it is also true that the Landsat data in digital format (CCT's) together with numerical (computer-aided) analysis techniques can provide a great deal more information at a higher level of mapping detail with mapping units of approximately half a hectare.

This paper introduces the fundamental concepts involved in numerical analysis of multispectral scanner (MSS) data. Emphasis is placed on the description of the essential steps required to conduct a multispectral classification; that is, I. Pictorial Display of the Raw Data, II. Definition of the Spectral (training) classes, III. Classification of the Entire Study Area, IV. Pictorial and Tabular Display of the Resulting Classification, and V. Evaluation of the Classification Result.

050879

Analysis of Multivariable Remote Sensing Data: Are We Ready for Landsat-D? by P. H. Swain.

Landsat-D is scheduled to be orbited some time in 1981. Aboard will be Thematic Mapper, a multispectral scanner which has the potential to significantly improve our capability to map and monitor earth surface phenomena. This paper surveys a number of technological issues related to effective processing of the data to be provided by Thematic Mapper.

NEW LARS PUBLICATIONS

041879

LARS Computer User's Guide by Staff.

The Computer User's Guide is a description of the products and services supplied by LARS System Services. Describes how to establish master accounts and computer ID's to use the LARS computer. Describes how to use the various facilities of LARS System Services.

The research reported in this paper was sponsored by the LARS Computer Facility.

042779

Purdue/LARS Organization by Staff.

This document provides a photo and brief resume for each of the LARS Program Leaders and principal administrative personnel.

SYSTEM SERVICES July 19, 1979

LARSPEC NEWS FROM BILL SHELLEY AND JILL HEINRICH

In June, LARSPEC was updated and converted to CMS370 and is no longer available in CMS360. In order to run batch, you have to use the CMS370 batch machines, BATEOD and BATJSC (nite batch).

Additional items on the select card have also been implemented. On the select card for integer and real parameters, range is now indicated by use of a minus instead of a comma, and a comma now indicates an individual run is desired. You may also indicate increments of a range with a plus for integer parameters only. An example of these new parameters combined is:

```
SELECT RUSE (5-20+5,43,97-100)
```

The runs selected and used are 5,10,15,20,43,97,98,99, and 100. A minus may also be used preceding an id parameter to indicate that the specified runs are not to be selected. The following: -RUSE(10-20), is equivalent to: RUSE (1 -9,21-9999). For alphanumeric-formatted id parameters, you may use a colon between two or more alphanumeric strings to specify those runs that are desired, such as SENA(NORFOLK:LORING:ORA); only the runs with these series names would be used.

If you want to use a print or punch site different from that which will be executed by the WHERE EXEC, you must use the "print" or "punch" LARSPEC command rather than the REMOTE command, because LARSPEC's "run" command resets output to the site initiated by LARSPEC. The "run" command does this because GSPEC may send output to many places and thus the site must be reset.

Please refer any suggestions or problems to BILL SHELLEY or JILL HEINRICH.

The following items about recent updates are from the LARSPEC NEWS file which can be obtained by typing 'NEWS':

LARSPEC was updated Saturday, June 30, 1979.
The changes added on the June 30th update are:

- 1) New control parameters for the select and graph cards.
- 2) May now send punch and printer output to your terminal.

LARSPEC was updated Tuesday, June 5, 1979.
The problems that were fixed are:

- 1) EXOSYS was renamed LARSPEC and may only be used in CMS370.

- 2) The 'END' parameter on the select and graph control cards, now works properly.

EXOSYS was updated Friday, May 10, 1979.
The problems that were fixed are:

- 1) GSPEC now properly ignores a run that does not satisfy any of the select parameters.
- 2) Radiometer type data really does work now in DSEL.

EXOSYSDV was updated Friday, March 30, 1979.
The changes made for the March 30th update are:

- 1) EXOSYSDV replaces EXOSYS.
- 2) Changes made to handle radiometer type data.
- 3) Changes made to handle 100th band in DSEL.

EXOSYSDV was updated Tuesday, March 20, 1979.
The changes made for the March 20th update are:

- 1) List change (IDLIST, DSEL, GSPEC)
Plant count and fruit count changed from integer to real F7.1
- 2) Changes made to handle wind direction and stress comments for old format.
- 3) Bug in FINDRN corrected.

BATCH NEWS FROM ROSS GARMOE AND JEANNE ETHERIDGE

Programs for userid BATCH were converted to CMS370. Programs for userid BATCH and the batch machines BATJSC and BATEOD (and any other CMS370 batch machines) were updated to allow new options on the BATCH OUTPUT card. (This card can be used the same as in the past). The format for the new option is:

```
BATCH OUTPUT  printsite  (COPY NN CLASS X HOLD )  punchesite (*)
                @userid   (NOHOLD) @userid
```

*same as for printer

where NN is number of copies and must be <100 and X is any valid computer class. COPY, CLASS, HOLD and NOHOLD may be abbreviated to CO, CL, HO, NO. The options may be in any order. If @userid is used, printer or punched output will be spooled to a reader file of that userid.

The time limit now works for 370 batch machines. If a user wishes to override the default time limit, he inserts a

BATCH TIME NNN card following the BATCH MACHINE card.

NNN is CPU minutes. The default time limits for 370 batch machines are:

```
BATEOD - 60 CPU minutes
BATJSC - 240 CPU minutes
```

NEW OPERATIONS PERSONNEL BY MIKE COLLINS

A welcome is extended to LINDA CRIST, MALISSA HADDOCK, and ROSS AIKEN who joined the Operations Group in June as student computer operators.

SYSTEMS MAINTENANCE SCHEDULE BY MIKE COLLINS

As stated on Page 17 of the LARS COMPUTER USER'S GUIDE, systems personnel who need to make changes to the system may schedule a shutdown from 7:30 a.m. to 8:00 a.m. on Monday and Thursday mornings.

Due to the unpredicted need and the amount of time for the system, a change has been made. Now in effect, systems personnel may make system changes from 7:00 a.m. to 8:00 a.m. either on Monday, Tuesday, Wednesday or Thursday mornings. Our objective is to provide a minimum notice of 24 hours for all scheduled shutdowns.

CONFUSING PRINTER OUTPUT NAMES BY MIKE COLLINS

When logging on the system users should enter their first and last name when 'NAME' is requested. Occasionally users will put their initials or their ID in the name slot creating confusion for the computer operators when distributing their output. If something other than the user's name is entered upon login and printer or punch output is produced, proper distribution cannot be guaranteed and output may be thrown away. Please help remedy this problem by properly entering your first and last name when logging on the system.

TROUBLE NEWS - ONLINE TROUBLE REPORTING BY ROSS GARMOE

An online problem reporting system is now available for 370 users. Its purpose is to collect information about any problems encountered by users at the time the user discovers a problem. To make a report, simply type "TROUBLE" as a CMS370 command. Type 'TROUBLE?' for a full explanation of the procedure for submitting TROUBLE reports.

COMPUTER SERVICE RATE - \$150/HOUR BY JEANNE, ROSS & JIM

On May 1 (retroactive to April 1) the CPU rate was reduced to \$150/hour for Computer Service.

Computer rates are determined by usage, and the rate is now \$100 lower than it was 7 months ago, so it is really to your advantage to use the computer while the rate is so low.

Since the rate was decreased, usage has been significantly lower. If usage remains at the May-June level, the computer service rate will have to rise. Also, the computer and software product rates for the IBM 3031 will be affected by current usage on the IBM 370/148.

If you have a need for more computer time, you will not likely be able to get a great deal more on the 8 a.m. to 5 p.m. shift. Consider using the machine more during the evenings and weekends. Better yet, learn how to do more processing using the overnight batch machines--they are less expensive still, as there is no charge for Priority Service or Local Terminal.

For help in setting up batch jobs, or for answers regarding batch, the following people can be contacted:

BILL SHELLEY - for LARSPEC and LARSYS
 SUE SCHWINGENDORF - for LARSYS
 CAROL JOBUSCH - for SPSS
 LUKE KRAEMER - for general batch usage.

SYSTEM TEMP DISKS BY MIKE COLLINS

We currently have seven 3 meg. CMS360 temp disks on the System 2314 disk units. Recently, users have encountered serious errors while attempting to write on one of the 3 meg. temp disks. We believe a bad area on the disk pack has been causing the errors, and we have no choice but to take the 3 meg. temp off the system.

Due to the unavailability of a large slot of 2314 disk space, we will not be putting the disk back on for CMS360. A new 3.3 meg. CMS370 temp disk will be installed instead. Since everyone is being encouraged to convert to CMS370, this temp should be more useful on the 3330 disk. This gives us a total of three 3.3 meg. CMS370 temp disks and six 3 meg. CMS360 temp disks.

As a note of information for converting cylinders to megabytes:

1 2314 cyl = .12 meg
 1 3330 cyl = .22 meg
 1 3350 cyl = .46 meg

SYSTEM ANALYSIS NEWS BY SUSAN SCHWINGENDORF

*** 370 LARSYS NOW AVAILABLE ***

All LARSYS and LARSYSDV processors have now been converted to run under CMS370. You can access these systems by logging in and typing:

ipl ls370 (for 370 LARSYS)
or ipl lsdv370 (for 370 LARSYSDV)

Shortly after the installation of the new IBM 3031 computer in September, these 370 versions of LARSYS and LARSYSDV will replace the current CMS360 versions. Note that there will not be a LARSYSXP running under CMS370. However, BILOT and SEIGEN are being moved from LARSYSXP to the LSDV370 system. If you feel there are other programs which should be converted, or need help converting your own programs, please contact BILL SHELLEY. Problems in the 370 versions of LARSYS and LARSYSDV are being worked on as they are reported to us.

370 LARSYS UPDATE

In June, several enhancements were added to the LARSYS (370 version) commands. A very useful addition for people who create statistics or histogram files is the ability to assign names to these files so that more than one can be saved on the user's private disk. This is accomplished with the STATDECK (HISTDECK) command. For example, a user has just executed a cluster job and wishes to transfer the LARSYS statistics file from the temporary disk to his private disk. He decides to name the file CLUSTER1 and issues the LARSYS command:

```
STATDECK SAVE CLUSTER1
```

The next day, this same user again gets on LS370 and verifies that this statistics file is saved by typing:

```
STATDECK STATUS
```

(All saved statistics files will be listed.) To use the CLUSTER1 statistics file for a classification job, the user types:

```
STATDECK USE CLUSTER1
```

before issuing the RUN LARSYS command.

A new command called GET has been added to LARSYS, which will obtain a copy of a skeleton control card file, copy it onto the user's disk, type the contents of the file and enter the EDIT environment. To use this command, the user types:

```
GET XXX
```

where XXX is the first three letters of the processor desired, and a file called XXX CC will be obtained. Remember that the name of this file can easily be changed to 'name' at the end of the Edit session by typing

```
FILE 'name'
```

Another helpful addition for those knowledgeable in CMS is that CMS commands may be entered from LARSYS if preceded by the letters 'CMS'.

An area where improvements are still being made is in sending jobs off to batch machines. A new parameter on the BATCH command allows the user to specify that punched output

should be returned to the reader of the user's computer ID. The format of this command is:

```
BATCH 'batch machine' 'userid'
```

If you have any questions or suggestions about the LARSYS commands, please talk to SUSAN SCHWINGENDORF or BILL SHELLEY.

Other items updated were LINEGRAPH, COLUMNGRAPH (to correctly plot data values), the BMD controller and COPYRESULTS (to permit renaming of classes and pools). This last item included the addition of two new control cards for COPYRESULTS which are documented in the COPYRESULTS Reference File.

UNIVERSAL DATA IN LARSYS

The 370 version of LARSYS has now been converted to accept both Universal format data as well as the regular LARSYS format. Since no Universal data is in the runtable, a personal runtable must be included in your control card file to use this option. The format of these cards is:

```
-RUNTABLE
  RUN (nnnnn000), TAPE (tt), FILE (ff)
  END
```

where the run number consists of nnnnn, the five digit acquisition number followed by three zeros. These cards precede the function selector and control cards.

REMOTE TERMINAL HIGHLIGHTS BY SUSAN SCHWINGENDORF

ST. REGIS TRAINING SESSION

During the week of June 11-14, BUD GOODRICK and SUSAN SCHWINGENDORF presented a 4-day short course on the basics of remote sensing and the use of LARSYS to personnel of the St. Regis Paper Company in Jacksonville, Florida. A remote terminal has been installed there, consisting of a DECwriter and an IBM 3776 printer terminal, which is also used to communicate with St. Regis' National Computer Center in Dallas, Texas. The purpose of this terminal is to support the technology transfer phase of the applications verification project underway with Purdue/LARS, St. Regis and NASA.

GRAPHICS COMPATABILITY SYSTEM (GCS) NEWS FROM LARRY BIEHL, BILL SHELLEY, AND JIM KAST

3-D PLOTTING!

A 3-dimensional plotting tool that can be used in the development of analysis routines is now available. This new programming tool is the 3-D Graphics Compatability System (GCS) obtained from the U.S. Army Corps Waterways Experiment Station. The USMA Graphics Compatability System is a FORTRAN-based computer graphics system designed for use on a wide variety of computer graphics terminals. 3-D GCS is an upgraded version of 2-D GCS that has been available on the Purdue/LARS computer since May 1977.

Some of the capabilities of 3-D GCS include plotting in spherical, cylindrical, or 3-D rectangular coordinate systems either in orthographic or perspective projections. Any or all axes may be linear or logarithmic. Also, the user has complete freedom as to what logarithmic base to use - 10, 3, 2, 16....

The 3-D graph is treated as an object in space, therefore, the user may walk around, over, or under the graph or object by defining the view point and view site - 6 numbers.

The Purdue/LARS 3-D GCS system supports 3 display devices presently-

- * Varian Printer/Plotter
- * Line Printer
- * Alphanumeric Terminals (GTX's, TI's, DECwriters)

Hopefully, in the near future, the Graphics II and DECwriter will be added and later on, maybe a graphics terminal.

New manuals which are for both the 2-D and 3-D GCS systems are available in the terminal area at Flexlab 1, Glen Prow's office at NASA/Johnson Space Center, Oscar Montgomery's office at Alabama A&M University, and LARRY BIEHL's office at Flexlab 2. Additional manuals are on order. The manuals describe how to access the GCS routines, discuss computer graphics programming and describe the GCS routines with examples of how to use them.

Examples which represent part of the power in 3-D GCS follow on pages 14 - 17 . Copies of the FORTRAN programs used to generate these plots are in the LARS Usage Notes section of the GCS Manual. Potential users are encouraged to review the GCS Manual to become aware of its capabilities when developing new analysis tools.

The complete 3-D GCS system has not been implemented. Users should also note that the following parts are not available:

- Structure Building - store plots on disk for later use or modification
- Interactive Routines - menu drawing, input instructions from terminal directly to GSC routines

Also, a later version was received in early June.

As part of implementing the 3-D GCS system, the Varian software routines were revised. The Varian software used by both 2-D and 3-D GCS under CMS370 runs 30% to 50% faster for plots of 1,000 to 5,000 vectors (normal LARSPEC plots). Also, the plot files sent to the Varian are 40% to 60% smaller.

Contact LARRY BIEHL if you have any questions concerning what the GCS package of routines can do or if you would like to implement the unavailable features in developing new analysis tools.

Field Research funds supported the implementation of 3-D GCS.

