G L009481

EARTH SCIENCE LABORATORY

AN INTRODUCTION

University of Utah
Research Institute
Salt Lake City, Utah

EARTH SCIENCE LABORATORY

The Earth Science Laboratory (ESL) is a Division of University of Utah Research Institute (UURI), a non-profit corporation established in 1972 to perform applied and mission-oriented research and development.

The Laboratory was founded in 1977 by principals from Kennecott Exploration, Inc., the Anaconda Company Uranium Division, and the University of Utah Department of Geology and Geophysics, with the intention of building a center of excellence in the geosciences. The present personnel and facilities have been selected for diversity and depth in providing professional consulting and contracting services in a variety of disciplines. ESL computer and laboratory facilities are being expanded continually to provide additional services to industry and to governmental organizations.

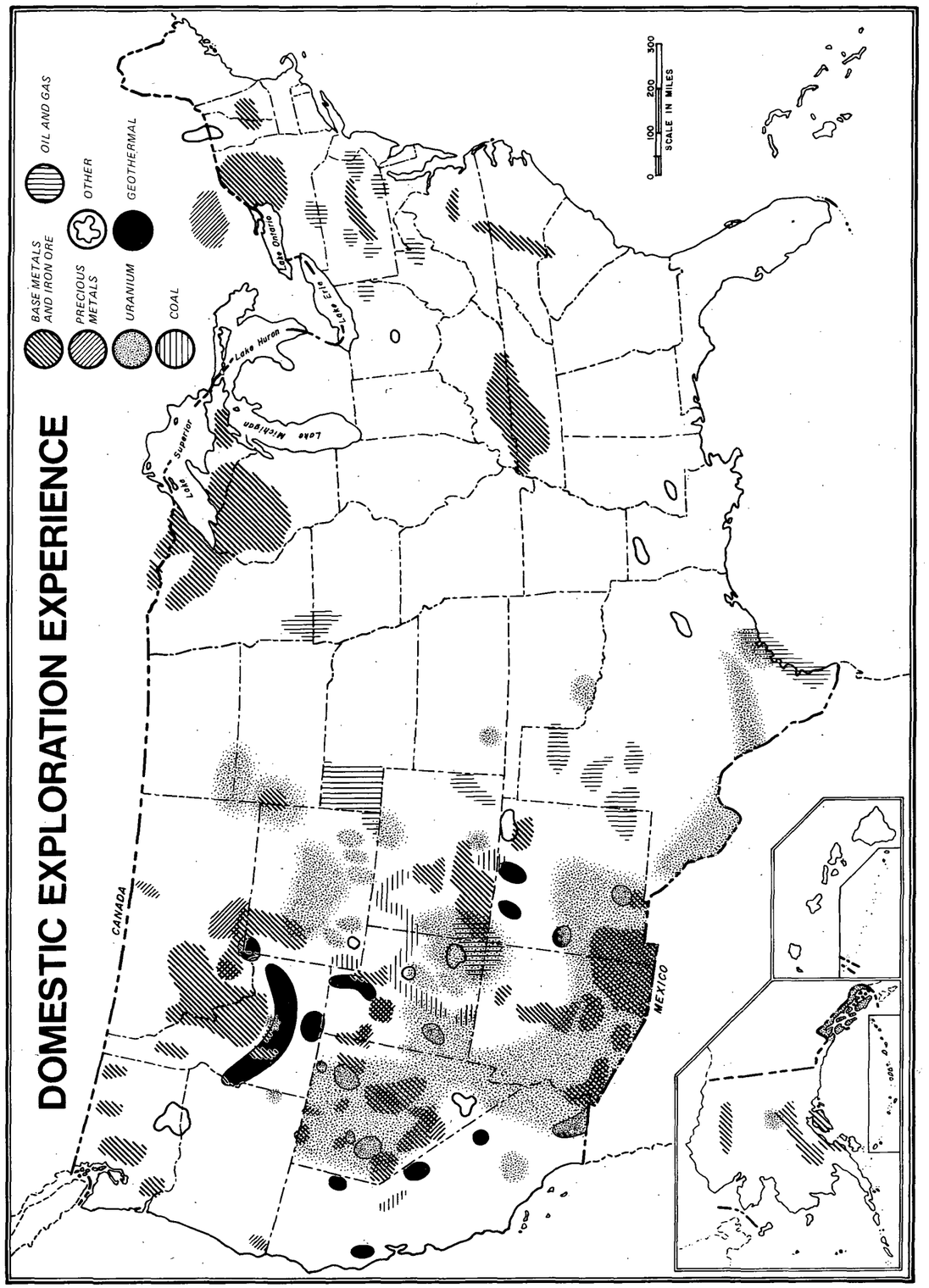
The logo of the Earth Science Laboratory exemplifies our interest in resource exploration, evaluation, and development on a global basis.

