Volume 11 No. 1 March 1966

ARCS and SPARKS

OTTAWA, ONTARIO

Canada's historical capital of modern scientists

Published by the Ultra Carbon Corporation . . . for the advancement of Spectroscopy

Arclets and Sparklets ...from ULTRA CARBON

INTRODUCING ULTRA CARBON'S TWO NEW MANUFACTURING REPRESENTATIVES

ON THE EAST COAST . . .

DONALD E. ANDERSON
ANDCO
P.O. Box 175
Lynnfield, Mass. 01940
Telephone Area 617 245-7399

Covering the New England States . . . Maine, New Hampshire, Vermont, Massachusetts, Connecticut and Rhode Island.

ON THE WEST COAST . . .

JOHN E. FALOON
301 E. San Marino Ave.
Alhambra, California
Telephone Area 213 282-8221

Covering the Southern California counties of San Luis Obispo, Kern, Santa Barbara, Ventura, Los Angeles, Orange, San Bernadino, Riverside, San Diego and Imperial.

Ultra Carbon is proud to have these two highly qualified men representing them. Both have many years of responsible experience behind them and look forward to serving you soon. We are confident you'll always find them ready to fill your needs promptly and courteously.

Arcs & Sparks is published by Ultra Carbon Corporation, P. O. Box 747, Bay City, Michigan, for the advancement of the profession of spectroscopy. News stories, changes of address and other pertinent correspondence should be directed to the Editor.

Cover Story

12th Ottawa Symposium on Applied Spectroscopy

Getting together with our brethren to the North is a stimulating experience. The 12th Ottawa Symposium on Applied Spectroscopy held last October was no exception. Sponsored by the Canadian Association for Applied Spectroscopy, the symposium attracted visitors and exhibitors from the United States and Europe, as well as Canada. All the technical sessions took place in the modern and spacious National Gallery Auditorium, Lorne Building, in the center of Ottawa. The Annual Symposium Dinner was held at the Beacon Arms Hotel. Tours included the Northern Electric Company Research and Development Laboratory, Shirley Bay; and the Stellar Physics Division of Dominion Observatory. Of course, all the visitors enjoyed the historic and scenic views of colorful Ottawa and Canada.

National Gallery (Lorne Building)

These three gentlemen contributed much to the success of the 12th Ottawa Symposium. From the left . . . P. A. Serin, Eldorado Mining and Refining Co., Port Hope, Ontario, president of C.A.A.S.; Baron Guy Daufresne de la Chevalerie, Ambassador of Belgium, who provided the very interesting banquet talk; and Dr. A. H. C. P. (Archie) Gillieson, Department of Mines and Technical Surveys, Ottawa.

(Continued on next page)

CANADIAN ASSOCIATION FOR APPLIED SPECTROSCOPY

CURRENT OFFICERS:

President: Mr. P. A. Serin, Eldorado Mining and Refining Co., Port Hope, Ont.

Vice President: Mr. P. E. Lemieux, Aluminium Laboratories Ltd., Arvida, P. Q.

Past President: Dr. A. H. C. P. Gillieson, Department of Mines and Technical Surveys, Ottawa, Ont.

Secretary: Mr. J. G. Carriere, Noranda Cooper and Brass Ltd., Montreal, P. Q.

Treasurer: Mr. P.R. de Lhorbe, Anaconda American Brass Ltd., New Toronto, Ont.

SYMPOSIUM COMMITTEES:

Chairman: D. S. Russell, National Research Council, Ottawa, Ont.

ARVIDA PROGRAM COMMITTEE:

Chairman:

R. V. Baker
T. J. Hudson
W. Lee
J. S. Lobos
M. Ouellet
D. O'Rourke

Aluminum Company of Canada Ltd.
Arvida, P. Q.

R. H. Black
J. Dobson
P. Lemieux
D. Stokes
R. Thomson
E. Van Dalen

Aluminium Laboratories Ltd.
Arvida, P. Q.

OTTAWA ARRANGEMENTS COMMITTEE:

Chairman:

J. C. Bartlet, Food and Drug Directorate
R. Horton, Geological Survey of Canada
G. J. Kurkoski, Dominion Magnesium Ltd.
R. Lauzon, National Research Council
J. C. Meranger, Food and Drug Directorate

12th OTTAWA SYMPOSIUM

ON APPLIED SPECTROSCOPY

Ottawa Arrangements Committee included: Roland Lauzon; John C. Bartlet, committee chairman; Peter Tymchuk; J. C. Meranger; and Jerry Kurkoski.

In the foreground, left to right, Paul Lemieux, Aluminium Laboratories Ltd., Arvida, Province of Quebec; John Burgener, Technical Service Laboratories, Toronto; L. E. Copleston, British American Research and Development Company, Sheridan Park, Ontario; Bill Bennett, Northern Electric Company Ltd., Lachine, Province of Quebec; and Al Du Fresne, Johnson and Johnson Ltd., Montreal.

Interesting conversation coming from (left to right) Mrs. C. C. Durham; C. C. Durham, Geological Survey of Canada; R. K. Kerr, Bausch and Lomb of Canada; J. P. Malone, Geological Survey of Canada; Courville Serge, Geological Survey; and J. R. Muysson, McMaster University.