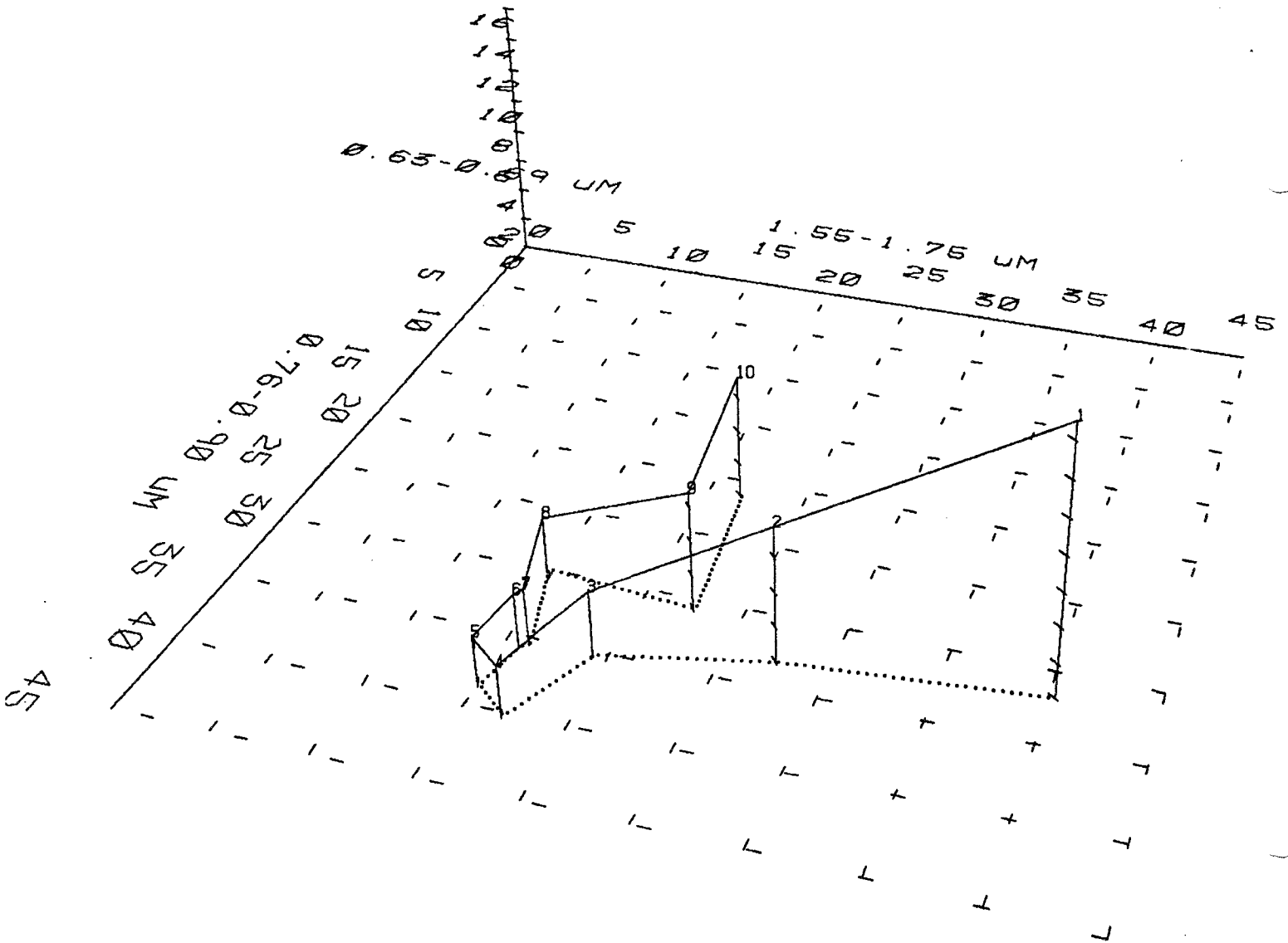
3DEXMP1 FORTRAN

Example of 3D line plot using 1978 Purdue Agronomy Farm Field Spectrometer data for a corn plot from beginning to end of growing season.

View Point 100, 50, 60
View Site 5, 20, 0
Window -50, 50, -50, 50

PLOT 732

SYMBOL	MATURITY STAGE	SYMBOL	MATURITY STAGE
1	1.5	6	
2	2.0	7	6.2
3	2.5	8	7.0
4	3.5	9	8.0
5	6.0	10	9.0



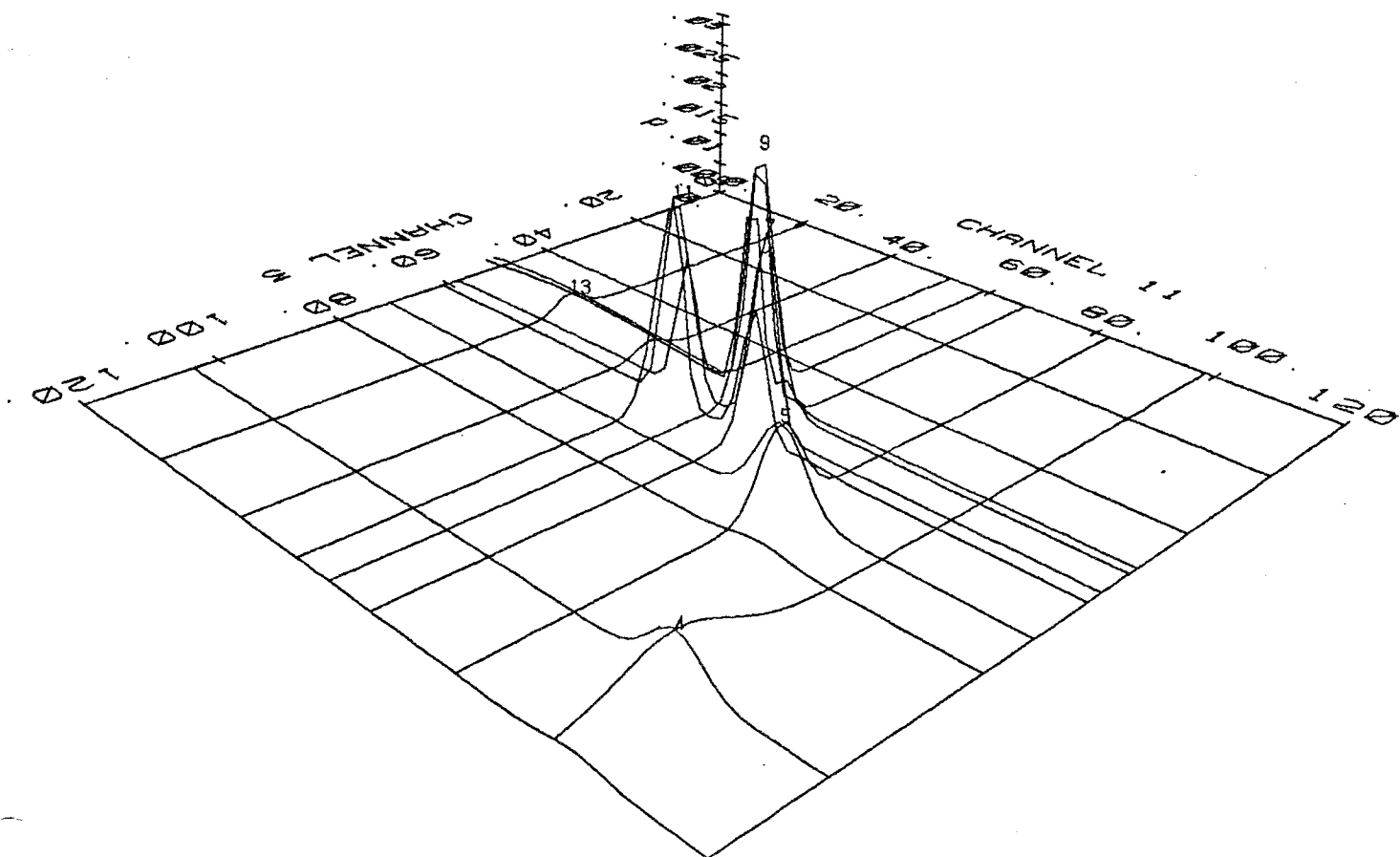
DENPLT FORTRAN

Example of 3D surface type plot using LARSYS statistics deck. The plot represents the joint density functions for several classes using two channels.

View Point 240, 240, .11
 View Site 24, 24, 0
 Window -120, 120, -.11, .11

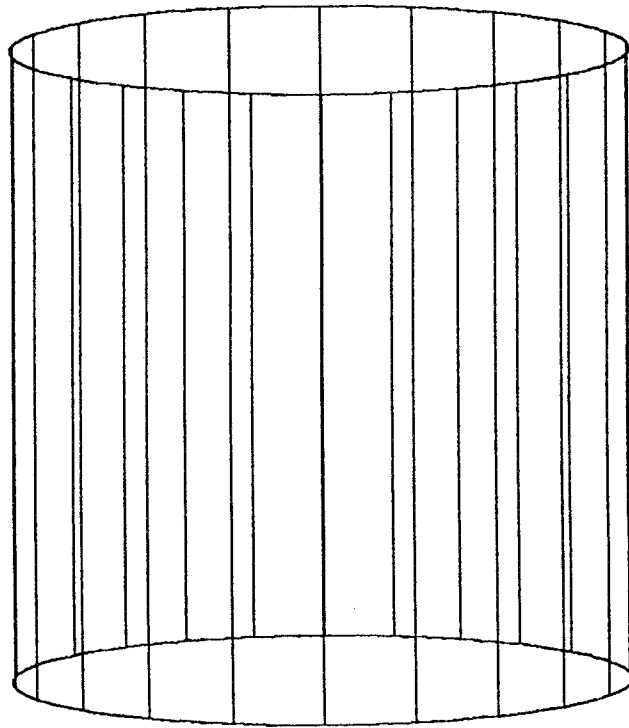
JOINT DENSITY FUNCTION PLOT

CLASS	CLASS NAME	CLASS	CLASS NAME
4	EXTRATI	9	DECID
5	SOIL	11	RIVER
7	VEGION	13	LAKE2



TST238 FORTRAN

Example of plot in cylindrical coordinate system.

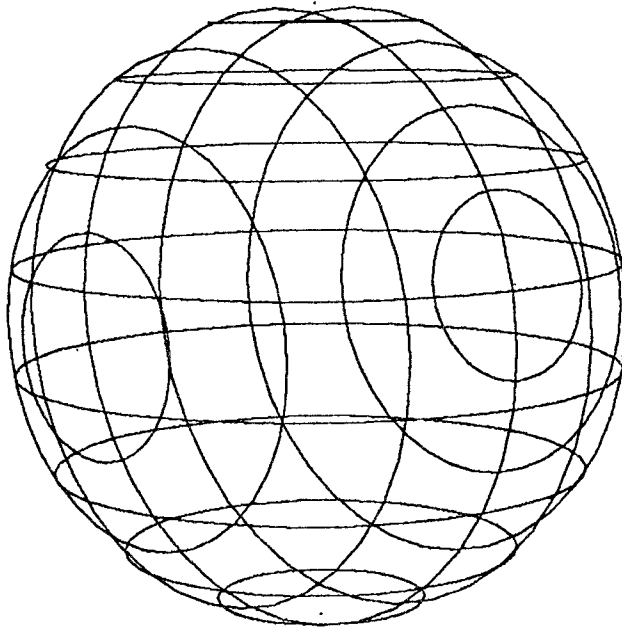


CYLINDRICAL COORDINATES

FIGURE 10 (U3PEN)

TST239 FORTRAN

Example of plot in spherical coordinate system.



SPHERICAL COORDINATES

FIGURE 11 (U3PEN)

3031 BENCHMARK RESULTS BY JIM KAST

Recently, LARS, IBM and LEC personnel performed benchmark tests on an IBM 3031 in Gaithersburg, Maryland. Primarily the purpose of these tests were to make a valid comparison of the IBM 370/148 and the IBM 3031. The following were the goals of this testing.

1. Examine a standard job mix to gain understanding of 3031 characteristics.
2. Be in a position to establish software product rates.
3. Be in a position to understand loading characteristics of the 3031, relative to the 148.
4. Be in a position to establish an overall CPU rate.
5. Put JSC in a position to estimate large-scale experiment costs.

The following software was included in the benchmark testing:

LARSYS	Law of the Minimum	BATCH
IMSL	CLASSY	RCSC
SPSS	GLMANOVA	FORTRAN G
EOD LARSYS	Landsat Reformatting	FORTRAN H
LARSYS P2	Geometric Correction	EDIT
LARSPEC		

The above software were used in five different tests.

STANDARD MIX TEST - The purposes of this test were to satisfy goals 1, 2 and 4.

LARS SOFTWARE RATE TEST - The purposes of this test were to satisfy goals 2 and 4.

JSC SOFTWARE TEST - The purposes of this test were to satisfy goals 5 and 4.

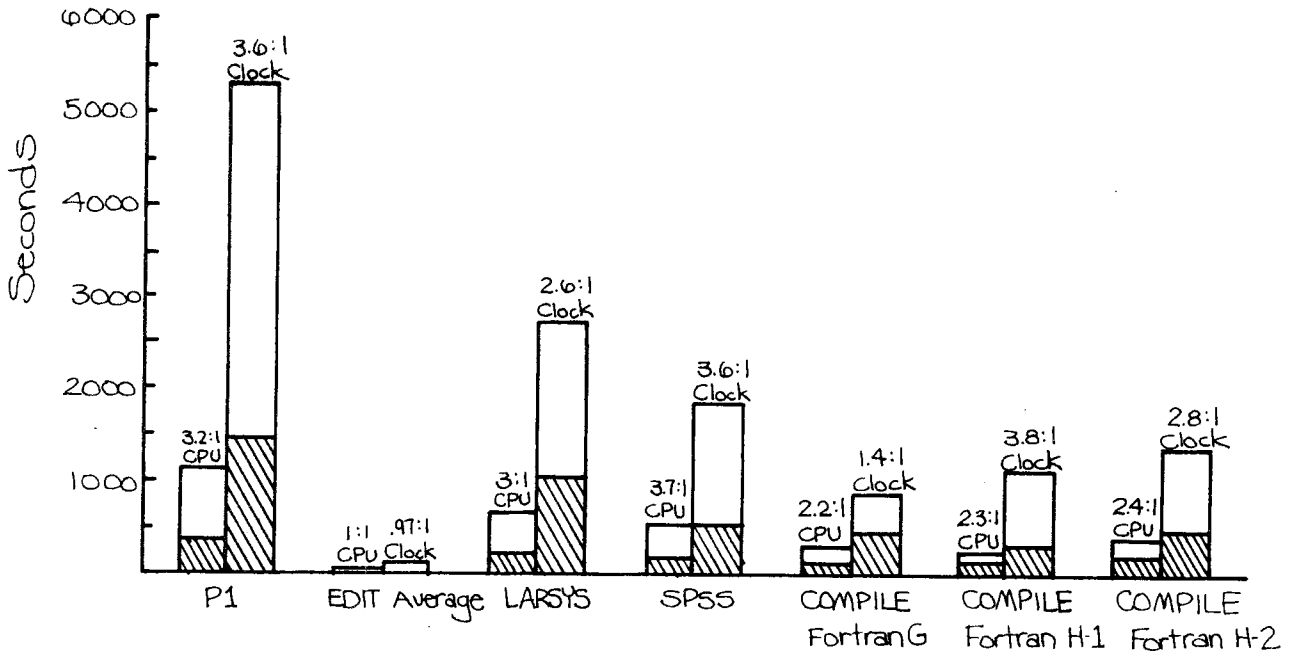
PAGING INTENSIVE TEST - The purposes of this test were to satisfy goals 3 and 4.

CPU INTENSIVE TEST - The purposes of this test were to satisfy goals 3 and 4.

The results of these tests are represented by the following bar graphs, where the outlined area is the timing results on the IBM 370/148 and the shaded area is the timing results on the IBM 3031.