PROFESSIONAL BACKGROUND

The professional staff brings to ESL over 200 man-years of exploration and exploration research, and a history of both regional and site-specific exploration. Major experience areas include porphry copper and skarn deposits, massive sulphides, bedded lead-zinc, molybdenum, copper-nickel (ultra mafic), iron ore, uranium, coal, precious metals, diamonds, and petroleum exploration. The staff has worked in many of the major mineral provinces of the United States, as shown by the accompanying map, and has worked on detailed geoscience studies for the following countries: Australia, Botswanaland, Brazil, Canada, Cyprus, Ethiopia, Haiti, Kenya, Mexico, New Guinea, South Africa, and Zambia. The staff is experienced in cost-effective exploration as well as research and development of new geophysical, geochemical, and geologic techniques.

Earth Science Laboratory personnel are widely published in technical reports and professional journals. In the last two years over sixty reports and articles have been produced, from exploration method concepts and evaluations to site-specific case studies. A publications list is available on request.

Report titles include geologic mapping studies, geophysical interpretations, computer program documentation, geochemical studies, and exploration architecture. Papers or articles delivered recently by staff members are represented in: Journal of the American Chemical Society, American Journal of Science, Transactions of the Society of Petroleum Engineers, the Third International Symposium on Water-Rock Interaction, the Geologic Society of America Bulletin, the AAPG Bulletin, and Geophysics.



PERSONNEL

MANAGEMENT

Stanley H. Ward, ESL Director (Ph.D. 1952, University of Toronto) formerly Chairman, Department of Geology and Geophysics, University of Utah.
Specialties: Geoscience research and development, mineral and geothermal exploration, design of exploration campaigns.

Phillip M. Wright, ESL Associate Director/Technical (Ph.D. 1966, University of Utah) formerly Chief, Geophysics Division Operations, Kennecott Exploration, Inc.
Specialties: Electrical and potential exploration methods, geophysical data interpretation, heat flow, mineral and geothermal exploration.

Wilford L. Forsberg, ESL Associate Director/Administration (B.S. 1963, Utah State University) formerly Business Manager, Department of Geology and Geophysics, University of Utah.
Specialties: Contract negotiations, financial and administrative management.

GEOPHYSICAL SECTION

William E. Glenn (Ph.D. 1973, University of Utah) formerly Senior Research Geophysicist, Kennecott Exploration, Inc.
Specialties: Well log analysis, reservoir engineering, electromagnetic methods, geophysical exploration.

Gerald W. Hohmann (Ph.D. 1970, University of California, Berkeley) formerly Chief, Geophysics Research and Development, Kennecott Exploration, Inc.
Specialties: Electrical and potential methods in geophysics, numerical modeling methods, mineral and geothermal exploration.

Claron E. Mackelprang (B.S. 1963, Utah State University) formerly Geophysicist, Bear Creek Mining Co.
Specialties: Applied electrical and potential prospecting methods, geophysical data interpretation, mineral exploration, geochemical sampling.

Louise S. McPherson (B.S. 1972, University of Utah) formerly Seismic Analyst, Hawaii Volcano Observatory.
Specialties: Seismic research and analysis.

Howard P. Ross (Ph.D. 1965, Pennsylvania State University) formerly Senior Geophysicist, Kennecott Exploration, Inc.
Specialties: Electrical and potential methods in geophysics, survey planning and data interpretation for mineral and geothermal exploration, nuclear waste disposal site selection.