Enjoying the social hour are (left to right) Joe Baretincic, Ormet Company; C. Serge, J. P. Malone, John Fortescue (back), Wilf White (back), and E. N. Cameron, all of Geological Survey of Canada.

Many of the wives enjoyed the social hour, too. From the left . . . Mr. and Mrs. E. N. Reed; Ron Graham, Falconbridge Nickel Mines Ltd., Richvale, Ontario; Mrs. W. R. Jurnan and Mr. Jurnan, Department of Mines and Technical Surveys, and Mrs. J. L. Dalton.

Visiting the exhibit area are Ed Warren of Technical Service Laboratories and Mrs. Warren, and Douglas S. Russell, National Research Council.

Harry Dryer, Applied Research Laboratories, Inc., Dearborn, Michigan, looking over a display of Ultra Carbon products with Carl Leistner.

LABORA-STORY OF THE MONTH*

Analytical Laboratory

at the

New Noranda Research Centre

POINTE CLAIRE, QUEBEC

by SILVIO BARABAS
Head, Analytical Department
Noranda Research Centre

In July, 1963, the nucleus of Noranda Research Centre's personnel moved into new, modern premises erected on a nine-acre lot in the City of Pointe Claire, 18 miles from downtown Montreal and less than a mile from the new six-lane Trans-Canada Highway. The two-story building, which is fully air-conditioned, provides some 42,000 square feet of working area, adequate to accommodate a staff of 75. The expansion of the building to double the present size could be accomplished readily if and when required.

Industrial Park

In the immediate vicinity of the Noranda Research Centre are located the Pulp and Paper Research Institute of Canada and Pharma Research, and within a few miles Domtar Central Research Laboratories and Smith, Kline and French Research and Development Laboratories. A number of other important industries are planning the erection of research laboratories within the same area which is developing into an important Industrial Research Park.

A committee of representatives of the various industrial research institutions operating in this "Lakeshore" area meets periodically to discuss matters of common interest. As a result of this activity, there is a friendly and co-operative interchange of information and literature between the member organizations. Moreover, arrangements have been made for the joint use of specialized services and equipment in the various laboratories and active consideration is being given to the establishment of a joint technical library.

Noranda Organization

The Noranda Organization comprises 54 operating companies, with 27 mines, 5 smelting and refining plants and 34 manufacturing plants. While Noranda is nominally associated with the mining and production of copper, silver and gold, it has become more recently a major producer of zinc and molybdenum with interests in pulp and paper, fertilizers and iron ore. Its total yearly sales in some 40 countries amount to approximately $500 million.

It became apparent in the immediate post-war years that in order to meet successfully the growing competition on the world markets, more research and development were required in the fields of mining, milling, smelting, refining and manufacturing operations. Initially, the principal Noranda subsidiaries had their own small research and development groups investigating their own specific problems. In 1960, however, it was decided to consolidate the research and development work of the entire Noranda Group into a central body which was to become the

*Reprinted from CANADIAN SPECTROSCOPY

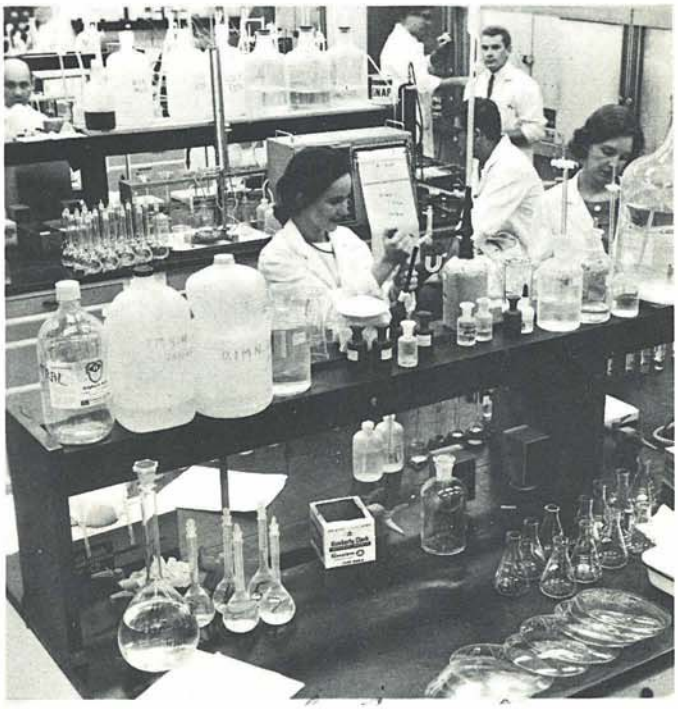
(Continued on next page)

Noranda Research Centre. The net effect of this centralization was a concentration and expansion of skills available to Noranda on one hand and the ample justification for the purchase of expensive specialized equipment on the other hand. In the past, the hiring of skilled manpower and the acquisition of specialized equipment often could not be justified by the limited needs of an individual company.

Research Centre's Organization

Since the projects under investigation at the Research Centre are sponsored by the individual companies, the Research Manager responds to a Research Committee composed of representatives from Head Office and the major Noranda subsidiaries.