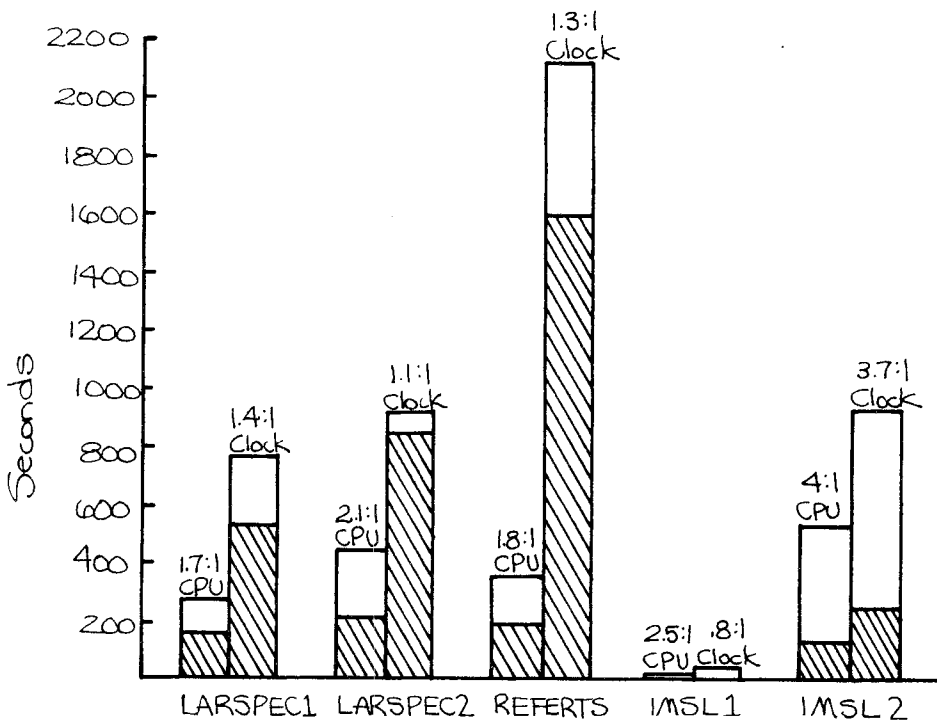
STANDARD MIX TEST (LIGHT LOAD)

Overall Improvement CPU 2.6:1
Clock 3:1



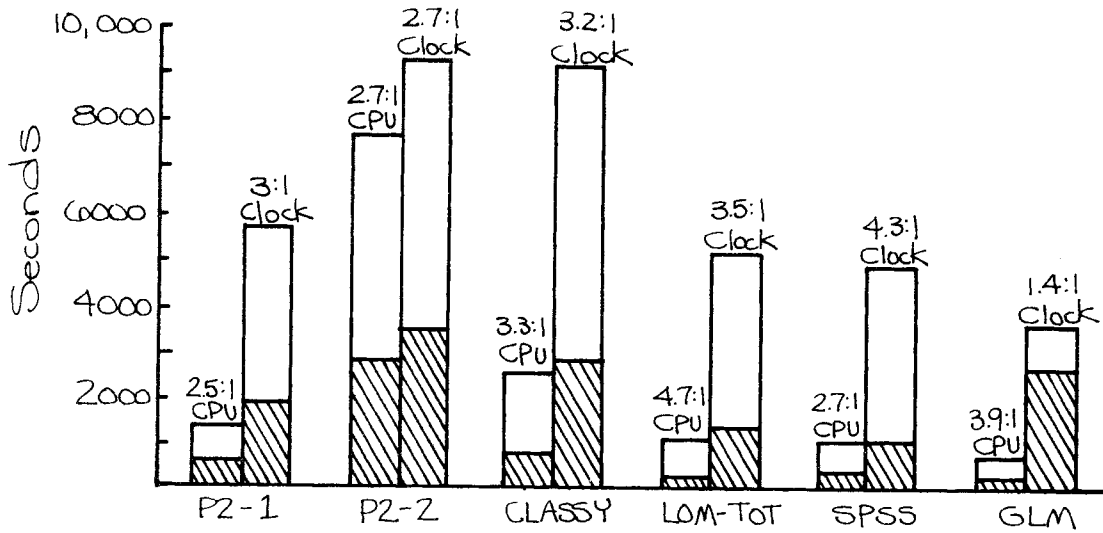
LARS SOFTWARE RATES TEST

Overall Improvement CPU 2.3:1
Clock 1.5:1



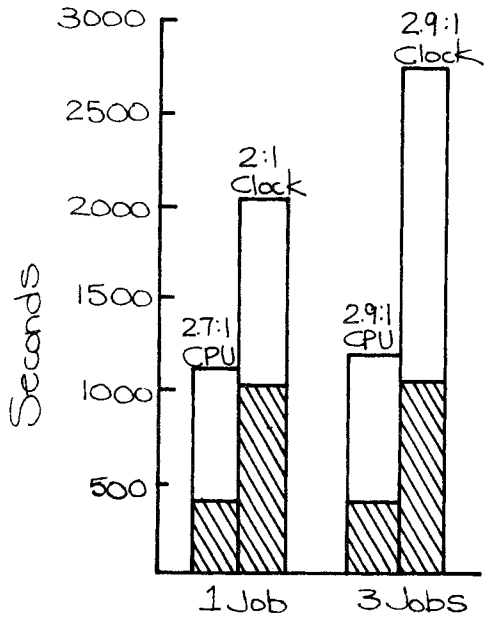
JSC SOFTWARE RATES TEST

Overall Improvement CPU 2.9:1
Clock 2.8:1



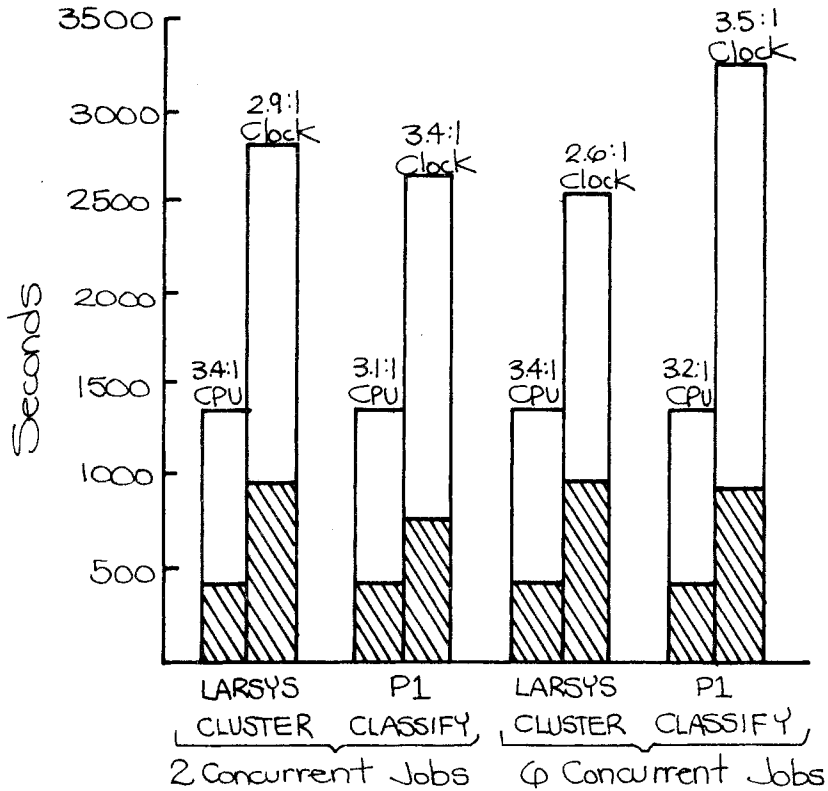
PAGING INTENSIVE TEST

Overall Improvement CPU 2.8:1
Clock 2.5:1



CPU INTENSIVE TEST

Overall Improvement CPU 3.3:1
 Clock 3:1



In summary, the data leads to the following conclusions:

1. CPU intensive software enjoys the greatest improvement.
2. Software making heavy use of tapes does less well.
3. The 3031 degrades more slowly than the 370/148 under extreme loading conditions.

An overall ratio of performance (3031;148) appears to be the following:

CPU time 2.8:1
 Clock time 2.9:1

SUMMARY OF 370/148 COMPUTER USAGE FOR JUNE, 1979

Overall Usage	Basic Rate CPU Time Used	12.85
	Priority Rate CPU Time Used	195.42
	Total CPU Time Used	208.28
	Terminal Sessions	3903
	Batch Jobs	

Usage by Time of Day - Time Period	Hours of CPU Used	Average Percent CPU Utilization
Mon-Fri midnite-8AM	26.66	16
Mon-Fri 8AM-4PM	101.06	60
Mon-Fri 4PM-midnite	61.97	37
Weekend	18.60	15

Batch Job Usage	Batch Machine	Jobs Run	Avg. Clock Time	Avg. CPU Time
	BATQUICK	152	1.40	0.10
	BATSHORT	125	6.92	0.55
	BATMED	62	28.45	4.16
	BATONITE	54	28.83	2.63
	BATLONG	14	29.23	9.58
	TAPTRAN	13	35.16	6.65
	BATEOD	78	17.65	1.33
	BATJSC	42	39.52	8.47

Keyboard Terminals - Location	Port	Terminal Type	Logins	Total Time in Use	Avg. Time Per Session
Flexlab2	30	INFOTON GTX	183	221.41	1.21
Flexlab2	31	INFOTON GTX	173	209.26	1.21
Flexlab2	32	INFOTON GTX	191	229.18	1.20
Flexlab2	33	INFOTON GTX	225	244.87	1.09
Flexlab2	34	INFOTON GTX	206	218.16	1.06
Flexlab2	35	INFOTON GTX	260	249.14	0.96
Flexlab2	36	INFOTON GTX	257	246.41	0.96
Comp. Room	37	DECwriter	306	128.45	0.42
Flexlab1	40	INFOTON GTX	197	116.99	0.59
Flexlab1	41	INFOTON GTX	203	171.27	0.84
Flexlab1	42	INFOTON GTX	210	169.60	0.81
Flexlab1	43	DECwriter	107	99.53	0.93
Dial-up	50	1st in Use	109	114.98	1.05
Dial-up	51	2nd in Use	16	13.91	0.87
Dial-up	52	3rd in Use	1	0.26	0.26
Dial-up	53	4th in Use	-	--	-
Dial-up	54	5th in Use	-	--	-
Dial-up	5E	In-House 1st	69	74.38	1.08
Dial-up	5F	In-House 2nd	61	74.70	1.22
Houston	60	Hazeltine 2000	180	75.39	0.42
Houston	61	Hazeltine 2000	190	76.59	0.40
Houston	62	2741	149	95.79	0.64
Houston	63	2741	154	66.81	0.43
Alabama	64	DECwriter	16	37.23	2.33
Alabama	65	INFOTON GTX	3	5.53	1.84
ISU	66	(various)	42	13.25	0.32
ISU	67	(various)	95	31.52	0.33
Houston	6A	Dial-1st in Use	169	151.30	0.90
Houston	6B	Dial-2nd in Use	142	117.28	0.83
Houston	6C	Dial-3rd in Use	106	81.70	0.77
Houston	6D	Dial-4th in Use	52	36.32	0.70

INTERLAB NOTES

PERSONNEL CHANGES

Several new graduate students have joined the Crop Inventory Systems Research area this summer. LARRY HINZMAN, Agronomy, is working under MARVIN BAUER on the field research project. VICTOR POLLARA, Agronomy, is working under CRAIG DAUGHTRY on the development of crop yield models utilizing spectral data, and MARK SWENSON, Statistics, is working under MARILYN HIXSON on the evaluation of Landsat training and classification techniques for crop identification and area estimation.

MINI-LARSIANS

Congratulations to Donna and LARRY BIEHL on the birth of their second son, Kevin Todd, July 2.

PURDUE UNIVERSITY NEWS

The following inter-office memos have been posted on the bulletin boards in Flexlab 1 and Flexlab 2.

Relocation of the Department of
Computer Technology

Telephone Changes - Office of the
Dean of Engineering

Changes in Travel Regulations

THE PICNIC

In spite of showers on Saturday, June 30, well over 100 LARS staff attended our annual summer picnic at Happy Hollow Park. The food was great and the sun shone just as we were starting to serve the chicken and all the goodies. Our thanks to all those who showed up in spite of the showers and to the committee: DONNA SCHOLZ, SUE SCHWINGENDORF, and ARLENE HODGE.

RECENT ACQUISITIONS IN THE LARS LIBRARY

PHOTOGRAMMETRIC ENGINEERING and REMOTE SENSING

Volume XLV

May 1979

Number 5

Cover Photo — Full-frame NASA Landsat image of the Stony Desert (a) and regions around Nazca, Peru, taken in 1974. Debate rages on the origin of large pre-Inca designs "etched" on the desert surface. They may have had religious significance or been a calendar system, and some claim they represent landing fields for pre-historic space travelers. A large X, which can be seen just northwest of the (a), is part of a vast complex of line drawings, most of which cannot be seen because of the resolution of the system. Submitted by David J. Brooks, Environmental Sciences Group, General Electric Company/MATSCO, Beltsville, Maryland.

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- Temporal Spectral Measurements of Corn and Soybean Crops**
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- Land-Use/Land-Cover Mapping from Aerial Photographs**
Robert D. Baker, J. E. deSteiguer, Douglas E. Grant, and Michael J. Newton661

PHOTOGRAMMETRIC ENGINEERING and REMOTE SENSING

Volume XLV

June 1979

Number 6

Cover Photo — This false-color infrared photograph was taken for the U.S. National Park Service to evaluate the effects of a forest fire in the Olympic National Park, Washington. The Hoh Lake fire was started by lightning about July 26, 1978, and finally brought under control on August 15, 1978. Walker and Associates took this photo on September 18, 1978, using their Zeiss 1523 camera mounted in a Cessna Skymaster 337. Kodak Aerochrome Infrared Film 2443 was exposed at f5.6, 1/200 second with a minus blue filter. The photo was submitted by Walker and Associates, Inc., of Seattle, Washington, and Precision Photo Laboratories, Inc., of Dayton, Ohio, who did the film processing and subsequent printing.

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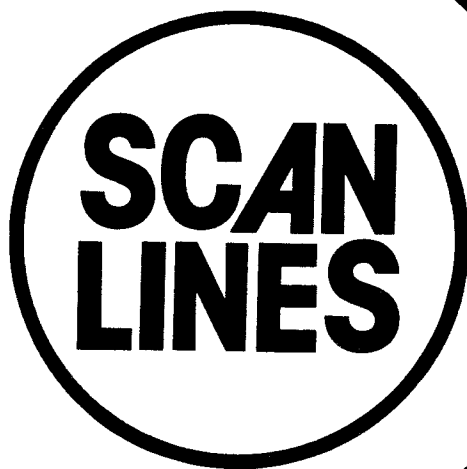
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LAP^a CO-RECEIPIENT OF GROUP ACHIEVEMENT AWARD

On July 24, the NASA/Johnson Space Center held a special awards ceremony to recognize the government, university and industry employees who made significant contributions to the success of the Large Area Crop Inventory Experiment. The following remarks by Dr. C.C. Kraft, Jr., Director, NASA/JSC, are excerpted from the awards ceremony program.

"The Large Area Crop Inventory Experiment (LACIE), the logical outgrowth of nearly 2 decades of scientific research, was the first large-scale program to apply remote sensing technology to the solution of international agricultural problems. An interagency undertaking of the Department of Agriculture, the National Oceanic and Atmospheric Administration, and the National Aeronautics and Space Administration, the program assembled the country's best talents into an integrated team which conducted a highly successful demonstration

of how wheat, the world's most important crop, can be identified and its production predicted on a world-wide basis.

"LACIE has proven to be a giant step in achieving NASA's goal of demonstrating the practical application of space technology to the challenging needs of resource and environmental management. LACIE now is serving as the basis for expanded applications in agriculture and has the promise of leading to an increasingly broad utilization of space technology in managing the world's natural resources.

"We are conducting this special honor awards ceremony to recognize those Government, university, and contractor employees - the LACIE team - who confronted and solved the extreme complexities of the Large Area Crop Inventory Experiment; and, as a result, made it an outstandingly

Prepared by the Laboratory for Applications of Remote Sensing for distribution at Purdue. Contact Susan Ferringer, SCAN LINES editor, to be placed on the mailing list (749-2052, ext. 290).

successful project, not only in what it accomplished directly, but also in the pathways it provided for our future endeavors."

The JSC Group Achievement Award was presented to the LACIE Supporting Research Team and was accepted by MARVIN BAUER (Purdue/LARS), Marvin Holter (ERIM) and Jon Erickson (JSC).

The NASA Distinguished Public Service Medal was presented to J. Ralph Shay, Oregon State University. While a department head in the Purdue School of Agriculture, Dr. Shay foresaw the important role remote sensing could play in monitoring agricultural resources and was instrumental in establishing the Laboratory for Agricultural Remote Sensing at Purdue University.

REMOTE SENSING PRESENTED AT AGRONOMY MEETINGS

Four papers describing results of field research conducted by Purdue/LARS were presented at the American Society of Agronomy meetings held August 6-10, at Colorado State University, Ft. Collins, Colorado. (* indicates presenter).

"Description of Multiband Radiometer for Field Research" by M.E. BAUER* and B.F. ROBINSON

"Maize Canopy Reflectance as Influenced by Nitrogen Nutrition" by G. WALBURG*, C.S.T. DAUGHTRY, M.E. BAUER, J.C. KOLLENKARK, and S.A. BARBER

"Soybean Canopy Reflectance as Influenced by Cultural Practices" by J.C. KOLLENKARK*, C.S.T. DAUGHTRY, M.E. BAUER, G. WALBURG and D. LONGER

"Effects of Cultural Practices on Reflectance of Spring Wheat Canopies" by C.S.T. DAUGHTRY*, M.E. BAUER, D. CRECELIUS, and M.M. HIXSON

DONALD HOLT, Professor of Agronomy and a member of the Crop Inventory Research Program area at LARS, was recognized as a Fellow of the American Society of Agronomy. Don conducts research in the environmental

physiology and agronomic research techniques.

He and his colleagues developed SIMED, the Purdue simulation model of alfalfa growth, and he has been involved in the development of models for corn and soybeans utilizing the unique approach employed in SIMED.

MULTIBAND RADIOMETER PROJECT NEWS

To develop the full potential of multispectral data acquired from satellites, increased knowledge of the relationships between the spectral characteristics and important parameters of earth surface features is required. This can best be obtained by carefully controlled studies over area, fields, or plots where complete data describing the condition of targets is attainable, and where frequent, timely spectral measurements can be obtained.

The currently available instrumentation systems are either inadequate or too costly to obtain these data. Additionally, there is a critical need for standardized acquisition and calibration procedures to ensure the validity and comparability of data.

Recognizing these needs, Measurements Research personnel, funded by NASA/JSC, have been working on the development of a multispectral data acquisition system which will improve and advance the capability for field research in remote sensing. Specific objectives are to:

1. Specify, develop and test the prototype of a radiometric instrument system.
2. Develop calibration, measurement and operation procedures.
3. Develop software for data handling capability.