PERSONNEL

Schuyler C. Schaff (M.S. 1976, University of Nevada, Reno) formerly Staff Geophysicist, Woodward-Clyde Consultants.
Specialties: Seismology, geophysical logging and interpretation.

William R. Sill (Ph.D. 1967, Massachusetts Institute of Technology) formerly Geophysicist, Bell Laboratories.
Specialties: Geophysics, applied geology, inversion of geophysical data, patents and mining claims.

Christian Smith (M.S. 1977, University of New Mexico) formerly Hydrologist, Water Resources Division, U.S.G.S.
Specialties: Geothermal aquifer assessment, ground-water hydrology, geophysical research and exploration.

GEOCHEMICAL SECTION

Regina M. Capuano (M.S. 1977, University of Arizona)
Specialties: Economic geology, geochemistry, uranium research.

Odin D. Christensen (Ph.D. 1975, Stanford University) formerly Assistant Professor of Geology, University of North Dakota.
Specialties: Geochemistry of geothermal systems, mineralogy, base metal exploration.

David R. Cole (Ph.D. 1979, Pennsylvania State University)
Specialties: Isotope and hydrothermal geochemistry, base metal exploration.

Ruth Kroneman (B.A. 1956, Carlton College, MN) formerly Chemist, Ames Laboratory (AEC) and Kennecott Exploration, Inc.
Specialties: Inorganic analytical chemistry and procedure development, AA, spectroscopy, ICP.

Joseph N. Moore (Ph.D. 1976, Pennsylvania State University) formerly Geologist, Uranium Division, Anaconda Co.
Specialties: Metamorphic and igneous petrology, volcanology, uranium and base metal exploration, geothermal exploration.

Larisa Ravinsky (Ph.D. 1972, Academy of Sciences, U.S.S.R.) formerly Chemist, Research Institute of Building Materials, Minsk, U.S.S.R.
Specialties: Dolomite-calcite geothermometry, geochemistry.

PERSONNEL

GEOLOGICAL SECTION

Robert E. Blackett (M.S. 1979, University of Utah) formerly Senior Geologist, Utah Power and Light Co., Mining and Exploration Dept.
Specialties: Environmental geology, coal and uranium exploration.

Michael J. Bullett (B.S. 1971, Westminster College, Utah) formerly Geologist/Information Specialist, Kennecott Exploration, Inc.
Specialties: Geologic mapping, geochemical sampling, sample preparation and curation.

Duncan Foley (Ph.D. 1978, Ohio State University)
Specialties: Volcanology, petrology, environmental and isotopic geology, regional geothermal resource assessment.

Jeffrey B. Hulen (B.S. 1969, University of Utah) formerly Geologist, Bear Creek Mining Co., and Kennecott Exploration, Inc.
Specialties: Geologic mapping, base and precious metal exploration, geothermal exploration.

Paul W. Jewell (B.S. 1978, Beliot College) formerly Geologist, Newmont Exploration, Ltd.
Specialties: Uranium and precious metal exploration, igneous petrology, structural geology.

Dennis L. Nielson (Ph.D. 1974, Dartmouth College) formerly Geologist, Uranium Division, Anaconda Co.
Specialties: Metamorphic and igneous petrology, volcanology, uranium base metal and geothermal exploration, structural geology.

Bruce S. Sibbett (M.S. 1976, University of Idaho) formerly Exploration Geologist, Lucky Mc Uranium Co.
Specialties. Geologic mapping, uranium exploration, volcanology, mineral patents and mining claims.

Debra W. Struhsacker (M.S. 1978, University of Montana) formerly Visiting Professor of Geology, University of Montana.
Specialties: Igneous and metamorphic petrology, tectonics, geothermal resource assessment.

Eric M. Struhsacker (M.S. 1976, Montana State University) formerly Geologist, Exxon Minerals Co.
Specialties: Base precious metals and geothermal exploration, volcanology.

PERSONNEL

Jon Zeisloft (B.S. 1964, Purdue University) formerly Geologist, Anaconda Co., Getty Oil Co., Pan American Petroleum Co.
Specialties: Stratigraphy, subsurface geology, stratabound mineral occurrences, oil and gas exploration.