All the research and development work at the Centre is carried out within the framework of two divisions: Research Division and Engineering Division. The former comprises Analytical, Chemistry and Solid State Physics Departments and the latter the Chemical Engineering, Extractive Metallurgy, Applied Physical Metallurgy and Technical Economics Departments.



General views of the Analytical Section

Analytical Department

The main function of the Analytical Department is to provide service to all other Departments at the Research Centre and to provide at request specialized non-routine analytical service to any of the Noranda Group of companies. In addition, the Analytical Department is engaged in research projects sponsored by the various Noranda companies. The objectives of such studies might be any one of the following:

(a) Development of analytical methods

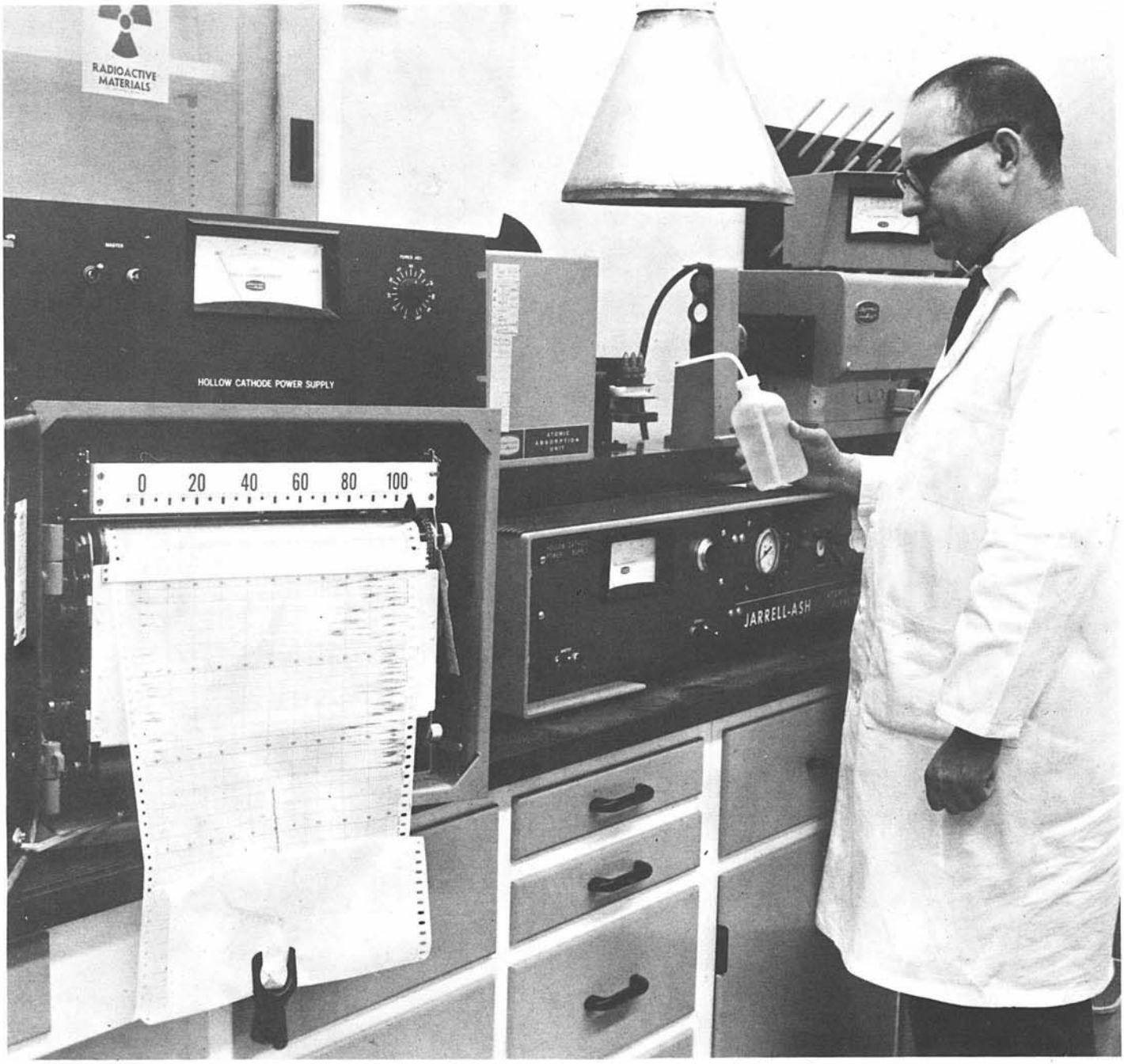
(b) Identification of complex compounds

(c) Automation of analysis

(d) Development of on-stream plant control systems

(e) Evaluation of methods and instruments

There are two operating groups within the Analytical Department: Chemical and Spectrographic. The Chemical group engages in Spectrophotometry, Potentiometry, Polarography, Atomic Absorption Spectroscopy and Automated Analysis as well as Classical Wet Analysis. The Spectrographic group engages in Optical Emission, X-Ray Fluorescence, X-Ray Diffraction and Infrared Spectroscopies. Obviously analytical research is carried out continuously by both groups with the equipment available to them. This includes the equipment shown in the illustrations and as well a wide selection of smaller instruments. In addition these are supplemented by equipment assigned to other departments such as a F & M Dual Column Chromatograph, DTA and DGA Analyzers and an A E I Electron Microscope.