The radiometric instrument will be a multiband radiometer with 8 to 10 bands between 0.4 and 2.4 micrometers; the data acquisition system will record data from the multiband radiometer, a precision

radiation thermometer, and ancillary sources. The radiometer and data handling system will be adaptable to helicopter, truck, or tripod platforms.

BARRETT ROBINSON, LEROY SILVA, and DAVE DEWITT have been meeting with NASA, USDA, and university researchers over the past year to ensure that the proposed system will meet the needs of the user community. In addition an important aspect of the development of the specifications describe a system which is technically realizeable at reasonable cost. Another result will be to ensure the commercial availability of the system.

BARRETT ROBINSON travelled to Stamford, Connecticut, August 9 to meet with project engineers of Barnes Engineering Corporation to finalize the contract for purchase of the prototype radiometer. On August 15, Barrett met with the technical monitor of the project at NASA/JSC in Houston, Texas.

JOINT SHORT COURSE ON APPLICATION OF REMOTE SENSING TECHNIQUES TO ENVIRONMENTAL PROBLEMS

The Indiana State University Remote Sensing Laboratory (ISURSL) and LARS have jointly developed a unique five-day short course directed to geographers and urban planners. It deals with the most current techniques of environmental assessment and draws on the collective resources of both laboratories.

Participants will be introduced to a variety of remote sensing principles, methodologies, and applications of both traditional and innovative remote sensing techniques for the solution of major environmental resource problems.

The short course will be hosted by Indiana State University and taught by Paul MauseI and Pat Madison of ISURSL and RON BOYD and JIM RUSSELL of LARS. The short course will include a one-day field trip to Purdue for a tour of the LARS facilities and seminars by MARION BAUMGARDNER, ROGER HOFFER, and DAVE LANDGREBE.

Currently the short course is scheduled to be offered four times:

October 15-19, 1979
March 17-21, 1980
June 16-20, 1980
August 18-22, 1980

For a brochure describing the short course and other information, contact JIM RUSSELL, Technology Transfer, ext. 299.

AGRISTARS UPDATE

Many of the LARS staff, including MARVIN BAUER, MARILYN HIXSON, JIM KAST, MARION BAUMGARDNER, DON HOLT, DAVE LANDGREBE, TERRY PHILLIPS and PHIL SWAIN have been working to define the role which Purdue would like to have in AgRISTARS.

AgRISTARS (Agricultural and Resources Survey through Aerospace Remote Sensing) is a follow-on and extension of LACIE to other crops, countries, and applications. It is planned as a five-year program of research, development, testing, and evaluation. It is being conducted by USDA, NASA, and NOAA

VISITING PROFESSORS

Dr. JOHN RICHARDS, on study leave from his position as Lecturer in Electrical Engineering at the University of New South Wales, Australia, is spending the fall semester at LARS and teaching in Purdue's School of Electrical Engineering.

His current interests are in the area of pattern recognition techniques applied to Landsat imagery, and he is working with PHIL SWAIN and DAVE LANDGREBE on a research project associated with classifier training. John is accompanied by his wife Glenda, son Matthew John and daughter Jennifer Elizabeth.

LANNY LUND will be working with MARION BAUMGARDNER over the next ten months in the Earth Sciences area. Dr. Lund is currently on sabbatical leave from the

Department of Soil and Environmental Sciences, University of California/Riverside, where he was working on soil genesis classification.

He hopes to extend his research on the effect of soil morphology on the nitrogen cycle, waste disposal, and land use in general, through application of remote sensing technology. Dr. Lund is accompanied by his wife and two children.

GORDON RESEARCH CONFERENCE

DAVE LANDGREBE, MARVIN BAUER, LEROY SILVA, and BARRETT ROBINSON attended the Gordon Research Conference on Remote Sensing of Earth's Surface in Plymouth, New Hampshire, on August 20-24. Dr. Landgrebe chaired a session on Spectral Characterization of Organic Matter and Dr. Bauer chaired a session on Crop Stress. Two poster papers, one on LACIE Results, and one on Reflectance Calibration and the Multiband Radiometer, were also presented.

VISITING SCIENTISTS

BILL DIPAOLO recently completed a 12-month program under the sponsorship of the Department of Interior, Bureau of Land Management. The visiting scientist program involved an introductory period of learning the applications of LARS software and hardware. This included the LARS Short Course with Hands-On option, the Educational Package, and performing a sample analysis for an area in Tippecanoe County.

Work then began on the analysis of an area of diverse rangeland in SW Idaho - approximately 60 miles south of Boise. Field investigations were performed in November and May. Various analysis techniques and classification algorithms were used, in addition to boundary digitization and physiographic stratification.

Preliminary results indicate that many factors contribute to the spectral response within the area, and the use of remote sensing technology to aid in western soil surveys will depend upon a thorough understanding of these factors.

Currently a LARS Technical Report is being prepared describing the observations made during the project, and a seminar on this work was presented on August 27. Bill DiPaolo departed LARS on Tuesday, August 28, for an assignment in Denver, Colorado.

VISITORS

MARION BAUMGARDNER recently hosted two visitors. Dr. Fred Kuiper, with the National Agricultural University, Wageningen, the Netherlands, received a briefing on LARS August 6-7. Dr. John Howard, Senior Officer of the Remote Sensing Center, Food & Agriculture Organization, Rome, Italy, visited LARS on August 23-24. He discussed remote sensing projects in the developing countries.

Purdue President Arthur Hansen, Provost Felix Haas, Dr. Fred Andrews, and Associate Dean of Engineering Robert Greenkorn, visited Flexlab 1 and 2 on August 9. They were interested in having an opportunity to see the LARS facilities and to hear of current programs.

LARS TRAVEL LOG

DAVE LANDGREBE, PHIL SWAIN, TIM GROGAN, and MARWAN MUASHER attended the IEEE Computer Society Conference on Pattern Recognition and Image Processing held in Chicago, Illinois, August 6-8.

PHIL SWAIN and "H.J." SIEGEL visited the Defense Mapping Agency in St. Louis, Missouri, August 15, to present a status report on their DMA sponsored research. The project involves application of multimicroprocessor systems to image processing and nicely complements the LARS SR&T project involving implementation of a context classifier on a Control Data Flexible Processor array.

Swain and Siegel also attended the IEEE Conference on Parallel Processing in Bellaire, Michigan, August 20-24.

MARION BAUMGARDNER visited Honolulu, Hawaii, on August 27-31, to give an invited paper on "Assessment of Arable

Lands in Asia-Pacific Region. The paper was presented at the Fertilizer Flows Preparatory Conference, sponsored by the Resource Systems Institute, East-West Center.

NEW PROJECTS FUNDED

Title: Spectral Data Collection and Processing, Sponsor: University of Missouri, Principal Investigator: L.L. BIEHL, Duration: June 1-30, 1979.

Title: Landsat Digital Data in Arizona, Sponsor: University of Arizona, Principal Investigator: R.A. WEISMILLER, Duration: June 15 to September 15, 1979.

Title: Resource Survey of Sequenega Project Area, Upper Volta, Sponsor: Africare/USAID, Principal Investigator: M.A. BAUMGARDNER, Duration: 12 months.

PROPOSALS SENT OUT

Title: A Proposal for Development of a Low-Cost Earth Resources Processing Capability for Ball State University, Sponsor: Ball State University, Principal Investigators: S.K. SCHWINGENDORF and R.K. BOYD, Duration: September 1, 1979 to August 31, 1980.

NEW LARS TECHNICAL REPORTS

J40379

A Two-Dimensional Filter Design for Isotropic Reconstruction of Track-Type Airborne Geophysical Surveys by P.E. Anuta and C.D. McGillem.

The problem of reconstruction of a continuous densely sampled uniform grid scalar surface from track-type geophysical surveys is discussed. Examples of track-type signal sources include earth gamma ray radiation and magnetic fields measured at low altitude (typically 500 ft.) along tracks spaced from a fraction to several miles apart. The signal model investigated assumes the geophysical surface consists of a narrow band isotropic stochastic signal process. The sampling process is characterized by a high sampling rate along track and a low sampling rate across track. A reconstruction filter approach is described which attempts to provide isotropic reconstruction to minimize the error in representation of scene features.

The research described in this report was sponsored by the National Science Foundation under Contract Number ENG-7614400.

042079

Prediction of Solar Irradiance Distribution in a Wheat Canopy Using a Laser Technique by M.E. Bauer, V.C. Vanderbilt and L.F. Silva.

A new measurement technique, the "laser technique", is proposed for providing timely information concerning the solar irradiance distribution in a vegetative canopy. The technique is used to determine power and energy budgets of radiation intercepted by the various foliage components of a wheat canopy. Several potential sources of error in application of the technique, methods of error minimization, and improvements to the technique are discussed.

The research in this report was sponsored by NASA under Contract No. NAS9-14016 and Contract No. NAS9-14970.

060779

Monitoring the Earth's Resources from Space - Can You Really Identify Crops by Satellite? by D.A. Landgrebe

The U.S. satellite earth observational program was intended to generate techniques which would contribute to man's more efficient management of the earth's resources. In this paper computer-based aspects of this technology are outlined and the current state of the art illustrated with several applications examples. The paper concludes with a sketch of research directions being taken toward a more advanced capability.

062279

An Analytical Approach to the Design of Spectral Measurements in the Design of Multispectral Sensors by D.J. Wiersma and D.A. Landgrebe.

The proper selection of spectral bands for a remote sensing system has been an important unresolved question for some years. In this paper an analytical technique is presented which permits the design of an optimal feature set against which practical spectral band designs can easily be compared. The technique not only aids in band design in this way, but also provides a useful tool for fundamental scene understanding research by providing a direct means for relating specific scene characteristics to classifier performance.

The research reported in this paper was sponsored by NASA under Contract No. NAS9-15466 and Contract No. NAS9-14970.

062379

A Method for Classifying Multispectral Remote Sensing Data Using Context by P.H. Swain, H.J. Siegel and B.W. Smith

A statistical model of spatial context is described and procedures for classifying remote sensing data using a context

classifier are outlined. Experimental results are presented. Because the computational requirements of the context classifier are very large, its implementation on parallel/pipelined multiprocessor systems is being investigated. Some of the special considerations necessary for such implementations are described, with particular reference to implementation on an array of Control Data Corporation Flexible Processors.

The work reported in this paper was sponsored by NASA under Contract NAS9-15466.

062779

Sampling for Area Estimation: A Comparison of Full-Frame Sampling with the Segment Approach by M.M. Hixson, B.J. Davis, and M.E. Bauer.

The objective of this investigation was to evaluate the effect of sampling on the accuracy (precision and bias) of crop area estimates made from classifications of Landsat MSS data. Full-frame classifications of wheat and non-wheat for eighty counties

in Kansas were repetitively sampled to simulate alternative sampling plans. Four sampling schemes involving different numbers of samples and different size sampling units were evaluated. The precision of the wheat area estimates increased as the segment size decreased and the number of segments was increased. Although the average bias associated with the various sampling schemes was not significantly different, the maximum absolute bias was directly related to sampling unit size.

The research reported in this paper was supported by NASA under Contract No. NAS9-14970.

SYSTEM SERVICES September 5, 1979

REMOTE HIGHLIGHTS BY SUSAN SCHWINGENDORF

ST. REGIS TRAINING SESSION

BUD GOODRICK and SUSAN SCHWINGENDORF travelled to Jacksonville, Florida, July 23 to July 25, to provide computer experience in the use of LARSYS to three St. Regis employees. Two different data sets covering land managed by St. Regis were analyzed during this time.

SUMMER NSF PROGRAM AT ISU

Again this summer, Indiana State University conducted a 6 week NSF program on Remote Sensing of Earth Resources. On Thursday, August 2, the 15 high school students participating in this program visited LARS to tour the computer facility and discuss remote sensing applications. Then, during their final week at ISU, each student worked on a classification project using the remote terminal to the Purdue/LARS computer.

JOINT SHORT COURSE

The ISU Remote Sensing Lab and Purdue/LARS have developed a five-day short course entitled "The Application of Remote Sensing Techniques to Environmental Resource Problems." This course is being offered at ISU four times during the coming year. The course staff includes JIM RUSSELL and RON BOYD from LARS, and Paul Mausel and Patrick Madison at ISU, with other staff members occasionally presenting applications seminars.

ALABAMA STATISTICS SEMINAR SCHEDULED

A short course on accessing statistical program (SPSS and BMD) which are available on the Purdue/LARS computer has been requested by people at the Alabama A&M remote terminal site. Currently this course is scheduled for the first week in September.

HIGHER SPEED MODEM FOR JSC

Glen Prow travelled to LARS August 8-9 to install a Codex LSI 9600 modem which replaces a lower speed Codex 7200 modem on the HOUSTON link. This modem allows the eight typewriter terminals and a Data 100 at JSC to communicate with the Purdue/LARS computer. This new modem will be utilized more fully when a statistical multiplexer is installed in the near future.

IMSL MANUALS

Two new sets of IMSL manuals (for the IMSL library of mathematical and statistical subroutines) were delivered to LARS. A set of 3 manuals will be placed in the terminal area of both Flexlab 1 and Flexlab 2.

IMSL PASSES TEST!

The IMSL subroutines have all been tested using the Minimal Test Package supplied by IMSL. This test, performed by J.P. DOLAN, consisted of a call to each IMSL subroutine and then a comparison of the returned answer with the expected answer. If these agreed, the subroutine passed. Happily, all routines passed the test, but the following subroutines (which perform I/O with user-supplied device numbers) should only be used with code compiled by the Fortran H compiler (to prevent the appearance of a "Device Number **** Out of Range" error message):

USHIST	USTREE	USWBM
USHIUT	USPLT	USWBS
USHVT	USPLTD	USWFM
USLEAP	USRDM	USWFV
USPC	USRDV	USWSM

EOD LARSYS ENHANCEMENTS

A number of changes and enhancements to the EOD LARSYS system have been made in the past months. These are listed in the SRTNEWS facility which computer users can access from CMS370 by typing: "SRTNEWS" or

SRTNEWS PRINT location

HOLD
NOHOLD

LARSYS FORMAT UPGRADES TO EOD LARSYS

A number of upgrades to the EODLARSYS (LARSYSPI) software have recently been announced. Among them are changes which improve this system's ability to read and write LARSYS formatted data tapes. Provision has now been made to store the variables contained in the LARSYS ID record and use the values (with the exception of the tape number, number of channels, and number of samples) when a subsequent ID record is to be written. The tape number, file number, number of channels, and number of samples are updated whenever an ID record is output. EOD LARSYS will now write LARSYS formatted data records including the six calibration bytes (set to zero) expected by LARSYS routines. These upgrades make for improved LARSYS/EODLARSYS compatibility.

CONVERTING LARSYS/EOD LARSYS FILES

Four new computer programs have been developed at LARS to allow communication between Purdue's LARSYS and JSC's EOD-LARSYS analysis systems. These programs convert a statistics deck or a results file produced by one system into a format which can be read and used by the other. For example, statistics developed in EOD-LARSYS can now be used by another classifier, such as ECHO or MINIMUM DISTANCE. A results file from a LARSYS classification can be converted to EOD-LARSYS format so that a stratified area estimate can be made.

The programs reside on a disk on LARS IBM 370/148 which may be accessed by any system user by issuing the CMS370 command:

GETDISK JSCDISK 29A 29A E PASS JLK

Contact CAROL JOBUSCH (LARS) for documentation or information on how to use these programs.

SYSTEMS ANALYSIS NEWS BY SUSAN SCHWINGENDORF

PRINTRESULTS ON LSDV370

An additional feature of the PRINTRESULTS processor in LSDV370 is the ability to request tables in acres and hectares. The user may enter either a scale factor (size of a pixel) or the total number of acres in the classification block. A bug was recently corrected so that these tables are now computed correctly.

UNIVERSAL TAPE FORMAT

The CMS370 versions of LARSYS can now receive input from either LARSYS or Universal format data tapes. Our thanks to several users of this feature who brought problems to the attention of the computer facility staff. These have now been corrected.

370 GETDISK UPDATED

The CMS370 version of the GETDISK command has been updated to include TEMP disk size requests in kilobytes (K) and megabytes (M). For example:

GETDISK TEMP 3M

would search for a 3 megabyte temporary disk (the largest currently available) to link to the user's ID.

GETDISK TEMP 200K

would result in a search for a temporary disk containing at least 200 kilobytes. (In this case, the computer would probably attach a 2 cylinder 2314 disk containing 240 kilobytes).

The present available TEMP disk sizes, in terms of K, M, and 2314 CYL are as follows:

<u>CYL (2314)</u>	<u>K</u>	<u>M</u>
2	240	.24
5	600	.60
10	1200	1.20
25	3000	3.00

Other size options include, SMALL, LARGE, and MAXIMUM. In addition, some defined names and their default addresses (ADR) and modes (MODE) have been revised or added. If you need written documentation on GETDISK, contact MARY ELLEN PIERSON or MON LI TANG at Flexlab 2.

