superconductors. The demonstration of a substantially complete Meissner effect in single-phase alloy systems, reported by J. V. Stout and L. Guttman of the Institute for the Study of Metals, University of Chicago, was of considerable interest. D. Shoenberg (Mond Laboratory), in a discussion of recent work on superconductivity at Cambridge University, reported the discovery that the elements osmium and ruthenium are superconducting. Since these elements are transition metals, the discovery of their superconducting properties disproves the previously suggested viewpoint that superconductivity is a property of only two groups of elements in the periodic table. Another report from the Mond Laboratory dealt with the work of Faber on supercooling effects and the growth of superconducting nuclei in superconductors.

Results on the anomalous heat conduction of some superconducting alloys were presented by K. Mendelssohn of Oxford and by J. K. Hulm of the Institute of Metals, Chicago. Prof. Mendelssohn suggests that the results imply a circulation process in superconductors not unlike that occurring in He II, but there is no general agreement on this point as yet. Rudolf Hilsch, University of Erlangen, described experiments on superconducting thin films in which it was possible to control the transition temperature over wide limits by varying the experimental conditions during deposition.

The second day of the symposium was spent on the properties of liquid helium II. The session began with a group of papers on liquid mixtures of He^3 and He^4. John Daunt and C. V. Heer (Ohio State University) reviewed measurements of the depression of lambda temperatures in solutions containing up to 89 percent of He^3. Transition temperatures as low as 0.2°K in the presence of He^3 were described, and agreement was shown with theory based on London's Bose-Einstein hypothesis. The phase diagram for dilute solutions of He^3 in He^4 was reported by Henry S. Somers (Los Alamos Scientific Laboratory) and a theoretical interpretation was given by W. Goad (Los Alamos), also on the basis of a London statistical model.

Of special interest was the announcement by D. W. Osborne, B. M. Abraham, and B. Weinstock (Argonne National Laboratory) that they had succeeded in solidifying He^3. Their results indicate that He^3, like He^4, probably does not have a triple point and that the liquid is the stable condensed phase at absolute zero.

Interesting experimental developments were discussed in the field of "second sound", a wavelike method of heat transfer occurring only in helium II. D. V. Osborne (Institute for the Study of Metals) reported the measurement of second sound velocities at temperatures as low as 0.10°K, attained at Mond Laboratory by means of adiabatic demagnetization. This work verified the results of an earlier experiment of the same nature performed at NBS, which showed that the velocity of second sound increases drastically below 1°K. The more recent experiments, however, have been carried to much lower temperatures, and the velocity of second sound has been found to approach about $1/\sqrt{3}$ that of the estimated velocity of ordinary sound at these temperatures, in good agreement with Landou's theoretical prediction. A continuation of work on the mechanical detection of second sound was reported by J. R. Pellam and W. B. Hanson (NBS). Their measurements now appear to have fully verified the generalized form of Bernoulli's principle which they previously proposed for liquid helium II to take account of second sound.

Several papers dealt with superfluid flow in helium II and the helium II film. John E. Robinson (Duke University) presented a theoretical paper in which he suggested that the entropy of helium II might be measured mechanically by means of adiabatic oscillations in communicating vessels. Super-flow experiments described by K. Mendelssohn (Clarendon Laboratory) show new effects which indicate "that a determination of pressure in super-flow requires additional knowledge to the definition of this quantity under classical conditions." D. C. Henshaw and L. C. Jackson (University of Bristol) described thickness measurements of the stationary helium II film on solids by an optical method which has now been extended to permit measurements as much as 7 cm above the liquid helium surface. J. G. Dash and H. A. Boorse (Columbia University) reported film thickness measurements by means of a capacitor depth gauge operated at radio frequencies. Heat capacity measurements on adsorbed films of helium below the lambda point were described by J. G. Aston and S. V. R. Mastrangelo (Pennsylvania State College).

An important development in the field of practical apparatus was a new storage container for liquid helium with an evaporation loss of only 1 percent per day. This container, described by Aaron Wexler (Westinghouse Research Laboratories), should go far in relieving some of the technical problems in the operation of a low-temperature laboratory. W. E. Henry of the Naval Research Laboratory described some laboratory aids to cryomagnetic research.

The National Bureau of Standards has been active in low-temperature physics since its founding in 1901 and, until World War II, was one of the few laboratories in this country in which low-temperature research was carried on. Over the past 50 years, NBS contributions to the field have included the first successful liquefaction of helium in this country, basic work on the theory of superconductivity, the first separation of heavy hydrogen, and pioneering research on second sound. Under the sponsorship of the Office of Naval Research, the Bureau is now carrying on a broad program of research on the properties of liquid helium, superconductivity, low-temperature calorimetry and thermometry, and liquefier development.