COMPUTER OPERATIONS

John W. Atwood (B.S. 1979, University of Utah)
Specialties: Computer programming, well log interpretation, stratigraphy, paleontology.

Terry J. Killpack (M.S. 1975, University of Utah) formerly Systems Engineer, Jet Propulsion Laboratory.
Specialties: Digital signal processing, geophysical modeling, computer programming, systems management.

Carleen Nutter (B.A. 1971, University of Utah) formerly Programmer/Analyst, Department of Geology and Geophysics, University of Utah.
Specialties: Applications programming, numerical analysis, graphics.

Carol A. Withrow (M.S. 1970, University of Utah) formerly Programmer/Analyst, University of Utah.
Specialties: Systems programming, graphics.

ELECTRONICS LABORATORY

Dale J. Green (B.S. 1956, University of Utah) formerly Chief Electronics Engineer, Kennecott Exploration, Inc.
Specialties. Design and development of electronic instrumentation for geophysical exploration and interpretation.

Steven L. Olsen, formerly Manager, Electronics Section, Hostal Medical Corporation.
Specialties: Electronics support for research.

FACILITIES

The Earth Science Laboratory main offices are located in University Research Park overlooking the Salt Lake Valley. The geochemical and electronics laboratories as well as some office space are in a nearby complex while the Geothermal Sample Library is in downtown Salt Lake City.

The Geothermal Sample Library (GSL) provides open-file accessibility and archival storage for field and drill hole samples (chips, cores, chip boards, and remainders from analyses) as well as cross-referencing to all work done on the samples. At present, the GSL contains nearly 240,000 feet of chips and 6,200 feet of core from shallow thermal gradient holes and deep holes in geothermal areas. Samples may be examined by appointment. Complete sample preparation facilities permit proper initial preparation for storage and subsequent division into representative subsamples for distribution to laboratories engaged in geothermal and other research.

The Geochemical Laboratory has facilities for preparing special samples (e.g., specific gravity and magnetic fractions) and for multi-element analysis of a spectrum of solid and fluid samples. Principal instrumentation includes an ARL Inductively Coupled Plasma Spectrophotometer (ICP) with dedicated computer operating system, scanning primary slit and auto sampler. The ICP is capable of simultaneous quantitative analysis for 37 major and trace elements (Na, K, Ca, Mg, Al, Si, Ti, P, Sr, Ba, V, Cr, Mn, Co, Ni, Cu, Mo, Pb, Zn, Cd, Ag, Au, As, Sb, Bi, Se, Te, Sn, W, Li, Be, B, Zr, La, Ce, and Th) at a rate of 15 to 20 samples per hour. Limits of accurate quantitative determination are commonly in the low ppb range for liquids and low ppm range for solids. A wide variety of matrices are readily accommodated by the ICP through software correction of spectral interferences and background correction using the computer-controlled scanning primary slit. The recent addition of tape drive and more memory enables data to be transferred directly from disk storage to other computers. An IL Atomic Absorption Spectrophotometer with graphite furnace and automatic background correction is available as back-up for the ICP. X-ray diffraction equipment for identification of mineral phases is available at the nearby Utah Biomedical Test Laboratory, another Division of the University of Utah Research Institute.