PERSONNEL

PETER JOBUSCH has joined the Basic Systems Staff effective August 1. Peter has a BS from Purdue in Mathematics/Computer Science and is completing a MS in Industrial Engineering. He brings with him much experience in IBM hardware and software systems. It will not be long before Peter becomes proficient in our system at LARS.

A welcome is extended to DAVID KEMPF, who joined the Operations Group in August as a Student Computer Operator.

JERRY MAJKOWSKI, a recent graduate of Purdue University's nuclear engineering program, has joined the ranks of LARS System Services personnel as a Computer Analyst I. Jerry is familiar with the LARS operation having spent two years as an undergraduate programmer here. For the next few months, Jerry will be working with LARRY BIEHL and BILL SHELLEY on LARSPEC development during the mornings. In the afternoons, he will be helping the yield modelling folks in Agronomy (Harold Reetz, DON HOLT & Company) on their CDC project. Jerry is in room C-115 at LARS, extension 259. He may be reached at Agronomy by dialing 2891 and asking for extension 281 or by dialing 2639. Welcome back Jerry; we are glad to have you on line!

NEW RATES BY ROSS GARMOE

New rates have been established for many System Services products. These new rates will become effective when the IBM 3031 computer becomes operational. The most significant rate changes are in Computer Service and Priority Service. These rates are higher to account for the reduced number of computer hours due to the three times greater CPU speed. Note also that all of the products whose rates are based upon CPU time have increased to allow for the CPU speed difference. The actual cost of using all of these products will remain about the same.

The other rate changes are to adjust income to match increased or decreased expenses for the product. For example, the rate Disk Service increased due to the cost of additional hardware. Local Terminal rate increased due to the expected decrease in usage caused by a faster, more responsive hardware system.

The new rate schedule is published on the next two pages.

Updated
2/16/79

PURDUE UNIVERSITY/LARS
System Services Products and Rates
July 1, 1979 - June 30, 1980

<u>DEPT.</u> <u>REF.</u>	<u>ITEM</u>	<u>UNIT</u>	<u>RATE/UNIT</u>
02001*	Computer Service	1 hour	\$ 150.00
02003*	Local Terminal	1 hour	3.00
02011*	Priority Service	1 hour	80.00
02016*	Disk Storage Space	1 meg. mo.	6.00
02017	Computer Tapes	1 tape	12.50
02018	Polaroid Film B&W	1 pack	4.20
02019	Polaroid Film Color	1 pack	6.60
02020	Polaroid Film P-N	1 pack	5.20
02024	Digital Display	1 hour	20.00
02026*	7-Track Tape Drive	1 hour	50.00
✓ 02030	Local Terminal	1 hour	6.00
✓ 02040	Varian Plotter	1 foot	.75
02083*	Professional Assistant	1 hour	19.50
02084	Technical Assistant	1 hour	13.00
02085*	Professional Staff	1 hour	32.00
02088*	Service Staff	1 hour	9.45
02089*	Clerical Staff	1 hour	8.00
02090*	Student Staff	1 hour	6.75
✓ 02800	Computer Service	1 hour	400.00
✓ 02805	Priority Service	1 hour	240.00
✓ 02810	Disk Storage	1 meg. mo.	8.50
✓ 02815	7-Track Tape	1 hour	35.00
✓ 02891	Professional Staff	1 hour	38.80
✓ 02892	Professional Asst. Staff	1 hour	19.25
✓ 02894	Service Staff	1 hour	9.15
✓ 02895	Clerical Staff	1 hour	8.90
✓ 02896	Student Staff	1 hour	7.35
02103	Landsat Reformatting	1 job	135.00
02104	Geometric Correction	1 run	270.00
02122	A/D Converter	1 hour	90.00
02125	Geometric Correction Data Points	1 mill pts	80.00
02126	Image Registration	1 run	1300.00
02127	Image Registration Data Points	1 mill pts	500.00
02128	Exotech Reformatting	1 run	15.00
02129	LARSYS Reformatting	1 run	90.00
02130	Precision Registration	1 run	1540.00
02131	Precision Registration Maps	1 map	320.00
02132	Boundary Definition Option	1 definition	920.00
02133*	Mead Photo Processing	1 run	350.00
02134	Landsat Frame Connection	1 frame connect.	230.00
02135	Table Digitizer	1 hour	20.00
02136*	Varian Plotter Output	1 foot	.35
✓ 02140	Color Class. Map	1 run	500.00
02183*	Professional Assistant Staff	1 hour	19.50
02190*	Student Staff	1 hour	6.75
✓ 02192	Professional Assistant Staff	1 hour	19.25
✓ 02196	Student Staff	1 hour	7.35

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System Services Products and Rates
Page 2

<u>DEPT.</u> <u>REF.</u>	<u>ITEM</u>	<u>UNIT</u>	<u>RATE/UN</u>
02203	LARSYS Version 3.1 Documentation	1 copy	1000.00
02204	LARSYS Educational Package	1 package	1250.00
02206	Student and Instructor Notes	1 set	760.00
02208	LARSYS Users Manual	1 manual	70.00
02210	Student Notes	1 set	30.00
02212	Thermofax Transparencies	1 page	.85
02213	Framed Transparencies	1 copy	1.00
02214	Slides	1 slide	2.50
02215	Printed Material	1 page	.08
02284*	Technical Assistant Staff	1 hour	13.00
✓ 02293	Technical Assistant Staff	1 hour	13.40
02301*	Statistical Services	1 hour	150.00
✓ 02302	Statistical Services	1 hour	500.00
02305*	LARSYS	1 hour	100.00
✓ 02306	LARSYS	1 hour	350.00
02310*	LARSPEC	1 minute	3.55
✓ 02311	LARSPEC	1 minute	10.00
02315*	Optronics Experiment	1 unit	90.00
02383*	Statistical Consultant	1 hour	19.50
✓ 02390	Student Staff	1 hour	
✓ 02392	Professional Assistant Staff	1 hour	19.25
✓ 02396	Student Staff	1 hour	7.35

* rates discontinued after 3031 installation

✓ new rates effective 09/79

3031 INSTALLATION SCHEDULE BY ROSS GARMOE

As we have announced in several of the past SCAN LINES, LARS is replacing the 370/148 with a 3031. The 3031 is approximately 2.9 times as fast as the 148 based on the results of our test at Gaithersburg. In addition, the 3031 has two megabytes of real memory instead of the 148's one megabyte. We expect to be able to provide much better service after the 3031 has been installed. The current schedule for 3031 installation is as follows:

August 24	3031 shipped from plant at Poughkeepsie
August 31	3031 arrives at LARS
Sept. 6 6 pm	370/148 is shut off and system is given to IBM customer engineers for installation of 3031
Sept. 9 12 midnight	3031 is turned over to LARS operations and Basic Systems staff for software installation, system test and operator training
Sept. 11 12 midnight	LARS resumes normal production

These dates are our current best estimates. If problems occur during shipping or unpacking, these dates will be delayed one week to September 13 through September 18. If a delay occurs, you will be notified via the system log message.

As with any new piece of equipment, a shakedown period must be expected. We hope that the few problems we may encounter will not be serious. However, if machine problems do cause you to lose work in progress, you can apply to MIKE COLLINS for credit.

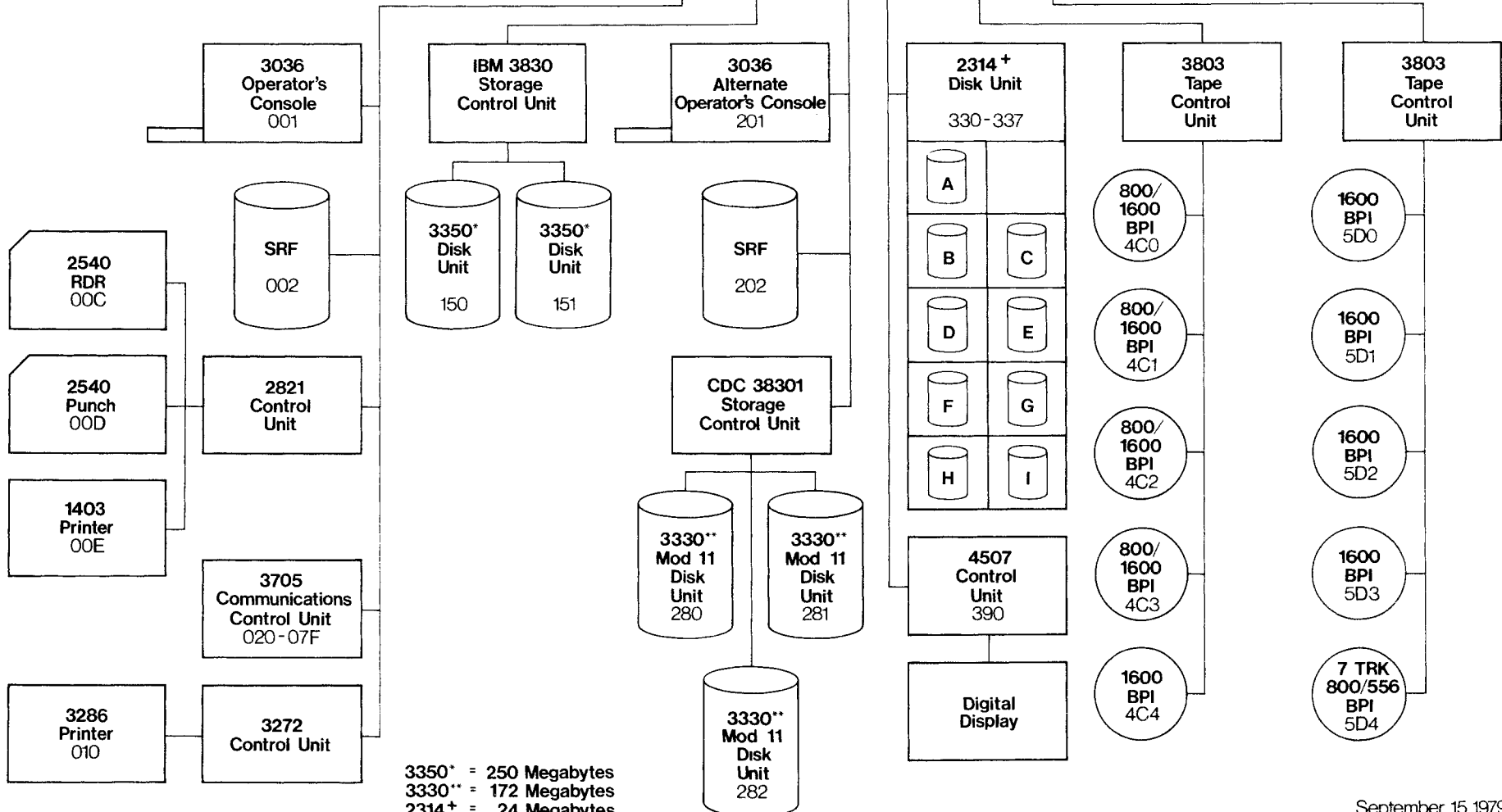
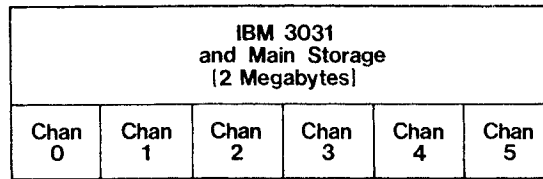
CDC CONTROLLER BY ROSS GARMOE

As part of the installation of the IBM 3031, a CDC controller is being added for the CDC 33302-11 disk drives. This installation will be performed during the scheduled maintenance period from 7 am to 9 am. The controller is being added to the 148 configuration to allow a shakedown period before the 3031 is installed. When the 3031 is installed, the CDC controller and drives will be moved onto a separate channel. This will reduce channel contention and improve performance somewhat.

LARS EQUIPMENT CONFIGURATION BY ROSS GARMOE

Included in this copy of SCAN LINES is a copy of the equipment configuration for the central site and for the communication system. Please note that these charts are for the 3031 and are not valid for the 370/148. We will attempt to keep these diagrams up to date and publish them as necessary. If you discover any errors, especially those concerning the remote sites, please let ROSS GARMOE know.

3031 Hardware Configuration



3350* = 250 Megabytes
 3330** = 172 Megabytes
 2314+ = 24 Megabytes

September 15, 1979

SYSTEM PERFORMANCE PROBLEM BY ROSS GARMOE

An error was recently found in the CP portion of VM/370. A LARS modification to add the QUERY REALUNIT XXX command failed to return buffer space if the virtual device XXX was not defined. This error would tie up progressively more memory as the QUERY was issued. When the memory was lost, less was available for user paging space. As a result, system performance fell off to unacceptable levels forcing system restarts to free up the memory. The error has been corrected and the system is now performing much better. We apologize for the inconvenience this problem caused.

TROUBLE BY ROSS GARMOE

As was announced in the last SCAN LINES, a TROUBLE processor has been added to the CMS370 system. This processor accepts trouble reports from the user and files them in a common data base. These reports are distributed on a daily basis to the proper people for action and response to the user. Our experience with the system has been good and we encourage you to use it. Among its other advantages are that it never is away from the phone and doesn't go on vacation. Also TROUBLE reports don't get lost as easily as small slips of paper and the processor keeps reminding us if a problem is not fixed. To find out how to use TROUBLE, enter TROUBLE? under CMS370.

CMS360 AND 2314 DISK SPACE BY ROSS GARMOE

As you know, we have been converting much of our code from CMS360 to CMS370. Both LARSYS and LARSYSDV are available under CMS370 as LS370 and LSDV370. The data reformatting group is making good progress converting their programs. They expect to be done in the near future. The Basic Systems group currently has no expertise in CMS360 maintenance. We urge you to convert your programs to CMS370 as soon as possible. If you encounter problems converting your programs, please contact ROSS GARMOE for help or suggestions.

As part of the CMS conversion, we are planning to remove the IBM 2314 disk system. We currently have moved enough users to other disks to free up two 2314 disks. If your minidisks are 2314 disks but you use only CMS370, please let MIKE COLLINS know. He will then move the minidisks to other devices.

We are currently planning to remove CMS360 from the system in January 1980 and the 2314's in February. These dates are earlier than those previously announced. If you will not be able to complete conversion by then, please let ROSS GARMOE know as soon as possible so we can rearrange our schedule.

BATCH MACHINE CONVERSION TO CMS370 BY ROSS GARMOE

On Sunday, October 14 at 3 pm, all of the batch machines except BATONITE will be converted to CMS370. BATONITE will remain a CMS360 machine for those users unable to complete their conversion. Time limit and other default parameters will not change when the batch machines are converted. Those users wishing to try CMS370 batch can use BATEOD and BATJSC.

SPOOL FILES AND COLD START POLICY BY ROSS GARMOE

One of the advantages to VM370 is the spool file system. It is very convenient to be able to send files to yourself or to other machines and have them remain in the spool system until they are needed. However, this can cause several problems. If enough people leave files in the spool system, the space is used up and will not be available for other users. Also files left in the spool system will be lost by a cold start.

It is the policy of System Services to avoid cold starts if at all possible. However, we do occasionally have to do a cold start which will lose all of the files. One of the reasons is for repair of the disk on which the spool files reside. If the disk crashes, it will not be possible to recover the spool files and it will be the user's responsibility to recreate the data in the spool file. The spool file system is not to be used as permanent file space.

Another reason for a cold start is major reorganization of the system disks. ROSS GARMOE is planning such a reorganization during October and he will attempt to save the spool files but cannot guarantee success.

If the spool files are lost at any time, you will be notified via the system log message.

LARSPEC BY LARRY BIEHL

On August 7th, LARSPEC was updated and another change was made to the select control card. The 'END' control parameter was changed to '.OR.' to help clarify the SELECT request.

With this update, radiometer type data is being plotted correctly and a memo will follow with further information and examples.

A new command has been added to LARSPEC. A user may now type 'BATCH' and the batch header cards will be set up for the user. The batch deck set up will be displayed for the user and changes may be made in the deck to the batch machine, print location, punch location, userid and user name, input filename, or filetype. After the changes have been made, the batch deck is again displayed to the user, who may make more changes. When no more changes are made, the card deck is sent to batch.

STATISTICAL NEWS FROM CAROL JOBUSCH

New programs and new versions of some old programs are now available in CMS370 as part of LARS statistical services.

1. There is a new program to perform the Shapiro-Wilk test formality, for sample sizes from 3 to 100.
2. There is a double-precision version of DRRSQU--all possible r-squares--for regression model building.
3. Four of the old (1970) BMD programs

BMD02V (factorial ANOVA for equal cell size)
BMD08V (hierarchical ANOVA for equal cell size)
BMDX63 (multivariate general linear hypothesis)
BMDX69 (MANOVA and covariance for equal cell size)

have been recompiled in double precision using FORTRAN H optimization level 2.

