the equations recently published by Hartwig and Ulmer.

An extensive review was presented by Richard E. Honig (RCA) of the variety of ion sources employed in the analysis of solids. The use of laser radiation to flash-evaporate solids and ion and neutral beam sputtering sources were discussed. Honig described in detail a comparison of the operation and performance of the radio frequency spark, the pulsed d-c arc, and the vacuum vibrator. Considerable data on the comparison of the spectral features (for example, ratio of monopositive ions to polycharged ions), energy distribution of the various ion species, and relative ionization efficiencies for various elements by these three techniques were presented. J. Franzen (Max-Planck Institut, Mainz) discussed in more detail certain aspects of the problem of source conditions in the radio-frequency spark on elemental discrimination. This discrimination arises from the different kinetic energy distributions for elements of different volatility, and the importance of spark gap width and other source parameters on the surface temperature and energy distribution. The rapidly growing application of spark source mass spectrometry in the last few years is due to the availability of several commercial instruments, and there is much current need for a thorough understanding of the phenomena associated with this technique.

Basic studies of the fragmentation reactions of the molecule-ions formed in a mass spectrometer source, which lead to the patterns observed, have been hindered by lack of detailed information on the states of the ions formed and their internal energy distribution. Additional insight into this question may be gained from recent results of V. Čermák and Z. Herman (Czechoslovak Academy of Science, Prague) on the yield of various fragment ions resulting from a crossed beam study with metastable noble gas atoms. From interpretation of their data, Herman suggests that the internal energy distribution of the initial molecule-ion is similar to that formed by electron impact for the higher energies. However there is a considerably greater yield of ions with energies less than about 1 ev.

Another area of increasing interest in mass spectrometry is in the identification of the empirical formula of various ions in the spectra by precise mass measurement. This technique is especially valuable in the study of natural products where structure identification problems by other techniques are hindered by the small quantities of sample available and the complexity of the material. By providing a high resolution spectrometer with both direct sample introduction to the source and introduction from a gas chromatograph, the utility of this approach is greatly expanded. K. Biemann (MIT) and co-workers reported in detail on several aspects of this technique, including the use of digital data handling and computers to provide rapid, precise mass measurements of every ion in the spectra. H. E. Lumpkin (Humble Oil) discussed a similar application of this technique to analysis for nitrogen, oxygen, and sulfur compounds in trinuclear aromatic petroleum fractions.

W. G. Meinschein (Esso Research) discussed his observations of paraffins in meteorite samples; his investigations have caused considerable controversy. The inertness of paraffins causes their preferential survival, compared with other organic compounds. Mass spectrometry has established that the paraffins observed in sediments and meteorites are quite similar and distinctly different from those found in crude oil. The former are characterized by preference for the odd carbon numbers, while petroleum shows a steady decrease with carbon number.

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Plant Physiology

The functioning of plants from the subcellular structural level to the organism as a whole was discussed at the 6th annual meeting of the Canadian Society of Plant Physiologists (Société Canadienne de Physiologie Végétale), in Kingston, Ontario, 4–6 June 1964.

At a symposium on respiration, D. F. Parsons (University of Toronto) discussed the structure and junction of mitochondrial membranes. By a negative staining technique for electron microscopy, he found two types of projecting subunits. One is on the outer membrane and consists of 60-Å hollow cylinders; the other is on the cristae and consists of 90-Å, mushroom-shaped structures. The latter structures have been found in many plant and animal tissues. These subunits are protein, but they do not contain cytochromes. There is evidence for the presence of a flavoprotein and an adenosine triphosphatase. The subunits may be associated with oxidative phosphorylation.

In a paper on electron transport in plant mitochondria, W. D. Bonner, Jr. (Johnson Research Foundation, University of Pennsylvania), discussed the large number of cytochromes that have been described and the difficulties in characterizing them. Two *c*-type, three *b*-type, and three *a*-type cytochromes are present in the mitochondria of all plant species, regardless of the respiratory characteristics. At normal O_2 concentrations, when adenosine diphosphate (ADP) is limiting (state 4 conditions), oxidation by plant mitochondria is not inhibited by HCN or CO. However, when ADP is in excess (state 3 conditions), HCN + CO reduces the rate to that of state 4. State 4 rate corresponds to the "ground respiration" of plant physiological literature. This is completely inhibited at low concentrations of O_2 by HCN and CO; the same is true in mitochondria which show HCN and CO insensitive respiration (skunk cabbage). Kinetic analysis suggest that O_2 reacts with two separate oxidases. This is supported by optical demonstration of two $CO(O_2)$-binding pigments. The presence of a second CO-binding pigment provides an explanation for both "ground respiration" and "cyanide intensitive respiration."