Dr. C. L. Chakrabarti evaluates the basic parameters of interest in atomic absorption spectroscopy.

Materials Analyzed

Last year some seventy different types of materials originating from 15 Noranda Companies were analyzed for almost any element listed in the periodic chart with the exception of the inert gases, rare earths and the post-uranium elements. Materials ranged in composition from ores and concentrates to high purity metals. In addition, numerous intermediate products from the treatment of smelter slags, ores, flue dusts, slimes and wastes by other Research Centre's departments were analyzed for their main or trace constituents.

In a strict sense, no analysis at the Research Centre is routine. Unlike the Plant Control Laboratories handling samples of well-defined general composition with the main constituents and impurities falling within the established and known minimal and maximal concentration levels, the Research Centre's laboratory must face up to situations where not only complete unknowns have to be analyzed, but what is worse, where the information available on the samples to be analyzed might be incorrect and misleading. For example, a research chemist or engineer may be trying a new process. In submitting the

(Continued on next page)

resulting samples for analysis and indicating the "approximate" range, the experience shows that he tends to be either too optimistic or too conservative. In either case, the information provided proves on occasions to be as harmful as it is beneficial.

In most instances, and for the reasons given above, the Centre's laboratory cannot avail itself of "standard methods of analysis." Most methods that are used in the laboratory have to be tailored specially to suit the specific needs.

Analytical Projects

Below is a brief description of some of the major projects handled by the Analytical Department since January, 1964:

1. Development of optical emission methods for the determination of impurities in high purity selenium, tellurium, and copper.

Development of optical emission methods for the comprehensive, semi-quantitative analysis of complete unknowns.

2. Development of X-ray fluorescence methods for the determination of copper, iron, silicon, calcium and magnesium in concentrates, mattes and slags.

Development of X-ray fluorescence methods for the determination of copper, silver, gold, selenium, tellurium, lead and sulfur in copper refinery slimes and slime leach products.

Development of X-ray fluorescence methods for the analysis of cast irons for silicon, molybdenum, copper, nickel, manganese and chromium.

3. X-ray diffraction identification of main constituents in ores, concentrates, slimes and leach residues as well as of some corrosion products.

4. Infrared identification of lubricating and fuel oils, organo-metallic and inorganic compounds.

5. Development of a method for the determination of micro amounts of carbon in selenium based on a combination of combustion and infrared measurement of the CO_2 absorption peak.

6. Development of a fully-automated method for phosphorus in copper based on anodic dissolution of the sample. Total time of analysis from receipt of metal sample to recorded phosphorus signal: 3 minutes.

7. Development of a continuous monitoring analytical system for chromium and free sulfuric acid in chromate pickling solutions.

8. Evaluation of on-stream analytical systems for use at a mine and concentrator.

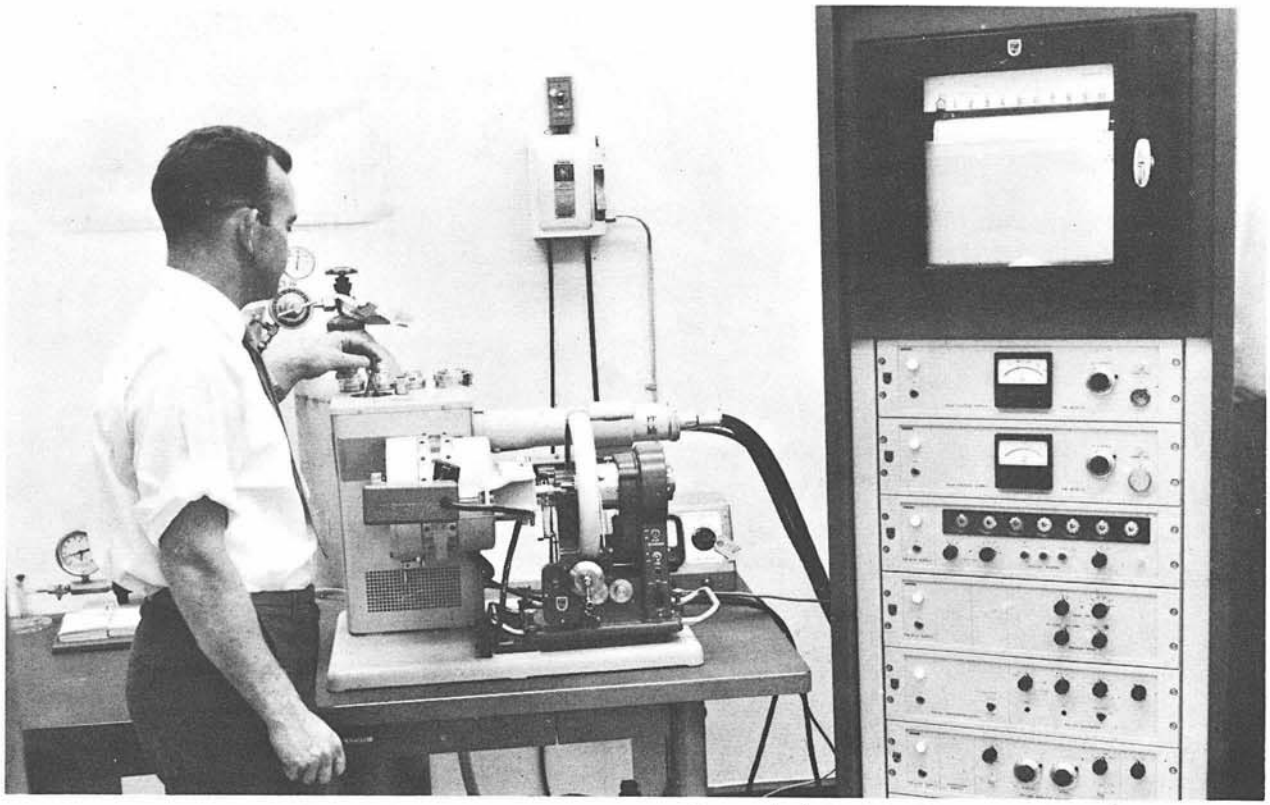
Laboratory Assistant, Paul Bouchard, lines up electrodes for optical emission examination of a high purity metal.