BMD02V will handle larger designs than SPSS ANOVA and is more efficient. The new double precision BMD02V took only 30 seconds of CPU time to run a six factor ANOVA with 1728 cells.

It is strongly recommended that the BMD programs be used only in double precision. Some of the single precision versions (available using the LARSYS BMD command) have serious round-off error problems.

For further information:

IPL CMS370
GETDISK SPSS
PRINT WTEST MEMO F
PRINT DRRSQU MEMO F
BMD

SUMMARY OF 370/148 COMPUTER USAGE FOR ⁻²¹JULY 1979

Overall Usage	Basic Rate CPU Time Used	26.90
	Priority Rate CPU Time Used	241.55
	Total CPU Time Used	268.45
	Terminal Sessions	4375
	Batch Jobs	1054

Usage by Time of Day - <u>Time Period</u>	<u>Hours of CPU Used</u>	<u>Average Percent CPU Utilization</u>
Mon-Fri midnite-8AM	43.85	26
Mon-Fri 8AM-4PM	115.04	68
Mon-Fri 4PM-midnite	76.00	45
Weekend	33.56	29

Batch Job Usage	<u>Batch Machine</u>	<u>Jobs Run</u>	<u>Avg. Clock Time</u>	<u>Avg. CPU Time</u>
	BATQUICK	200	2.70	0.14
	BATSHORT	299	5.90	0.45
	BATMED	41	30.81	2.97
	BATONITE	179	9.17	1.37
	BATLONG	26	22.60	4.09
	TAPTRAN	5	73.05	12.48
	BATEOD	174	24.16	1.26
	BATJSC	109	22.55	10.17

<u>Keyboard Terminals</u> - <u>Location</u>	<u>Port</u>	<u>Terminal Type</u>	<u>Logins</u>	<u>Total Time in Use</u>	<u>Avg. Time Per Session</u>
Flexlab2	30	INFOTON GTX	135	197.65	1.46
Flexlab2	31	INFOTON GTX	191	263.05	1.38
Flexlab2	32	INFOTON GTX	181	193.57	1.07
Flexlab2	33	INFOTON GTX	262	271.87	1.04
Flexlab2	34	INFOTON GTX	197	254.94	1.29
Flexlab2	35	INFOTON GTX	311	280.13	0.90
Flexlab2	36	INFOTON GTX	283	285.65	1.01
Comp. Room	37	DECwriter	356	129.85	0.36
Flexlab1	40	INFOTON GTX	245	197.35	0.81
Flexlab1	41	INFOTON GTX	167	159.25	0.95
Flexlab1	42	INFOTON GTX	223	147.51	0.66
Flexlab1	43	DECwriter	165	135.45	0.82
Dial-up	50	1st in Use	139	98.51	0.71
Dial-up	51	2nd in Use	35	26.80	0.77
Dial-up	52	3rd in Use	8	14.02	1.75
Dial-up	53	4th in Use	16	13.80	0.86
Dial-up	54	5th in Use	--	----	---
Dial-up	5E	In-House 1st	34	38.06	1.12
Dial-up	5F	In-House 2nd	49	41.29	0.84
Houston	60	Hazeltine 2000	157	82.38	0.52
Houston	61	Hazeltine 2000	184	87.88	0.48
Houston	62	Trendwriter	138	81.81	0.59
Houston	63	Trendwriter	140	80.18	0.57
Alabama	64	DECwriter	21	77.26	3.68
Alabama	65	INFOTON GTX	2	3.39	1.69
ISU	66	(various)	161	63.40	0.39
ISU	67	(various)	230	104.51	0.45
Houston	6A	Dial-1st in Use	181	136.28	0.75
Houston	6B	Dial-2nd in Use	145	141.83	0.98
Houston	6C	Dial-3rd in Use	120	104.60	0.87
Houston	6D	Dial-4th in Use	96	60.78	0.63
St. Regis	4A	DECwriter	26	43.52	1.67



INTERLAB NOTES

PURDUE UNIVERSITY NEWS

The following inter-office memos have been posted on the bulletin boards in Flexlab 1 and Flexlab 2.

Fees for Staff Members, Staff Spouse, and Staff Children Registering as Students in the University

Change in Telephone Numbers for Intercollegiate Athletics Department

RECENT ACQUISITIONS IN THE LIBRARY

PHOTOGRAMMETRIC ENGINEERING and REMOTE SENSING

Volume XLV

August 1979

Number 8

OVER PHOTO — A mosaic of the Los Angeles area taken with a synthetic aperture radar system on 25 May 1977, as part of a joint European/United States program using aircraft to simulate space shuttle conditions. The NASA L-band radar (1.215 Ghz) system, operated by the Jet Propulsion Laboratory, was mounted in the NASA CV-990 aircraft. Submitted by Dr. M. Leonard Bryan, Jet Propulsion Laboratory of the California Institute of Technology, Pasadena, California. (See page 1097.)

Accuracy Analysis of Stereo Side-Looking Radar <i>Franz Leberl</i>	1083
The Effect of Radar Azimuth Angle on Cultural Data <i>Dr. M. Leonard Bryan</i>	1097
Geologic Interpretation from Compositated Radar and Landsat Imagery <i>M. I. Daily, T. Farr, C. Elachi, and G. Schaber</i>	1109
Mapping of Particulate Iron in an Ocean Dump <i>Craig W. Ohlhorst and Gilbert S. Bahn</i>	1117
Planimetric Restitution of Landsat Imagery Using the Zeiss Stereotop <i>E. Clerici and I. A. Harley</i>	1123
Parameters of Cotton Cultivation from Infrared Aerial Photography <i>T. J. Henneberry, W. G. Hart, L. A. Bariola, D. L. Kittock, H. F. Arle, M. R. Davis, and S. J. Ingle</i>	1129
Forest Type Mapping from Landsat Digital Data <i>Jean Beaubien</i>	1135
Reflectance of Varying Mixtures of a Clay Soil and Sand <i>A. H. Gerbermann and D. D. Neher</i>	1145



LARS · Purdue University · Vol. 5 · No. 8 · October 5, 1979

AGRISTARS NEWS

During September several Purdue/LARS staff have been involved in the planning activities necessary to the beginning of AgRISTARS.

CRAIG DAUGHTRY, JIM KAST, MARVIN BAUER, and MARILYN HIXSON met with other Corn/Soybeans subproject personnel at ERIM on September 19-22, to develop a technical plan.

On September 26, Kast and Bauer returned to ERIM for a discussion of AgRISTARS with NASA/JSC officials Jon Erickson, Jim Dragg, and Don Hay. These discussions were continued on September 27-28, at Johnson Space Center in Houston, Texas. MARVIN BAUER and DAVE LANDGREBE participated as LARS representatives. Further meetings are planned to be held at NASA/JSC on October 3-5. JIM KAST, LUKE KRAEMER and PETER JOBUSCH will discuss computer-related subjects.

MARION BAUMGARDNER, DAVE LANDGREBE, and BERNIE LISKA also met with Charles Caudill in Washington D.C. on September 24.

Discussion centered around potential involvement of Purdue/LARS in the USDA funded portion of AgRISTARS which is separate from the NASA funded Corn/Soybeans Vertical Slice subproject.

LARS TRAVEL LOG

BARRETT ROBINSON visited NASA/JSC, Houston, Texas, August 31 to September 2, to meet with Richard Juday regarding the Multiband Radiometer.

PAUL ANUTA, LARRY BIEHL, CRAIG DAUGHTRY, MARILYN HIXSON, PHIL SWAIN, MARVIN BAUER, and ERIC STONER attended the SR&T Quarterly Review on September 6-13, at NASA/JSC, Houston, Texas.

ROGER HOFFER was on the road from September 10-19. He went to Moscow, Idaho, to present an invited paper, "Computer-Aided Analysis of Remote Sensor Data-- Magic, Mystery, or Myth?", at the Inter-

Prepared by the Laboratory for Applications of Remote Sensing for distribution at Purdue. Contact Susan Ferringer, SCAN LINES editor, to be placed on the mailing list (749-2052, ext. 290).

national Symposium on Remote Sensing of Natural Resources.

Hoffer then visited Seattle, Washington to confer with Bob Scott, Washington Department of Natural Resources, about research activities.

The last stop of the trip was Sioux Falls, South Dakota where he was joined by PHIL SWAIN. They attended the Fall Convention of the American Society of Photogrammetry and the American Congress of Survey and Mapping. Hoffer co-chaired a plenary session on Remote Sensing for Natural Resources in the Future and Swain presented an invited paper on Digital Processing.

LARS was represented at this year's Farm Progress Show by the Jasper County Soil Mapping Display located in the Purdue tent. STEVE KRISTOF, DOUG MORRISON, and DICK WEISMILLER were available during the three-day event to answer questions. The show was held September 25-27, at the Lincoln Priebe Farm located 10 miles south of Crawfordsville, Indiana.

MARION BAUMGARDNER travelled to Des Moines, Iowa, on September 26-27, to participate in a planning committee meeting for the National Conference on Remote Sensing for Resource Management sponsored by the Soil Conservation Society of America.

On October 2-5, PAUL ANUTA will visit Berkeley, California, to attend an IEEE Acoustics, Speech, and Signal Processing Workshop on Two-Dimensional Signal Processing.

DICK MROCYNSKI plans to attend the Remote Sensing Applications Conference sponsored by NASA Eastern Regional Remote Sensing Applications Center, Easton, Maryland. The conference will be held October 2-5.

Other upcoming travel includes a trip to Alexandria, Virginia on October 14-17, for CAROL JOBUSCH. She will be attending an SPSS Users and Coordinators Conference. BILL SHELLEY and JIM KAST will be in Houston, Texas on October 21-25 for technical discussions on the SR&T Computer Support Task.

RECENT MEETINGS FEATURE REMOTE SENSING RESEARCH

The following two papers describing devices and procedures developed by LARS Field Research were presented at the 23rd Annual Meeting of the Society of Photo-Optical Instrumentation Engineers held at San Diego, California, August 27-30. (* indicates presenter).

"A Multiband Radiometer for Field Research" by BARRETT ROBINSON*, MARVIN BAUER, DAVE DEWITT, LEROY SILVA and VERN VANDERBILT.

"Calibration Procedures for Measurement of Reflectance Factor in Remote Sensing Field Research" by BARRETT ROBINSON and LARRY BIEHL*.

The following three papers were presented at the American Society of Agronomy Meetings held August 6-10, at Colorado State University, Ft. Collins, Colorado. (* indicates presenter).

"Multiseasonal Landsat Data Used in Soil Boundary Determination" by STEVE KRISTOF, MARION BAUMGARDNER, and SUE KAMINSKY.

"Changing Concepts of Soil Spectral Properties for Characterizing Soils" by ERIC STONER*, MARION BAUMGARDNER and DICK WEISMILLER.

"Utilization of Spectral Data During the Soil Survey of Jasper County, Indiana" by FRANK KIRSCHNER, B.F. Smallwood, H.R. Sinclair, and DICK WEISMILLER*.

TOPOGRAPHIC OVERLAY PROJECT MOVES ON TO PHASE TWO

Phase 1 of the LARS Topographic Overlay Project has successfully been completed. Different methods of processing Landsat spectral and topographic data overlays, from a test site in Colorado, were evaluated. The best approach was determined to be the Multi-Cluster Blocks method of analysis. This approach will be tested in Phase 2 on a completely different test site in the central part of Washington state.

Tim Gregg, Eric Barthmeier, and Larry Garbaker, Washington Department of Natural Resources, met with MIKE FLEMING, ROGER HOFFER, and LUIS BARTOLUCCI ON August 27 to September 4. They reviewed LARS computer-aided analysis capabilities and worked on developing spectral training statistics over the test site located in the Okonagon Quadrangle.

ITC VISITOR INVOLVED IN TECHNOLOGY TRANSFER PROJECTS

Frederic Hilwig, photointerpreter and lecturer in the soil sciences department of ITC, Enschede, the Netherlands, visited LARS on September 23-26. Much of his visit was devoted to developing a new minicourse with his co-author SHIRLEY DAVIS. "Selecting Landsat Imagery" is one of two minicourses being jointly produced through ITC and LARS.

Hilwig spent the remainder of his time discussing the 1980 Machine Processing of Remotely Sensed Data Symposium with MARION BAUMGARDNER. Hilwig represents the International Soil Society which is working with LARS to present its 6th Annual Symposium in conjunction with the International Symposium on Soil Information and Remote Sensing.

VISITORS

Dr. Philip Katz, with Weyerhaeuser, visited DAVE LANDGREBE on September 11, to discuss image processing.

Fred Quiel, a geologist with the University of Karlsruhe, West Germany, visited on September 12-14. Quiel returned to LARS to renew contacts he made as a visiting scientist during 1973. He was hosted by STEVE KRISTOF and met with MARION BAUMGARDNER, DICK WEISMILLER, PHIL SWAIN, CAROL JOBUSCH, DICK MROCYNSKI, and DONNA SCHOLZ to discuss progress in research and applications of remote sensing technology. SHIRLEY DAVIS and LUIS BARTOLUCCI exchanged ideas on technology transfer opportunities and numerical analysis acceptance in Europe.

Several Argentinian scientists met with LUIS BARTOLUCCI to assess the feasibility of using computer-aided analysis techniques to evaluate and inventory natural resources of the Chaco province. Dr. Adolfo Gustin, Ing. Lino Ledesma, Ing. José Rogrigues, and Ing. Jorge Veleda all visited LARS on September 14.

Dr. José Trevino, University of Monterey, Monterey, Mexico, visited LARS September 27 to discuss his interest in starting a remote sensing program at the University of Monterey. Dr. Trevino discussed curriculum development and LARS capabilities in general with LUIS BARTOLUCCI, DAVE LANDGREBE, JOHN PETERSON, SHIRLEY DAVIS, and TERRY PHILLIPS.

Dr. Barry Haack spent September 24-29 working with RON BOYD on the upcoming addition of Ball State University to the LARS Remote Terminal Network. Haack is with the Department of Geography at Ball State University, Muncie, Indiana.

VISITING SCIENTIST

Mr. D. Samake recently began a two-month visiting scientist program at LARS on September 17. He is with the government of Mali and will be conducting a digital analysis of an area in his country.

ADVANCED DEGREE AWARDED

ROSS NELSON, graduate student in Ecosystems, recently completed his masters degree and has accepted a job with NASA/Goddard Space Flight Center in the Forest Resources Group. His thesis is titled: "Computer-aided Processing of Landsat MSS Data for Classification of Forestlands".

NEW PROJECTS FUNDED

Title: A quantitative Applications-Oriented Evaluation of Thematic Mapper Design Specifications. Sponsor: NASA/Goddard Space Flight Center. Principal

Investigator: PHIL SWAIN. Duration:
October 1, 1979 to September 30, 1980.

Title: An Addendum to Reserach in
Remote Sensing of Agriculture, Earth
Resources and the Environment. Sponsor:
NASA. Principal Investigator: DAVE
LANDGREBE. Duration: December 1, 1978
to November 30, 1979.

SYSTEM SERVICES

October 5, 1979

3031 RATE CHANGE BY ROSS GARMOE

When we set the rate for the 3031 Computer Service, we made two assumptions. The first was that the 3031 was approximately 3 times the power of the 148. The second was that the amount of computation that would be performed would not change by a significant amount. These assumptions caused us to set the Computer Service rate at \$400 per hour. Initial experience has shown us that the comparative machine speeds are about right. However, the demand for computing exceeded our estimates by a significant amount. We were surprised by this demand and thought that usage would drop off after people got used to the faster machine. Discussions with users indicated that they were planning to use the machine at the higher level and in some cases, they indicated even higher usage. These considerations have caused System Services to lower the Computer Service rate from \$400 per hour to \$325 per hour effective with the installation of the 3031.

3031 INSTALLATION BY ROSS GARMOE

As you probably know by now, LARS has replaced the IBM 370/148 by an IBM 3031. The switch occurred during the period from September 6 to September 9 and has continued with no major problems.

We would like to thank the LARS installation team for their long hours of preparation and installation effort, JIM KAST, ROSS GARMOE, MIKE COLLINS, MARY ELLEN PIERSON, BILL SHELLEY, TERRY PHILLIPS, CATHY KOZLOWSKI, and PETE JOBUSCH. Special thanks go to the IBM customer engineers, Jim Hamilton, Charlie Bowden and Gayle Comer for their very efficient installation. We all appreciate your support and interest in the machine upgrade.

EOD/LARSYS UPDATES BY SUSAN SCHWINGENDORF

A number of enhancements have been made to the EOD/LARSYS system during the past month. Information on these updates may be obtained from the computer terminal by typing (under CMS370)

SRTNEWS (to get output on your terminal), or

SRTNEWS PRINT printlocation

HOLD
NOHOLD

 (to get output printed at the printer nearest you).

