Meetings

Gaseous Electronics

When a group of people get together to discuss a phenomenon that is potentially as complicated as the discharge of electricity through gases, one might expect to find a whole spectrum of types of activity extending from observations made on the complex phenomenon itself at one end, to studies of the abstracted single events which comprise the phenomenon at the other. Such was certainly true of work presented at the Annual Conference on Gaseous Electronics, the seventh, held this year at New York University, October 14 through 16. Jointly sponsored by New York University's College of Engineering, which is celebrating its centennial this year, and the Division of Electron Physics of the American Physical Society, the conference of 244 registered attendants heard 41 contributed papers and 4 invited papers. Clearly not all of these papers can be mentioned in this brief report.

Representative of the studies of fundamental processes are the work of W. M. Hickam and R. E. Fox on negative ion formation using mono-energetic electrons and the calculations of rotational excitation by slow electrons done by E. Gerjuoy and S. Stein. L. M. Branscomb reported experiments on the photodetachment of electrons from negative hydrogen ions, which confirm within 10% the theory of Chandrasekhar. Other work on so-called individual processes is that of A. W. Ehler, N. Wainfan, W. C. Walker, and G. L. Weissler, who measured the cross sections for absorption of light by atoms, the photoionization cross sections of several gases and photoelectric yields from metals.

Somewhat more complicated than the single-event processes are the swarm or multiple-event processes. D. J. Rose reported on measurements of the first Townsend ionization coefficient in hydrogen, which work appears to resolve a long-standing discrepancy between two earlier investigations. Here also belong the measurements of the diffusion and volume destruction coefficients for the helium atom and the helium diatomic molecule by A. V. Phelps, the studies of the effect of temperature on the lifetime of metastable mercury molecules by C. G. Matland and A. O. McCoubrey, and the diffusion calculations by R. N. Varney.

Even more complicated are the ionization processes involving metastable nitrogen molecules investigated by W. B. Kunkel and A. L. Gardner in the long-lived afterglow in nitrogen containing traces of oxygen. Jumping to the extreme in complication of the phenomena studied, we find the work of R. St. John and J. G. Winans on retrograde motion of an arc cathode spot in a magnetic field, and that of C. G. Smith on the anchored mercury arc spot. Here also we should list the work on metallic flames excited by active nitrogen and on afterglows in mixtures of rare gases and nitrogen discussed and beautifully demonstrated by C. Kenty. Employing a high-current arc, the work reported by W. Finkelnburg is directed as much at the use of the arc as a high-temperature laboratory as at understanding its formation.

Much of the work discussed at the conference occupies the middle ground in which one attempts to measure some quantity characteristic of an operating discharge or to study some aspect of an operating discharge. In the first of these categories should perhaps be placed the measurements of electric field in the cathode fall region of a glow discharge by R. W. Warren. In the second category we find a number of papers dealing with breakdown, that is, the build-up of processes which, on application of electrode voltages, lead ultimately to the self-sustaining discharge. Here also belong the papers on plasmas. Experimental evidence for the Townsend avalanche build-up of current preceding the spark breakdown was presented in a paper by H. W. Bandel, who measured currents during the formative time lag in air at atmospheric pressure, and in work by M. Menes in argon. An interesting part of the discussion of breakdown consisted of a symposium of three invited papers presented by F. Llewellyn Jones, L. H. Fisher, and L. B. Loeb. Summarizing the present state of affairs in a complex and controversial field, these papers helped to clarify terminology and indicated general agreement on the importance of the avalanche build-up of current and the role of secondary processes in the pre-breakdown regime, but pointed up the difficulty in explaining the transition from this regime into the characteristic narrow visible channel of the spark at pressures near atmospheric. The paper of H. Margenau, also invited, presented a theory of spectral line widths starting from the quantum mechanical formalism.

Two papers by W. S. Boyle, P. Kisliuk, and L. H. Germer discussed theory and experiment concerning the departure from Paschen's law at very small electrode separations, showing that the departure is caused by enhancement of field emission by the space charge of positive ions formed in metal vapor evaporated from the electrodes. I. A. MacLennan and A. D. MacDonald presented a theory concerning the effect of electron mean free path on the high-frequency breakdown field in neon-argon mixtures. E. L. Huber, in a paper read by Professor Loeb, reported the extension to nitrogen, oxygen, and mixtures of these gases of studies of the corona mechanisms triggered by alpha-particle ionization.

Among the papers discussing the plasma was a theory by E. O. Johnson involving a new model of the low-voltage arc, and a theory of the positive ion saturation region of a plasma probe by G. J. Schulz and S. C. Brown, in which modifications were made to include

the drift current of positive ions at the sheath edge. The high-frequency impedance of a plasma was discussed by K. S. W. Champion and S. C. Brown.

A cocktail party and banquet were enjoyed by a large company on Friday evening. Guest speakers were T. E. Allibone of Associated Electrical Industries in England, who discussed work in gaseous electronics being done in England, and W. Finkelnburg of Siemens-Schuckert at Erlangen, who discussed similar work in Germany. The conference committee this year consisted of W. P. Allis, M. A. Biondi, S. Githens, W. R. Gruner, H. D. Hagstrum, E. O. Johnson, and L. H. Fisher, who as secretary, and as the New York University representative, was in large measure responsible for the excellent facilities and smooth working of the conference generally. To the extent that they are available, copies of the book of abstracts of contributed papers at one dollar each may be obtained on request from Professor L. H. Fisher, New York University, New York 53, New York. The conference for next year is to be planned by a committee under the continued chairmanship of W. P. Allis. The committee will also include J. D. Cobine, L. H. Fisher, H. Margenau, A. V. Phelps, and D. J. Rose.

Homer D. Hagstrum
Bell Telephone Laboratories

AAPT Summer Meeting

The 1954 summer meeting of the American Association of Physics Teachers was held on the University of Minnesota campus on June 28–30. In addition to the excellent series of papers, demonstrations, and panel discussions appearing on the program, the association witnessed the total eclipse of the sun, which occurred on the morning of June 30.

The morning meeting on Monday was devoted to the topics of effective demonstrations in physics and to laboratory testing. C. N. Wall, of the University of Minnesota, was chairman. It was pointed out in discussion and demonstrations by F. E. Christenson, St. Olaf College, that showmanship, careful planning, and time provided for students to reflect are essential co-requisites if demonstrations in physics are to be effective. Furthermore, demonstrations should be free from complicated components and should be direct. Use may be made of an oscilloscope, amplifier, or other units without explaining how they work, but stating that the units must be used in showing the demonstration. The materials should be stored so as to be easily available and in units as nearly ready to go as possible.

Haym Kruglak, University of Minnesota, compared performance, essay, and multiple choice tests in laboratory testing. He reported the performance test as the easier, the essay as the harder, and the multiple choice test as the least desirable for laboratory testing.

J. W. Buchta, University of Minnesota, presented a film strip giving the results of a very unique experiment in which he showed that phase velocity is greater than group velocity in a dispersive medium. This film