Spectroscopist, Ken Lea, determines trace amounts of carbon in high purity selenium by the infrared technique.

The author discusses the problems facing the Analytical Chemistry Department at the Research Centre.

*Head, Analytical Department, Noranda Research Centre, 240 Hymus Boulevard, Pointe Claire, P.Q.

Crystallographer, Marthe Beaudry, sets the goniometer for x-ray diffraction examination of a concentrate.



X-ray technologist, Brian Givens, runs slimes in slags for major constituents by x-ray fluorescence.

FOCUS ON YOU

at the

Fourth Annual Pacific Conference

September 1965

Pasadena, California

Checking over the registrations is Norman Mitchell, Reservations Chairman. The two lovelies are Marian Anderson (left) and Lana Renken. All are with Applied Physics Corp.

Two important participants were Dr. R. E. Nusbaum and George V. Alexander, both of UCLA, Laboratory of Nuclear Medicine and Radiation Biology.

What's a conference without the ladies? Hope we never find out. At the Pacific meeting were (left to right) Mrs. Kathy Brzozowski, ITT Cannon, Inc.; George Gordon, University of California; and Elizabeth M. Dalaba, Air Force Rocket Propulsion Laboratory, Edwards Air Force Base.

Very entertaining and interesting banquet speaker was Prof. George C. Kennedy, Professor of Geochemistry at the Institute of Geophysics and Planetary Physics, University of California, Los Angeles. Official title of his address was, "Recent Progress in the Physics of Very High Pressures," with the subtitle, "Diamonds are a Girl's Best Friend."

From all points they came . . . (left to right) W. B. Ferguson, Consolidated Electrodynamics; E. W. Milburn, General Electric, San Francisco; John Ferraro, Argonne National Laboratory; and T. C. Yao, Shell Development Company.

Ballroom of the beautiful Huntington-Sheraton Hotel, Pasadena, was the scene of the banquet.

The 1965 Annual Award for the Society for Applied Spectroscopy, New York Section, was presented to Dr. M. G. Mellon, left, Professor Emeritus, Purdue University, by C. Manning Davis, Chairman of the New York Section. Dr. Mellon's accomplishments and contributions to the field would comprise a list that would run several pages, and we wish we could mention each one. We can think of no one more deserving of such a high honor, and we not only want to add our "congratulations," but a sincere "thank you," as well.

Who's running the show?

Martin E. McGoldrick, Armco Steel, Publicity Chairman; David W. Robertson, General Refractories, Chairman-elect; Mrs. Sally Scribner; Bourdon F. Scribner, National Bureau of Standards, Program Chairman; Mrs. Muriel Pifer; and Charles W. Pifer, Hoffmann-LaRoche, General Chairman.

FOCUS ON YOU

at the

1965 EASTERN SYMPOSIUM

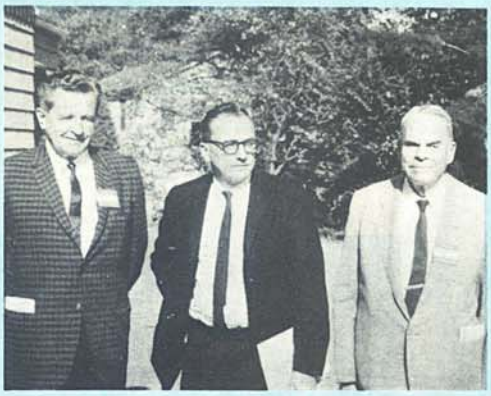
NOVEMBER 1965, NEW YORK CITY

Seated . . . Dave Gardner, General Telephone and Electronics Lab; Charles Jedlicka, Lucius Pitkin; LaVerne S. Birks, U.S. Naval Research Lab; Elfriede Rittershaus, Paul Lublin and James Cosgrove, all from General Telephone.