REMOTE TERMINAL HIGHLIGHTS BY SUSAN SCHWINGENDORF

ALABAMA SHORT COURSE

RON BOYD and CAROL JOBUSCH visited Alabama A&M University from September 4-7 to present a series of seminars and terminal sessions on using CMS and SPSS. About 20 people at Alabama A&M participated in these sessions.

BALL STATE TERMINAL

During the week of September 24-28, Barry Haack of Ball State University was at LARS for his first one-week training course on using LARSYS. Dr. Haack will be in charge of the low-cost remote terminal to be installed at Ball State. This terminal will consist of a typewriter terminal used in a dial-up mode. Printer output will be obtained on the terminal, or printed in the Purdue/LARS computer room and mailed to the users at Ball State. This initial training session, under the direction of RON BOYD, included working through Units 2, 3, 4 and 5 of the Educational Package, learning the additional CMS and LARSYS commands required for the low-cost terminal, and completing an analysis of data covering the Bloomington, Indiana area.

THANKS FOR LEC SUPPORT

Due to a funding bind, the support which Lockheed Electronics Company provided to JSC personnel using the Purdue/LARS computational facility has been eliminated, effective October 1, 1979. Some of the work previously performed by LEC will be performed by Bob Goode of NASA. Other activities will now become the responsibility of the LARS computer user. Users should contact Bob Goode for special training in the use of the Data 100 hardware if they will be making use of the LARS facility during other than the published schedule. We wish Bob and our JSC users the best of luck in adapting to their new responsibilities.

It is also appropriate at this point to extend a public thanks to the LEC personnel (and especially Glenn Prow), who have very significantly contributed to the ability of researchers at JSC to make regular, reliable use of a computer system over a thousand miles away. Use of a shared computer system could never have grown to present levels without their excellent, competent support. We are sorry to see you go.

SAS NOW AVAILABLE ON LARS COMPUTER BY CAROL JOBUSCH

SAS provides

- * a wide range of statistical procedures including general linear models, MANOVA, a variety of linear and nonlinear regression methods, econometric models, estimation of spectral and cross-spectral densities, maximum likelihood and nearest neighbor discriminant analysis.
- * a variety of easy-to-use line-printer plot and chart routines including box graphs, pie graphs and contour plots.
- * data management tools--it can read
 - hierarchical files
 - variable length records
 - multiple record types
 - multiple input data sets
 - free-format data.
- * extensive report-writing capabilities

SAS Institute has just started to distribute a CMS370 version of SAS*79. LARS has installed it for a 3 month trial period.

For further information, call CAROL JOBUSCH at LARS.

8
SUMMARY OF 370/148 COMPUTER USAGE FOR AUGUST 1979

Overall Usage	Basic Rate CPU Time Used	62.17
	Priority Rate CPU Time Used	243.93
	Total CPU Time Used	306.10
	Terminal Sessions	4725
	Batch Jobs	1135

Usage by Time of Day - <u>Time Period</u>	<u>Hours of CPU Used</u>	<u>Average Percent CPU Utilization</u>
Mon-Fri midnite-8AM	66.29	36
Mon-Fri 8AM-4PM	119.21	65
Mon-Fri 4PM-midnite	88.60	48
Weekend	31.97	29

Batch Job Usage	<u>Batch Machine</u>	<u>Jobs Run</u>	<u>Avg. Clock Time</u>	<u>Avg. CPU Time</u>
	BATQUICK	185	1.67	0.09
	BATSHORT	274	6.00	0.36
	BATMED	14	56.19	3.81
	BATONITE	83	26.56	2.28
	BATLONG	9	16.99	5.37
	TAPTRAN	22	46.66	7.30
	BATEOD	347	21.39	1.69
	BATJSC	177	46.39	18.13

Keyboard					<u>Total</u>	<u>Avg. Time</u>
<u>Terminals</u>	<u>- Location</u>	<u>Port</u>	<u>Terminal Type</u>	<u>Logins</u>	<u>Time in Use</u>	<u>Per Session</u>
	Flexlab2	30	INFOTON GTX	220	183.35	0.83
	Flexlab2	31	INFOTON GTX	160	239.48	1.50
	Flexlab2	32	INFOTON GTX	197	182.11	0.92
	Flexlab2	33	INFOTON GTX	385	273.96	0.71
	Flexlab2	34	INFOTON GTX	184	202.95	1.10
	Flexlab2	35	INFOTON GTX	224	250.10	1.12
	Flexlab2	36	INFOTON GTX	271	238.82	0.88
	Comp. Room	37	DECwriter	319	151.61	0.48
	Flexlab1	40	INFOTON GTX	203	161.37	0.79
	Flexlab1	41	INFOTON GTX	163	184.23	1.13
	Flexlab1	42	INFOTON GTX	278	187.25	0.67
	Flexlab1	43	DECwriter	119	76.44	0.64
	Dial-up	50	1st in Use	104	105.07	1.01
	Dial-up	51	2nd in Use	38	43.76	1.15
	Dial-up	52	3rd in Use	8	3.19	0.40
	Dial-up	53	4th in Use	12	4.95	0.41
	Dial-up	54	5th in Use			
	Dial-up	5E	In-House 1st	29	28.27	0.97
	Dial-up	5F	In-House 2nd	29	34.07	1.17
	Houston	60	Hazeltine 2000	192	67.37	0.35
	Houston	61	Hazeltine 2000	184	85.18	0.46
	Houston	62	2741	185	93.80	0.51
	Houston	63	2741	201	95.94	0.48
	Alabama	64	DECwriter	24	45.90	1.91
	Alabama	65	INFOTON GTX	6	12.43	2.07
	ISU	66	(various)	272	84.95	0.31
	ISU	67	(various)	355	123.85	0.35
	Houston	6A	Dial-1st in Use	196	167.36	0.85
	Houston	6B	Dial-2nd in Use	176	123.98	0.70
	Houston	6C	Dial-3rd in Use	140	104.39	0.75
	Houston	6D	Dial-4th in Use	108	66.73	0.62

INTRALAB NOTES

PERSONNEL CHANGES

RON BOYD will be leaving on October 15, to accept a job with the Computer Sciences Corporation in Silver Springs, Maryland. LARS wishes him and his family the best of luck.

PROPOSALS SENT OUT

Title: Addendum to the Goddard Space Flight Center Earth Resources Data Processing Terminal Support Proposal.
Sponsor: NASA/Goddard Space Flight Center. Principal Investigator: Sue Schwingendorf. Duration: February 23, 1978 to December 22, 1979.

URDUE UNIVERSITY NEWS

The following inter-office memos have been posted on the bulletin boards in Flexlab 1 and Flexlab 2.

Schools of Pharmacy, Nursing, and Health Sciences Organization

Supervisory Development Institute
Change in Facilities and Organizational Structure

RECENT ACQUISITIONS IN THE LARS LIBRARY

PHOTOGRAMMETRIC ENGINEERING and REMOTE SENSING

Volume XLV

September 1979

Number 9

COVER PHOTO — Edge-enhanced false color composite image, taken August 1, 1975, of approximately one-fourth a Landsat scene of the Nun River Basin, Northeast China. New agricultural lands (arrows) are easily recognized by their large geometric field patterns designed to accommodate mechanized farming procedures. The arrow near the center of the view points to a soybean field in the primary study area (Study Area I) described in the paper by Welch, Lo, and Pannell (page 1211). The cover was produced from CCT data through the assistance of Pat Chavez, Jr., Flagstaff Computation Branch, Computer Center Division, U.S. Geological Survey.

TECHNICAL ARTICLES

- Mapping China's New Agricultural Lands
R. Welch, H. C. Lo, and C. W. Pannell1211
- Real-Time Photogrammetric Support of Dynamic Three-Dimensional Control
Dr. V. Kratky1231
- Selection of Additional Parameters for the Bundle Adjustment
G. H. Schut1243
- A Closed Solution for Space Resection
Dr. K. K. Rampal1255
- Numerical Cadastral Survey
Dr. K. Jeyapalan1263
- Atmospheric Refraction Compensation in Terrestrial Photogrammetry
C. S. Fraser1281

IBM Journal

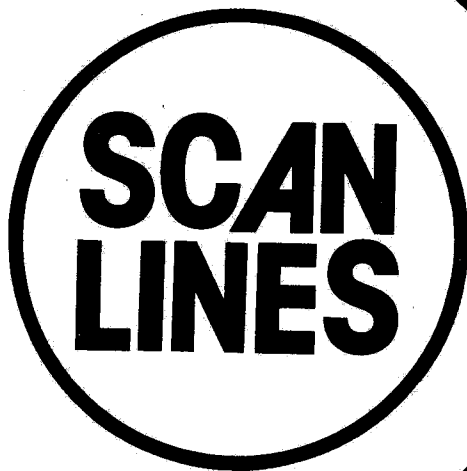
of research and development

- P. P. Sorokin 476 Contributions of IBM to Laser Science—1960 to the Present
- J. J. Wynne and J. A. Armstrong 490 Systematic Behavior in Alkaline Earth Spectra: A Multichannel Quantum Defect Analysis
- M. M. T. Loy 504 Two-Photon Coherent Transients
- H. Morawitz 517 Cooperative Emission of an Excited Monolayer into Surface Plasmons
- R. G. DeVoe and R. B. Brewer 527 Subnanosecond Optical Free-Induction Decay
- D. M. Burland and D. Haarer 534 One- and Two-Photon Laser Photochemistry in Organic Solids
- S. Völker and R. M. Macfarlane 547 Photochemical Hole Burning in Free-Base Porphyrin and Chlorin in n-Alkane Matrices
- D. S. Bethune, J. R. Lankard, M. M. T. Loy, and P. P. Sorokin 556 Time-Resolved Infrared Spectral Photography: A New Technique
- J. D. Crow 576 (GaAl)As Laser Requirements for Local Attached Data Link Applications
- R. T. Lynch, Jr., M. B. Small, and R. Y. Hung 585 GaAs/(GaAl)As Laser Technology
- A. C. Luntz 596 Molecular Beam Laser-Induced Fluorescence Studies of Chemical Reactions
- D. W. Pohl 604 Forced Rayleigh Scattering

IBM Systems Journal

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Preface	354
Performance analysis of complex communications systems <i>H. M. Stewart</i>	356
A distributed information system study <i>K. Ziegler, Jr.</i>	374
An office communications system <i>G. H. Engel, J. Groppuso, R. A. Lowenstein, and W. G. Traub</i>	402
A research perspective on computer-assisted office work <i>A. M. Gruhn and A. C. Hohl</i>	432
Automatic programming for energy management using sensor based computers <i>M. J. Shah</i>	457
Forum: Data stream linkage and the UNIX system	470



LARS · Purdue University · Vol. 5 · No. 8 · November 14, 1979

NEW COLOR VIDEOTAPE FEATURES PATTERN RECOGNITION

Watch for a premier showing of a new videotape on "Pattern Recognition in Remote Sensing." This videotape, authored and presented by PHIL SWAIN, is a product of a team of people who worked along with Swain, including SHIRLEY DAVIS, JIM RUSSELL, SUE FERRINGER, Neil Sydor of Telecommunications, and Sara Jane Coffman of Purdue's Office of Instructional Materials Development.

This videotape is the first in a series of five being sponsored by Continuing Education's Division of Independent Study under the auspices of G. W. O'Brien.

So, if you want to see the Funny Dice roll in living color and be one of the first to see a new LARS product, watch for the premier showing in the next few weeks.

ADVANCED SHORT COURSE NEWS

Plans are progressing and announcements have gone out for the course "Advanced Topics in the Analysis of Remote Sensing Data." This course, being organized by PHIL SWAIN, will be offered May 12-16, 1980. Course instructors represent a wide range of LARS expertise; they include DAVE LANDGREBE, CLARE MCGILLEM, PAUL ANUTA, MARILYN HIXSON, ROGER HOFFER, as well as Dr. Swain.

Prepared by the Laboratory for Applications of Remote Sensing for distribution at Purdue. Contact Susan Ferringer, SCAN LINES editor, to be placed on the mailing list (749-2052, ext. 273).

Each year course staff reviews the course outline to ensure that it reflects the most current and significant work being done in remote sensing. Last year new material was added on applications other than agriculture, and Dr. Hoffer joined the staff. This year new emphasis will be given to Data Preprocessing Methods and Data Enhancements and Transformations. This new material will be presented by CLARE MCGILLEM and PAUL ANUTA.

As before, the course will last for five full days, beginning Monday morning and concluding in the middle of the afternoon on the following Friday. There will be a get-acquainted luncheon on Monday and an opportunity will be scheduled sometime during the week for a visit by course participants to LARS. This course is designed for those who have already worked extensively in quantitative analysis of remote sensing data and are interested in learning about the most current work being done. Registration cost for the course is \$595.00.

Contact PHIL SWAIN for more information.

ADVANCED DEGREE AWARDED

ERIC STONER recently completed work under his major professor, MARION BAUMGARDNER, to earn the degree of Ph.D. in Agronomy. His dissertation is titled "Physicochemical, Site, and Bidirectional Reflectance Factor Characteristics of Uniformly-Moist Soils." Stoner left LARS on November 9 to accept a position as soil scientist in the Earth Sciences Group of NASA/Earth Resources Laboratory, Space Technology Laboratories, Mississippi.

VISITORS

On October 17-18, Fred Gordon, technical monitor for the Thematic Mapper Design project, from NASA/Goddard Space Flight Center, was at LARS. He discussed this project with PHIL SWAIN, VERN VANDERBILT, and DAVE LANDGREBE, and also reviewed the use of LARSPEC and learned about CMS370 from LARRY BIEHL.

Dr. Gerald R. Gruber, another instructor, and 30 students from the University of Frankfurtammain, visited on October 8. Their stop at LARS was part of a student tour through the United States focusing on Economic and Social Geography. LARS work was presented by SHIRLEY DAVIS, STEVE KRISTOF, and ROGER HOFFER.

FUNDAMENTAL RESEARCH PROJECTS STUDIED

PHIL SWAIN was in College Station, Texas, November 4-7, to attend the first meeting of the working group for planning fundamental research in Pattern Recognition and Image Analysis. This is one of four working groups which will conduct a study in 1980 to develop a program of fundamental research that can be initiated in 1981. Fundamental research focuses on increasing the understanding of basic concepts in remote sensing in order to provide improved building blocks for future applied research projects.

These studies are sponsored by the Renewable Resources Branch, Resource Observation Division of the NASA Office of Space and Terrestrial Applications, and are coordinated by R. B. MacDonald of the Space and Life Sciences Directorate, Johnson Space Center.

The four working groups: (1) Scene Radiation and Atmospheric Effects Characterization, (2) Pattern Recognition and Image Analysis, (3) Electromagnetic Measurements and Data Handling, and (4) Information Utilization and Evaluation, will hold a number of workshops starting early in 1980. This will allow a large number of scientists to contribute to the identification of critical research topics.

MARVIN BAUER will also be participating as a member of the working group on Scene Radiation and Atmospheric Effects Characterization. Further meetings for both working groups are planned during December to finalize plans for the upcoming workshops.

LARS TRAVEL LOG

MARION BAUMGARDNER, chairman of the ARI Study Panel on Remote Sensing, addressed the annual meeting of the Agricultural Research Institute on October 17, at the National Academy of Sciences Building in Washington, D.C. His presentation had a twofold purpose: (1) to give a tutorial presentation on remote sensing technology and its applications to agriculture, and (2) to suggest research priorities for the 1980's.

On October 18, MARION BAUMGARDNER, member of the National Board of the United Methodist Committee on Relief, participated in the fall meeting at Philadelphia, Pennsylvania.

DAVE LANDGREBE was at NASA/Goddard Space Flight Center, Greenbelt, Maryland, on October 23, to attend a meeting of the IEEE Geoscience Society Administrative Committee.

LARRY BIEHL travelled to Fort Dodge, Iowa, October 22-26, to help with NASA/JSC field research data collection. BARRETT ROBINSON spent October 31-November 3, helping with this data collection also.

ROGER HOFFER travelled to NASA/JSC, Houston, Texas, on November 6-9, to chair the Agriculture, Forestry, and Range Committee of the Earth Resources Synthetic Aperture Radar (ERSAR) Workshop.

DICK MROCZYNSKI gave a presentation at the Third Conference on Remote Sensing and Information Systems held in Lake Tahoe, Nevada, on November 6-8.

LUIS BARTOLUCCI met with the International Development Bank in Washington, D.C. on October 19, to discuss remote sensing programs in Ecuador, Bolivia, and Costa Rica. Bartolucci was joined by TERRY PHILLIPS on October 20, when they flew to Quito, Ecuador, for a two-week visit. While in South America, they assessed needs, already existing capabilities at the Ecuadorian Remote Sensing Center (CLIRSEN), and future remote sensing activities in Ecuador.