PHOTO PROCESSING

FIRST RESEARCH AND DEVELOPMENT CONFERENCE

The first annual Photographic Research and Development Conference to be held in this country met in Asbury Park, New Jersey, on May 23 and 24, 1951, under the auspices of the Signal Corps Engineering Laboratories and the Society of Photographic Engineers.

The annual conference has been inaugurated to present the latest theoretical ideas and experimental facts involved in developments of photography, including photomechanics, photo-optics, and photochemistry.

Of greatest interest to the physicist was an invited paper by E. Wainer of Horizons, Inc., Cleveland, Ohio, who spoke of his work on phosphor type photoconductive coatings for continuous tone electrostatic electrophotography.

Since 1940, when C. F. Carlson announced his invention relating to electron photography, considerable work has been done to improve techniques and results obtainable. Carlson's process, somewhat modified, consists of sensitizing by placing an electrostatic charge on an "electrophotographic plate" (comprised of a photoconductive layer, such as selenium upon a base plate of considerably lesser specific resistivity), then obtaining a latent image by exposing in the usual manner, and then dusting the plate with a micronized resinous powder rendering the image visible.

A few years later, H. Kallmann (now at New York University) suggested to his co-workers at the Signal Corps Laboratories a manner of utilizing phosphors whose dark resistance is of the same order as that of selenium. His method was to irradiate the phosphor layer with infrared in order to empty the electron traps, then to expose the phosphor in the normal manner to form a conductivity latent image, following which the layer is charged and developed. This is a complete reversal of Carlson's method; however, the successful application of the "Kallmann effect", as his method has been named, has led to Wainer's work which began in July 1950 under sponsorship of the Signal Corps Engineering Laboratories.

From a theoretical examination of the electrophotographic process using photoconductive phosphors indications are that only low photographic speeds may be expected, so that the greater portion of Wainer's work is in making basic changes in the sensitive materials. According to Wainer, the photoconductivity of zinc sulphide—cadmium sulphide phosphors appears to be greater with increased CdS content, and indications are that properly prepared CdS will be more effective than commercially available phosphors for photographic purposes by factors which may be of one order of magnitude. Experimental evidence which he has compiled indicates that a phosphor which has been made luminescent by use of a substitutional impurity is not photoconductive; whereas, a sulphide phosphor made luminescent by an interstitial impurity, such as copper, is photoconductive. Further investigations were presented wherein indications are that the increase in dielectric constant exhibited by phosphors is an adverse phenomenon as far as photographic work is concerned and that only photoconductive and electrometric changes are important for evaluating the photographic process. In those cases where large dielectric changes are accompanied by large photoconductive changes, the overall speed of the phosphor is high, and it appears that the magnitudes of the photoconductive changes are sufficiently large in such cases to mask the dielectric changes which are evident.

Several descriptions of new methods of rapid processing were presented by members of industrial and government research laboratories. A paper by H. D. Russell of the Kodak Research Laboratories, Rochester, New York, described the elimination of the normal processing operations of fixing and washing by treating film in a stabilizer after development, whereby images of reasonable permanence to heat, light, and moisture are obtained in a minimum of time. Russell was followed by S. Levinos, who described a stabilization process developed at the Signal Corps Engineering Laboratories wherein the conversion of the unexposed silver halide to a light transparent, light insensitive form is accomplished by a thiourea solution.

The contribution of L. Katz, Raytheon Manufacturing Company, Boston, Massachusetts, on controlled processing of film using turbulent flow phenomena is worthy of note. Katz indicated that recent investigations into the phenomena of turbulent flow have shown that its use can greatly increase the speed of photographic processing. Accurate control of the developing process can be obtained by the application of turbulent flow by variations in Reynold's number, which can be obtained by changing the pressure with which the fluids are introduced.

The diversity of papers presented may be seen from the following: "Application of Ion Exchange Resins in Photographic Processing" given by H. P. Gregor, Polytechnic Institute of Brooklyn, in which the chemistry of ion exchange processes and the general characteristics of cation and anion exchange resins were discussed in detail; and "An Application of the Polaroid-Land Process to Radiography" given by A. Bachelder, Polaroid Corporation.

The 15 papers given at the two-day session provided a lively program which proved of keen interest to the 178 in attendance. It is not amiss to recall the remarks of H. Hoerlin (*Physics Today*, June 1950, page 29) with regard to the fact that in Europe photographic science enjoys considerable stimulation from contact with academic institutions and at this time to note the increased attention given to photographic science by academic institutions in this country as was indicated at this conference.

The success of the symposium and the enthusiasm expressed for it by scientists in industry, universities, and government engaged in pursuits relating to photography have impressed the sponsors and justified their plans to continue the Photographic Research and Development Conference as an annual affair.

Bernard Marcus
Signal Corps Engineering Laboratories

MEETINGS TO BE HELD

MATHEMATICAL CONFERENCE

The fifty-sixth summer meeting and thirty-second colloquium of the American Mathematical Society will