Standing . . . Walter Sutkowski, General Telephone; Carl J. Leistner, Ultra Carbon; Gene Wesley, Sylvania Electric Products; Mike Downey and Collin Wiggins, both from General Telephone.

Al Marranzino of U.S. G.S., Denver (left) chats with two Ultra Carbon representatives, Gene Musinski and Del Hughes.

Ray Baney (left) and Del Hughes, both from Ultra Carbon, with one of the student awardees, Mrs. Marjorie Schooley Malmberg, University of Maryland.

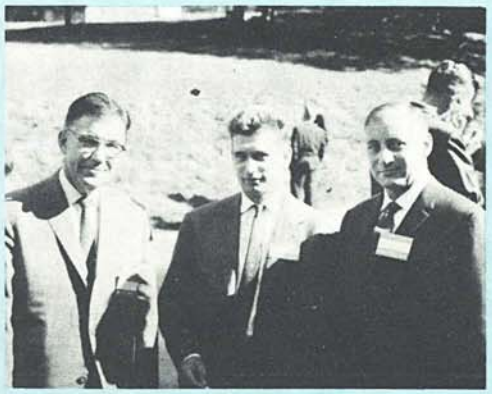


Enjoying the Tennessee sunshine are C. F. Metz, Los Alamos Scientific Laboratory; Fred Stephens, Lawrence Radiation Laboratory; and H. H. Willard, Professor Emeritus, University of Michigan.

at the Ninth Conference on Analytical Chemistry in Nuclear Technology

Gatlinburg, Tennessee

OCTOBER 1965

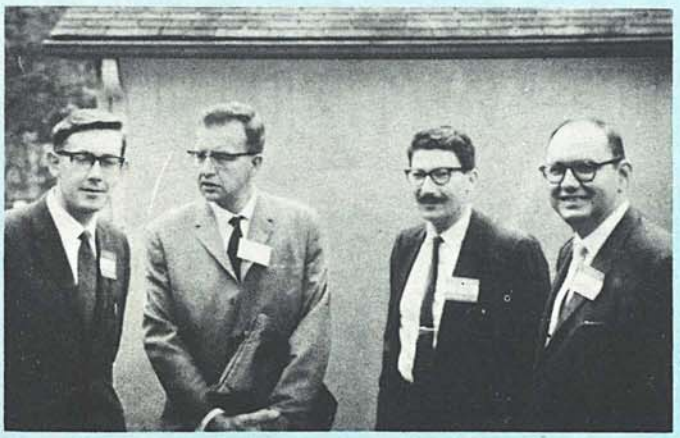


During a break . . . (left to right, foreground) M. T. Kelley, ORNL, and two visitors from France, Rene Botter, French Atomic Energy Commission, Saclay; and Rene L. Berger, French AEC, Aux-Roses.

Checking over their schedule with Sue Holloway, Travel Department, Oak Ridge National Laboratory, are Gerald Goldstein (center), also of Oak Ridge, and P. F. Kane, Texas Instruments, Inc.

Not finding much elbow room at this well-attended convention are A. M. Yoakum, ORNL; Jim Robinson, Louisiana State University; I. L. Glaze, American Cast Iron and Pipe Company, and his wife.

Giving us a smile are R. A. Murie, Allison Division, General Motors Corporation; C. D. Susano, ORNL, Dr. Levitt, Chemical and Engineering News; and P. F. Kane, Texas Instruments.



Two more of the many foreign visitors are (left to right) C. J. Hardy, United Kingdom Atomic Energy Authority; and Jacob Kooi, Euratom, Amsterdam, The Netherlands. With them are A. S. Friedman, U.S. AEC, Washington; and J. W. Nehls, U.S. AEC, Oak Ridge.

at the Annual Meeting of the NEW ENGLAND SECTION

October 1965 Durham, New Hampshire

The ladies always come up with a nice smile. Here we have Mrs. James Swartz and Mrs. Bruce Burrell, both of AVCO, Lowell, Mass.; Mrs. Walter Pojasek, Ledgemont Laboratories, Kennecott Copper; Mrs. Richard Crawford (whose husband is with M&C Nuclear, Texas Instruments); and Mrs. Truman Light, Foxboro Company, Foxboro, Mass.

Left to right . . . Fred Brech, Jarrell Ash Co.; C. L. Grant, University of New Hampshire; R. Crawford, M and C Nuclear; Walter Pojasek, Ledgemont Laboratories, Kennecott Copper Co.; and Mark Brash, AVCO.

These young men are (left to right) Hillyer Senning, Air Force Cambridge Research Laboratories, Bedford, Mass.; William Dotchin, University of New Hampshire; and Robert Pojasek, from Ipswich High School, Ipswich.

Another gay group . . . William Beasley, University of New Hampshire; Lt. Roger W. Beaudoin, New Hampshire State Police; Merle Thorpe, Humphreys Corp.; James M. Morris, Baird-Atomic, Inc.; and Mrs. Merle Thorpe.

T. P. Schrieber and Albert Ottolini, both of Research Laboratories, General Motors Corporation, and "Contemplating Metal Sculpture."

George Schenk, Program Co-chairman, and D. B. Rorabacher, both of Wayne State University.