The final SR&T Quarterly Review is scheduled to be held at the NASA/JSC, Houston, Texas, during the week of December 3-7. MARVIN BAUER, BARRETT ROBINSON, CRAIG DAUGHTRY, MARILYN HIXSON, PHIL SWAIN, and JIM KAST will be making presentations.

PROJECTS FUNDED

Title: Goddard Space Flight Center Earth Resources Data Processing Remote Terminal Support. Sponsor: NASA/Goddard Space Flight Center. Principal Investigator: S. K. SCHWINGENDORF. Duration: through 12/22/79.

Title: A Quantitative Applications-Oriented Evaluation of Thematic Mapper Design Specifications. Sponsor: NASA/Goddard Space Flight Center. Principal Investigator: P. H. SWAIN. Duration: 10/1/79 to 9/30/80.

Title: Development of a Low-Cost Earth Resources Processing Capability for Ball State University. Sponsor: Ball State University. Principal Investigator: S. K. SCHWINGENDORF. Duration: 9/1/79 to 8/31/80.

Title: An Addendum to Research in Remote Sensing of Agriculture, Earth Resources and the Environment. Sponsor: NASA. Principal Investigator: D. A. LANDGREBE. Duration: through 11/30/79.

Title: Use of Spectral Data to Estimate the Relationship Between Soil Moisture Tensions and Their Corresponding Reflectances. Sponsor: OVRT. Principal Investigator: J. B. PETERSON. Duration: 10/1/79 to 9/30/80.

NEW LARS TECHNICAL REPORT

062879

Machine Processing of Landsat MSS Data and DMA Topographic Data for Forest Cover Type Mapping by M. D. Fleming and R. M. Hoffer.

In forestry, as in many other disciplines involving land management, there exists a definite need for timely, reliable information on which to base resource management decisions. This was emphasized in 1974 through the Forest and Rangeland Renewable Resources Planning Act in which the U.S. Congress mandated the U.S. Forest Service to provide information on the condition and productivity of approximately 1.6 billion acres of land every 10 years. The synoptic view that can be obtained through data from spacecraft altitudes is proving to be of considerable value in developing resource bases, particularly where information over extensive geographic areas is needed. The launch of Landsat-1 in 1972 initiated a new era for land managers by proving that high-quality data can be obtained from satellites at reasonably frequent intervals for nearly any portion of the earth's surface. However, the ability to collect data from satellites far surpasses existing capabilities to analyze and interpret the data in a timely, reliable manner. If computer-aided analysis techniques are to be effectively utilized in conjunction with MSS satellite data on a routine, operational basis, it is important to define and develop the most effective analysis techniques and to determine the level of detail and the reliability of information that can be obtained with such techniques.

The research described in this paper was sponsored by NASA under Contract No. NAS9-15508.

NEW LARS PUBLICATIONS

062579

Workshop Series on Numerical Analysis of Remotely Sensed Data by R. K. Boyd and J. C. Lindenlaub.

This publication is designed for supervised individual study of multi-spectral scanner data analysis concepts and procedures. Used in conjunction with a specially designed set of printouts and under the guidance of a knowledgeable instructor, the basic steps in a typical analysis sequence are studied. Each step is prefaced by a set of instructional objectives, described and illustrated with examples and exercises and reinforced with self-check questions.

The work described in this publication was sponsored by Purdue University Continuing Education.

082779

LACIE: An experiment in global crop forecasting by M. E. Bauer.

The need for global crop production information, remote sensing and yield models, the LACIE approach and results, and future applications of remote sensing are briefly described.

The research described in this report was sponsored by NASA under Contract No. NAS9-15466.

SYSTEM SERVICES November 14, 1979

CMS360 AND 2314 DISK SYSTEM BY ROSS GARMOE

At 9:00 a.m. on December 14, CMS360 and all of the associated LARSYS systems will be removed from VM370. At the same time, the IPL names LARSYS and LARSYSDV will be changed to refer to the CMS370 versions. Also, BATONITE will be converted to run under CMS370. On January 4, 1980, all 2314 disk space will be released and the 2314's will not be available for user minidisks. Please contact ROSS GARMOE if this schedule will affect your project.

System Services has been working on the conversion of all CMS360 users to CMS370 for the past year. This project has progressed faster than expected because of your support and assistance. We thank you very much.

LARSPEC BY JERRY MAJKOWSKI

There have been three updates since LARSPEC last appeared in SCAN LINES. The first was on September 11. At that time new header parameters were added for LARSPEC data. The new identification record parameters along with LARSPEC mnemonics are:

- COB2 - Reflective Calibration Obs. 2
- RIRF - ID Record Type (=1 Crops, =2, Soil)
- NMAT - Maturity Stage (numerical)
- DBWE - Dry Biomass - Weeds (G/Sq.M)
- PMOW - Plant Moisture Weight (G/Sq.M)
- YELD - Crop Yield (Kg/Ha)
- TSWT - Grain Test Weight (Kg/Hectiliter)
- GMOS - Grain Moisture Content (Percent)
- INST - Instrument Type (Spectrometer, Radiometer)

This update also included a revision to the BATCH terminal command introduced in the September SCAN LINES. A BACKUP option may now be specified to back punched output onto tape.

The option for the terminal command is:

BATCH BACKUP 'tape number'

See the September 14 LARSPEC memo and the COMMANDS CONTROL CARDS listing for more details.

On October 8, the agronomic ID record punching in DSEL and IDLIST -CASES AGRONOMIC- was expanded to include additional agronomic parameters. 45 different agronomic variables are punched now. SAS can be used to reduce the disk file down to fewer variables if the researcher desires. Any variables with null data values are punched as -9. (Previously they were punched as 9999).

Also on October 8, the OPTION PRINT parameter in GSPEC was expanded to include printing tables of multiband radiometer data values. An OPTION CENTERBAND parameter was also added to GSPEC. The researcher may now plot multiband radiometer data in 'fullband' format, - band response from wavelength beginning to end - or centerband format - band response point at center of wavelength band.

Detailed documentation on these changes can be found in the October 14 LARSPEC memo.

Finally on October 30, various minor corrections and changes took place. They include the following:

1. Corrections were made to the LARSYS stat deck punched from DSEL.
2. Temperature calculations for the OPTION TPLLOT parameter in GSPEC were implemented.
3. The header line for the oneline listing was changed.
4. Corrections were made in DSEL to properly handle observations which belong to more than one class.
5. Corrections were made in GSPEC to properly handle short and long wavelength plots in non-interactive mode.
6. The PRINT and PUNCH terminal commands were corrected so that they reset properly when an invalid site is entered.
7. The line size for the PRINT TERMINAL command was increased to 120 characters. Any output being printed at a terminal with the capability for 120 characters will look just like line printer output. Terminals with the capability for only 80 characters will wrap the data around to the next line.

A LARSPEC expansion to look for in the near future is the ability to copy user selected data from tape(s) and store in a disk file for use as input to the LARSPEC routines. This will allow a more efficient method of analysis of those data sets which are used again and again.

PERSONNEL CHANGES

MARY ELLEN PIERSON has been promoted to the position of Shift Supervisor for Computer Operations. Her primary responsibilities will be to supervise the performance and activities of all full-time and student computer operators, ensure effective preventive maintenance to the system and diagnose equipment failures.

REMOTE TERMINAL HIGHLIGHTS BY SUSAN SCHWINGENDORF

GODDARD VISITOR

On October 17 and 18, Fred Gordon was at LARS to discuss the Thematic Mapper Design project with PHIL SWAIN, VERN VANDERBILT and DAVE LANDGREBE. Fred is the technical monitor at Goddard for this project, and Phil Swain is the principal investigator at LARS. This project involves studying the effect on classification accuracy of varying different design specifications for the thematic mapper.

While at LARS, Fred Gordon also took the opportunity to review the use of LARSPEC and learn about CMS370 from LARRY BIEHL.

DECEMBER CMS COURSE IN HOUSTON

The week of December 10-14, Purdue/LARS is scheduled to present the third annual CMS course at JSC. This year the course has been subdivided into 19 one-hour modules, to make it easier for people to select the ones they want to attend. Monday morning has been set aside for beginners--people who have never used the Purdue/LARS computer or who haven't begun learning CMS. They will get immediate practice in logging on and using a few basic EDIT and CMS commands. The Monday afternoon and Tuesday sessions are on an intermediate level and include sessions on virtual machines, CMS commands, EDIT commands, writing simple EXEC files, doing Fortran programming, and sending jobs to batch machines (to take advantage of much cheaper rates!).

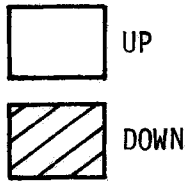
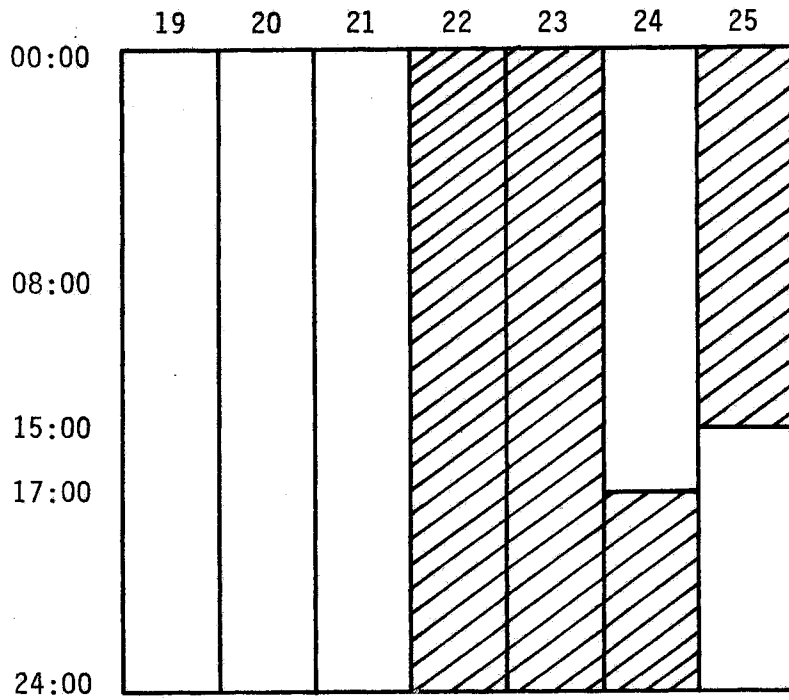
Wednesday's and Thursday's CMS sessions are for the more experienced CMS user, with modules covering further aspects of Fortran programming, more CMS commands, CP commands, more complicated EXECs that run them, and writing your own Edit macros. Also presented on Wednesday and Thursday will be sessions on accessing other software packages at LARS such as the RT&E Data Base programs, IMSL, SPSS, CSMP, GCS graphics subroutines, and LARSPEC.

Anyone interested in any of these sessions should talk to Mike Pore at JSC. Since there will be at least 3 instructors at JSC every day during the course week, people with specific questions or problems relating to the Purdue/LARS computer should give their name and question topic to Mike Pore or Ken Baker and a consulting time will be arranged.

SYSTEMS ANALYSIS NEWS BY SUSAN SCHWINGENDORF

During the past month, two processors have been added to LSDV370 (both from the LARSYSXP backup tapes). One is SEIGENVECTOR and the other is CMERGEGSTATISTICS. The main difference between the CMERGE and BMERGE processors is that a bispectral plot for two channels, or for a two-channel sum versus a two-channel sum, can be requested from CMERGE. To request this plot, use the MEANS parameter on the OPTIONS card. Please notify BILL SHELLEY or SUSAN SCHWINGENDORF if you have any problems with the LS370 or LSDV370 systems.

COMPUTER SCHEDULE FOR THANKSGIVING HOLIDAY



SUMMARY OF 370/148 COMPUTER USAGE FOR OCTOBER 1979

Overall Usage	Basic Rate CPU Time Used	32.50
	Priority Rate CPU Time Used	118.57
	Total CPU Time Used	151.08
	Terminal Sessions	5069
	Batch Jobs	799

Usage by Time of Day - Time Period	Hours of CPU Used	Average Percent CPU Utilization
Mon-Fri midnite-8AM	27.95	15
Mon-Fri 8AM-4PM	78.12	43
Mon-Fri 4PM-midnite	33.26	18
Weekend	11.74	10

Batch Job Usage	Batch Machine	Jobs Run	Avg. Clock Time	Avg. CPU Time
	BATQUICK	75	0.18	0.04
	BATSHORT	161	4.09	0.23
	BATMED	30	13.94	1.56
	BATONITE	6	39.24	5.49
	BATLONG	147	8.59	1.17
	TAPFRAN	10	10.48	1.71
	BATEOD	201	15.74	1.37
	BATJSC	134	37.86	12.71

Keyboard Terminals - Location	Port	Terminal Type	Logins	Total Time in Use	Avg. Time Per Session
Flexlab2	30	INFOTON GTX	331	170.40	0.51
Flexlab2	31	INFOTON GTX	260	161.39	0.62
Flexlab2	32	INFOTON GTX	374	178.42	0.48
Flexlab2	33	INFOTON GTX	594	212.90	0.36
Flexlab2	34	INFOTON GTX	297	136.78	0.46
Flexlab2	35	INFOTON GTX	274	187.34	0.68
Flexlab2	36	INFOTON GTX	290	159.55	0.55
Comp. Room	37	DECwriter	271	71.93	0.27
Flexlab1	40	INFOTON GTX	243	163.63	0.67
Flexlab1	41	INFOTON GTX	216	175.66	0.81
Flexlab1	42	INFOTON GTX	262	190.73	0.73
Flexlab1	43	DECwriter	146	80.33	0.55
Dial-up	50	1st in Use	81	58.31	0.72
Dial-up	51	2nd in Use	5	1.22	0.24
Dial-up	52	3rd in Use			
Dial-up	53	4th in Use			
Dial-up	54	5th in Use			
Dial-up	5E	In-House 1st	18	14.19	0.79
Dial-up	5F	In-House 2nd	28	20.58	0.73
Houston	60	Hazeltine 2000	168	67.51	0.40
Houston	61	Hazeltine 2000	157	81.39	0.52
Houston	62	2741	185	97.77	0.53
Houston	63	2741	242	101.75	0.42
Alabama	64	DECwriter	81	62.00	0.77
Alabama	65	INFOTON GTX	37	31.18	0.84
ISU	66	(various)	122	43.79	0.36
ISU	67	(various)	193	79.66	0.41
Houston	6A	Dial-1st in Use	213	170.61	0.80
Houston	6B	Dial-2nd in Use	161	106.48	0.66
Houston	6C	Dial-3rd in Use	143	85.04	0.59
Houston	6D	Dial-4th in Use	76	49.17	0.65



INTERLAB NOTES

NEW PERSONNEL WELCOMED

A big welcome is extended to the following people who recently joined the LARS staff. PAM BURROFF, Secretary in Technology Transfer, began employment on July 23. Pam's extension is 292. GAY BENSON, joined the staff on September 10 as Secretary in Field Measurements. Her extension is 226, and DIANA (DEE DEE) DEXTER started at LARS on November 6 as Secretary/Receptionist in Flex II. Dee Dee's extension is 288.

PROMOTION

PAM JOHNSON was promoted to Business Office Administrative Assistant on October 1, 1979. Her major duties include contract administration, LARS fiscal management and coordination between other departments and business office personnel. In addition, she will function for account clerks and/or the business administrator in their absence.

Pam came to LARS from the Chief Accountant's office and has worked at LARS for 3 years. She previously worked in the Purdue Contract office and the Biochemistry Department.

PROPOSALS SENT OUT

Title: Research in Remote Sensing of Agriculture, Earth Resources, and the Environment, Sponsor: NASA, Principal Investigator: D.A. LANDGREBE and M.E. BAUER, Duration: 12/1/79 to 11/30/80.

Title: Addendum to the Alabama A&M University Earth Resources Data Processing Remote Terminal Support Proposal, Sponsor: Alabama A&M, Principal Investigators: S.K. SCHWINGENDORF and J.L. KAST, Duration: 10/1/79 to 9/30/80.

EMPLOYMENT OPPORTUNITIES

Information about the following job openings have been posted on the bulletin boards in Flexlab 1 and Flexlab 2.

Senior Research Scientist/Engineer or Technical Division Head in the following five areas are available at the Research Institute, University of Petroleum & Minerals, Dhahran, Saudi Arabia.

1. Petroleum and Gas Technology
2. Energy Resources
3. Geology and Minerals
4. Environment and Water Resources
5. Metrology, Standards, and Minerals

Environmental Scientist at the Remote Sensing Institute, South Dakota State University, Brookings, South Dakota

Remote Sensing Analyst at the Center for Applications of Remote Sensing, Oklahoma State University, Stillwater, Oklahoma