The question of whether respiration is affected by light has in the past been answered by indirect means. However, the techniques issued by G. Krotkov (Queen's University) have made it possible to show that light and dark respiration are two different processes. "Photorespiration," or evolution of CO_2 in light, involves different pathways of metabolism and perhaps utilizes glycollic acid metabolism. Corn, a plant of exceptionally high productive ability, has no photorespiration and appears to lack cofactors for glycollic acid oxidation. Corn does not "waste" products of photosynthesis in respiration while it is illuminated, and it is thus more efficient than other plants.

A closely knit group of papers on translocation originated from the laboratories of the Division of Biosciences, National Research Council, Ottawa,

under the direction of P. R. Gorham and D. C. Mortimer, and from the laboratory of G. Krotov and C. D. Nelson (Queen's University). Mortimer's results showed that downward translocation of products of photosynthesis takes place at greatly varying rates and intensities in different vascular bundles of a leaf. Thus each bundle has to be analyzed separately. The Queen's group showed that translocation is under hormonal control and that there is selective and preferential translocation of certain sugars.

The session on nitrogen included two papers from the laboratory of W. G. Boll (McGill University) on the ability of ethanolamine to replace vitamin B_6 in the nutrition of excised tomato roots, and on the biochemical mechanisms associated with this ability. C. L. Mer (now visiting at Harvard from Imperial College, London) provided a nutrition hypothesis for growth responses in oat seedlings. The hypothesis precludes the necessity to postulate changes in auxin metabolism to account for various growth responses to changed environment.

A session on regulators was of general interest and included papers on light quality and periodicity, on the regulation of enzyme synthesis, photosynthesis, and nuclear activity by hormones, and on the mode of action of herbicides.

The sessions on metabolism covered a wide range of research interests. A growing interest in the phenolic substances in plants was evidenced by a group of papers from the Halifax, Nova Scotia, laboratories of the National Research Council. These included very interesting work on the pathways of lignin biosynthesis and the interrelations of soluble and insoluble derivatives of the many C_6–C_1 and C_6–C_3 phenolic acids in plants. Other papers included biosynthetic studies on indoles, carbohydrates, phosphatides, alkaloids, and chlorophylls. Various problems in plant metabolism, including organic acid metabolism, respiration, frost hardiness, and the influence of seasonal or environmental factors on plant metabolism were also discussed.

A report was made on the cytological and cytophysiological studies of tissue cultures of Jerusalem artichoke and oat coleoptiles. (G. Setterfield and F. Wightman, Carleton University, Ottawa). A number of synthetic auxins which promote cell expansion also promote cell division. Papers were presented on control mechanisms of amino acid synthesis, on chloroplast bleaching in *Euglena*, and on histochemical tests. Nelson's group from Queen's University presented work on the effect of auxin in controlling cellular permeability and on the electroosmotic transport of C^{14}-labeled sugars in *Nitella* cells.

The nonscientific event at the meetings was a banquet in honor of D. L. Bailey (University of Toronto). Bailey is retiring from the editorship of the *Canadian Journal of Botany*, the official journal of the society, after a number of years of outstanding service. Special guests included Leo Marion, editor-in-chief of the *Canadian Research Journals*, and Pauline Snure, manager of the editorial office.

At the business meeting it was decided that next year's annual meeting will take place in early June at the University of New Brunswick, Fredericton. G. Setterfield was elected president of the society and A. R. A. Taylor (University of New Brunswick) was elected vice president. Other officers of the society are M. Shaw (University of Saskatchewan), past president; M. Cailloux (Université de Montréal), eastern director; and Mary Spencer (University of Alberta), western director.

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Forthcoming Events

October

10. **Paleontological Research Inst.**, annual, Ithaca, N.Y. (R. S. Harris, 109 Dearborn Pl., Ithaca 14850)

11–14. American **Oil Chemists** Soc., Chicago, Ill. (C. H. Hauber, AOCS, 35 E. Wacker Dr., Chicago 60601)

11–14. International **Scientific Radio Union**/Inst. of **Electrical and Electronics Engineers**, joint meeting, Univ. of Illinois, Urbana. (E. C. Jordan, Dept. of Electrical Engineering, Univ. of Illinois, Urbana)

11–15. **Diseases of the Chest**, 8th intern. congr., Mexico City, D.F. (M. Kornfeld, American College of Chest Physicians, 112 E. Chestnut St., Chicago 11, Ill.)

11–15. **Electrochemical** Soc., Washington, D.C. (ES, 30 E. 42 St., New York, N.Y. 10017)

11–16. American Assoc. of **Medical Record Librarians**, annual, Miami Beach, Fla. (M. J. Waterstraat, RRL, 840 North Lake Shore Dr., Chicago, Ill. 60611)

11–16. Pan American Assoc. of **Ophthalmology**, 7th, Montreal, Canada. (J. W. McKinney, PAAO, 921 Exchange Bldg., Memphis, Tenn.)