Stephen Olah, Reichold Chemical Co.; and R. E. Haffelfinger, Battelle Memorial Institute.

at the Anachem Conference

October 1965

WAYNE STATE UNIVERSITY DETROIT, MICHIGAN

Fred L. Losee, Eastman Dental Dispensary; George V. Alexander, Laboratory of Nuclear Medicine and Radiation Biology, UCLA; and Carl J. Leistner, Program Co-chairman, Ultra Carbon.

Charles M. Gambrill, Ethyl Corporation; Paul K. Winter, General Motors; and L. S. Nelson, Sandia Laboratory, Albuquerque, New Mexico.

In Memoriam

We are very sorry to report the death of Jim Oda of United States Geological Survey, Denver, Colorado. He died December 27, 1965. His death will be a great personal loss for all of us and a real loss to the field of applied spectroscopy. We extend our sympathy to his family.

CHICAGO AWARD WINNER

Proudly displaying his Spectroscopy Award is Larry G. Brown. A graduate student in the Department of Physics, Illinois Institute of Technology, he was selected by the Department to receive the $500 stipend accompanying the award made to the department for spectroscopic investigations being actively pursued there. Dr. R. J. Malhiot received an award on behalf of the Department of Physics. Larry has been working toward his M.S. degree and plans to continue toward his Ph.D. degree in physics, specializing in spectroscopy. The award was presented at the 16th Mid-America Symposium on Spectroscopy.

ED JAYCOX HONORED

Edwin Jaycox (above, left) was honored at a testimonial dinner sponsored by a group he helped organize, the New York Section of SAS. Seated next to Ed are Charles Guettel and Mrs. Guettel, and Dave Nash. Ed retired after 45 years of service with the Bell Telephone Laboratories. A large and enthusiastic group at the dinner thoroughly enjoyed his informal talk on "Reminiscences of the Early Days of Emission Spectroscopy." We hope to still see a lot of you, Ed. Good luck.

PAST PRESENT FUTURE

GAINESVILLE is still fresh in the minds of those who attended the 14th Annual Southeastern Symposium on Spectroscopy at the University of Florida. Held January 20 and 21, the meeting attracted more than 75 chemists, metallurgists and spectroscopy specialists. Among the speakers were Armin Helz, Charles Annell and Harry Rose Jr. from the U.S. Department of the Interior Geological Survey, Washington, D.C.; John Norris and Frederick Brech of Jarrell-Ash, Boston; Harry T. Dryer, Applied Research, Dearborn, Michigan; David C. Manning, Perkin-Elmer, Norwalk, Conn.; and Max Amos, Commonwealth and Industrial Research Organization, Victoria, Australia. The Southeastern Section of SAS and the University can be proud of this meeting which has almost doubled in registrations in just a few short years.

SEVENTEENTH PITTSBURGH CONFERENCE on Analytical Chemistry and Applied Spectroscopy is being held just about the time this issue is coming off the presses, so we're planning on covering the meeting thoroughly in our next issue. The Pittsburgh Conference is always one of the highlights of the year and, according to J. P. McKaveney, president of this year's conference, another record-breaker is on tap. The dates are February 21 thru 25 and the place is the Penn-Sheraton Hotel.

7th EXPERIMENTAL NMR Conference follows the Pittsburgh conference. Being held February 24-26 at Mellon Institute, the NMR Conference is devoted to advances in instrumentation, experimental design and techniques.

BATON ROUGE was the scene of the recent 19th Annual Symposium on Modern Methods of Analytical Chemistry. The Symposium was held in Coates Chemical Laboratories on the campus of Louisiana State University, January 24-27. Program Chairman was Professor James W. Robinson.

FIFTH NATIONAL MEETING of SAS will be held at the Sheraton-Chicago Hotel from June 13 thru 17, 1966. Original papers are being solicited in all areas of theoretical and applied spectroscopy and gas chromatography, including x-ray spectroscopy, arc-spark emission, flame emission, atomic absorption, infrared, ultraviolet, visible, Raman, far infrared. NMR-EPR, nuclear particle spectroscopy, activation analysis and solid state spectroscopy. To present a paper, submit a brief abstract of not more than 200 words to Dr. E. Lanterman, Program Co-chairman, Borg-Warner Corporation, Roy C. Ingersoll Research Center, Wolf & Algonquin Roads, Des Plaines, Illinois 60018. Deadline is March 1.

Ultra Carbon Announces 3 Promotions

RAY BANEY

Assistant Sales Manager

Many of you who have met Ray when he ably represented Ultra Carbon at numerous conferences and symposia will be happy to learn he has been appointed Assistant Sales Manager. We consider him top notch.

Ray joined Ultra in 1958 as an inspector in the Quality Control Department. Bubbling with natural sales ability, he was soon promoted to Sales Engineer where he has done an outstanding job.

Ray has studied at Bay City Junior College and General Motors Institute in Flint, Michigan. His wife, Marilyn, and four children are mighty proud of the head of their family.

ROBERT BENDER

Supervisor—Sales Administration

After nine years of devoted service to Ultra Carbon, Bob still exhibits the same hard-driving, "up-and-at-em" attitude of his early days with us. It is with sincere admiration we announce his appointment to Supervisor—Sales Administration.