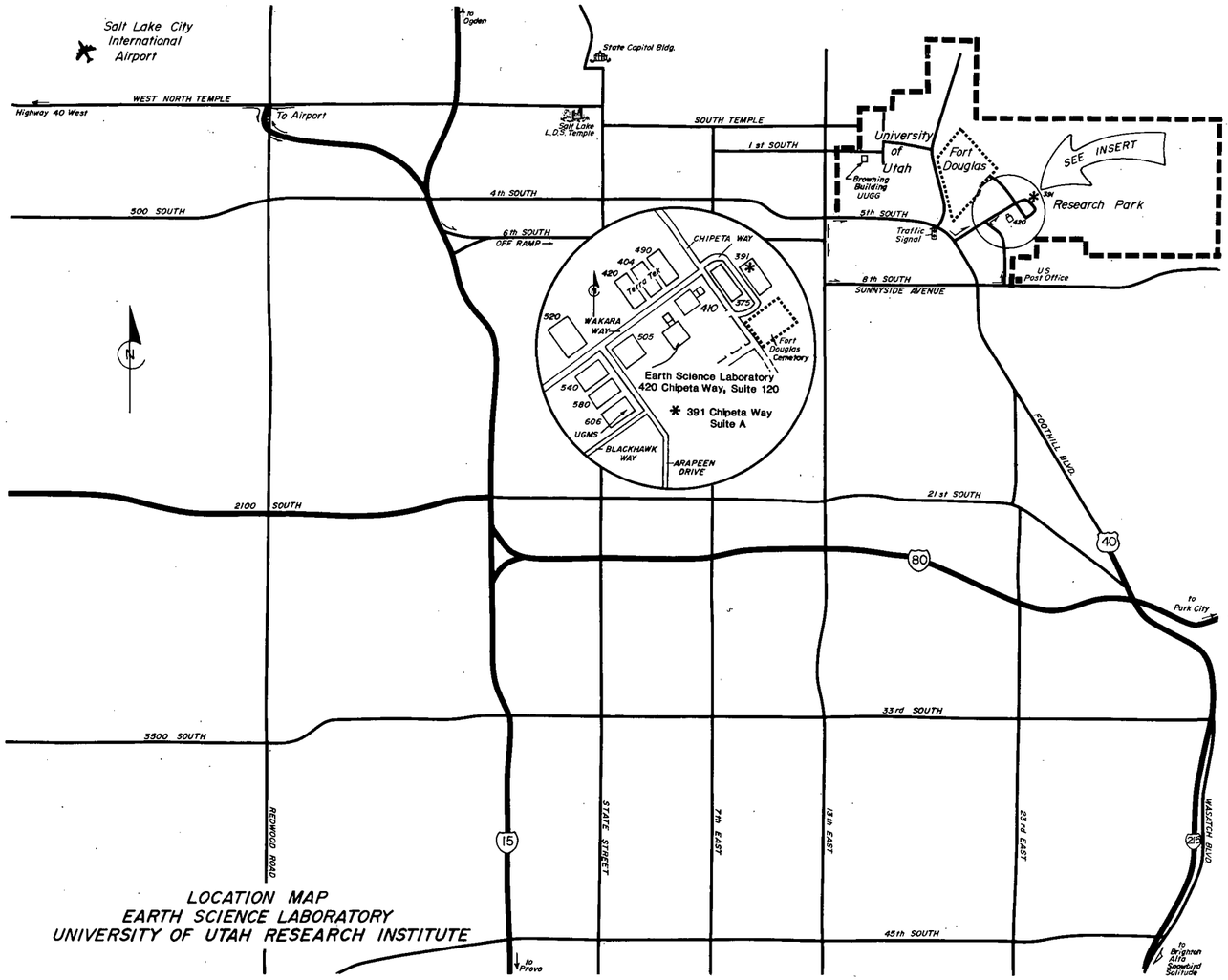
FACILITIES

The Electronics Laboratory is well suited for development of microprocessor integrated geophysical instrumentation. Test, design, and prototype construction facilities are state-of-the-art.

Computer facilities at ESL consist of a PRIME 400 minicomputer system with a link to the University of Utah's UNIVAC 1100/60 computer. The present system includes a PRIME 400 CPU, 1256 K bytes of memory, 160 M bytes of disk storage, 9-track magnetic tape drive, 36-inch Zeta pen plotter, line printer, Tektronix 4014 graphics terminal, DECwriter terminal, 6 Perkin Elmer CRT terminals, and two Texas Instruments Silent 700 terminals. Interfacing with the UNIVAC 1100/60 is by a 2400 baud synchronous line. Three dial-in phone lines are available, two at 300 baud and one at 1200 baud.

ESL's Illustrations department provides professional support with an array of techniques and equipment for the most exacting technical, mapping, and drafting requirements.

The Documents Library provides research materials in basic geoscience publications and periodicals. Emphasis in the present collection is on geothermal information in open-file data and site-specific studies, but all other exploration and research fields are represented.



LOCATION MAP
EARTH SCIENCE LABORATORY
UNIVERSITY OF UTAH RESEARCH INSTITUTE