Bob is a graduate of the Northeastern Business College in Bay City. Not long after joining Ultra as a scheduling clerk, he left to serve a new employer: Uncle Sam. When he returned he began work in the Sales Department and has steadily climbed.

We invite you to join us in congratulating Bob and wishing him even more success in the future.

VERN ROYER

Manager of Manufacturing

We take great pride in announcing the appointment of Vern to Manager of Manufacturing. His enthusiasm and vitality contribute much to the high standards of our manufacturing operations.

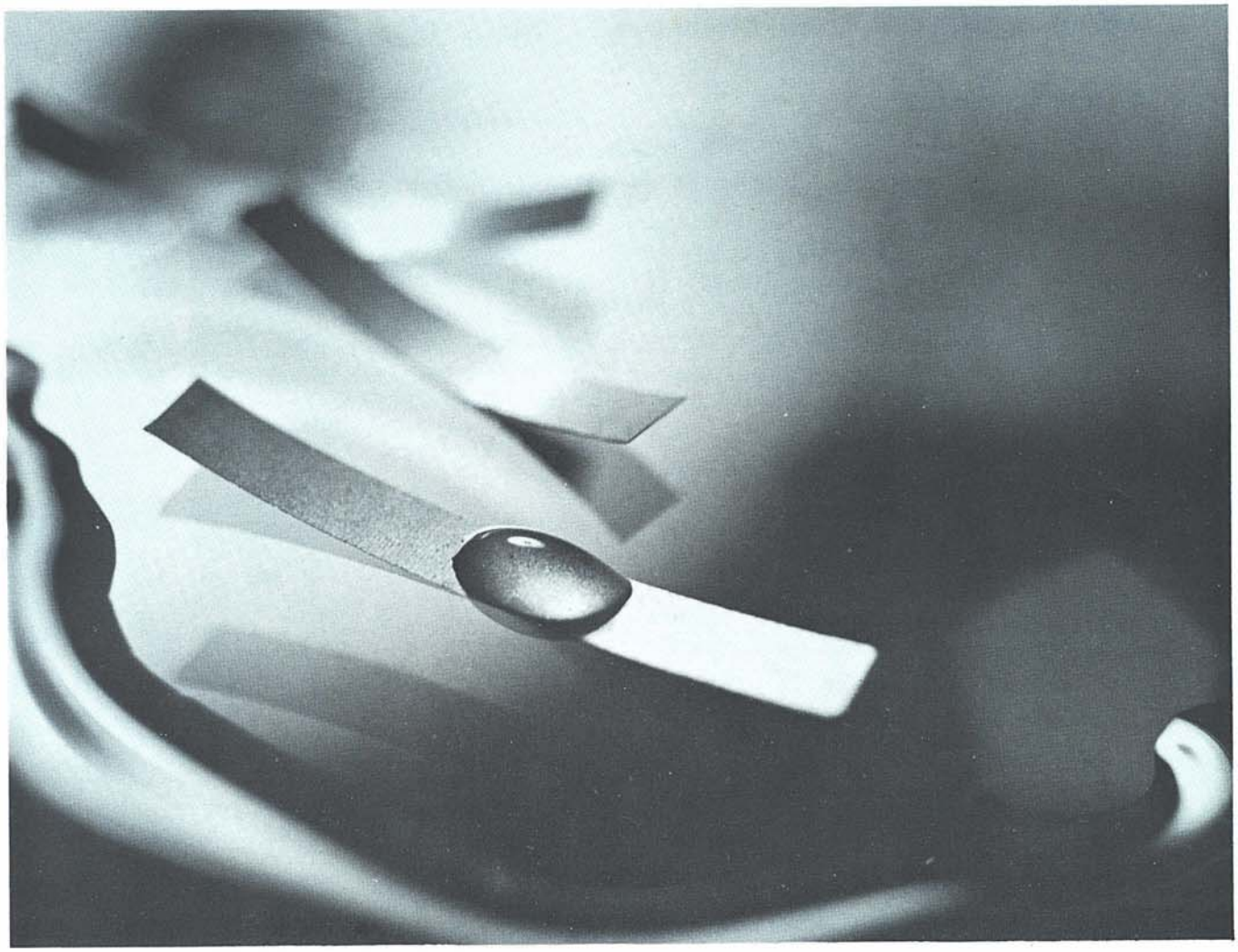
It was in 1959 that Vern came to Ultra as a machine operator. With his valuable background and extensive training in tool and die work, Vern was soon promoted to shop foreman. (A combination of college training in engineering and in business is hard to beat!)

Vern and his wife, Marjorie, have a son Mike in Viet Nam, and a daughter, Suzanne.

ULTRA CARBON®
CORPORATION

The shape of tomorrow, today

For more than 20 years, Ultra Carbon consistently has provided industry with advanced graphite technology. "F" purity graphite for the AEC . . . *Ultra purity* spectrographic electrodes . . . micromachined graphite shapes – these are typical of our past contributions to the spectrographic profession.



Tissue thin graphite filaments for flash photolysis of liquid samples are another Ultra innovation. For our Laboratory Products catalog, write: Ultra Carbon Corporation, Box 747, Bay City, Michigan 48709.