

the
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AAPT APPARATUS COMPETITION

A Report by Howard A. Robinson

THE joint meeting of the AAPT and the APS held in New York from January 29th through 31st was significant for a variety of events. Among these was an Apparatus Competition, held under the auspices of the Committee on Apparatus for Educational Institutions of the AAPT, which drew not only some one hundred and ten entries but also the interest of large numbers of visitors. Because of space limitations, it was possible to accept only sixty-odd entries, but this number included two from abroad, a few from American high schools, and one from an industrial research laboratory. The great majority, as was perhaps to be expected, came from American college and university departments of physics.

The competition was underwritten by a special grant from the W. M. Welch Scientific Company. Apparatus was exhibited in each of two categories: Equipment used in Demonstration Lectures in Introductory College Physics, and Equipment used in Introductory College Physics Laboratories. First, second, and third prizes of 500, 200, and 100 dollars each were awarded in each category, but a number of entries were also selected for honorable mention awards.

Dr. E. Creutz, Director of Research of General

Howard A. Robinson of Adelphi College, who served as director of the competition, is a member of the Committee on Apparatus for Educational Institutions of the American Association of Physics Teachers. Other Committee members are: (chairman) Sanborn C. Brown of the Massachusetts Institute of Technology, Vernet Eaton of Wesleyan University, Harald Jensen of Lake Forrest College, and W. C. Kelly of the American Institute of Physics.



E. Creutz inspects Regnault calorimeter entry from the Institute of Theoretical Physics, Copenhagen, Denmark.

Atomic, Professor Paul Kirkpatrick of Stanford University, and Professor C. D. Wall of the University of Minnesota acted as judges. All entries were displayed anonymously during the inspection; the judges worked unbelievably assiduously, starting at two o'clock on Wednesday afternoon and only finishing at two o'clock on Thursday morning.

All entries had their day in court. Every one was examined individually by each judge, but as the night grew longer and the field grew narrower a tendency toward joint reinspection of single exhibits became more and more noticeable. There was a good deal of unanimity among the judges, particularly for the top prizes.

The first prize in the Demonstration category was awarded to Harold Waage of Princeton University for an unusual and remarkably delicate construction involving light images reflected from noncoupled pendulums of slightly different period. One image gave the zero position and was static, two images showed the amplitude of the individual pendulums, while the fourth, being ingeniously reflected from both, showed the beats between them. Mr. Waage also distinguished himself by winning the third prize in the same category for an alpha-particle spark counter, a clever modern analogue of a spinthariscopes for making the count of α particles both audibly and visually apparent to a large audience. The second prize in this category went to Captains Lemnitzer and Flertzheim of West Point for a very simple and highly instructive



First prize in the laboratory category was won by W. M. Whitney and R. G. Marley of MIT for their air puck momentum apparatus, shown above as it was being examined by judges Kirkpatrick, Creutz, and Wall.

working model of an electrodynamic pump using mercury.

As was perhaps to be expected, the entries leaned heavily toward mechanics, although heat, electricity, and modern physics each had their adherents. Optics had by far the fewest entries, most of them consisting of models of optical phenomena. These optical entries included a very beautiful construction illustrating the principles of polarized light through crystals exhibited by Lester I. Bockstahler of Northwestern University, which was awarded an honorable mention in the Lecture Demonstration category.

The Laboratory category had equally interesting awards. The first prize went unanimously to Messrs. Whitney and Marley of the Massachusetts Institute of Technology for their experiment on conservation of momentum using pucks floating on air as colliding bodies. Highly quantitative and visual, the apparatus was one of the outstanding exhibits. The second prize was awarded to Messrs. Dockrill and Thurston of the University of Michigan for a simple stroboscopic camera highly useful in photographing the movements of moving bodies. This exhibit underscored a certain preoccupation among physics departments in trying to improve currently available mechanisms for quantitatively locating the changing position of objects in space at short time intervals. A number of entries were concerned with this problem, including one exhibit by John Marean of the Reno (Nevada) High School using easily developable magnetic tape falling



Dr. Creutz and author adjust optical pendulum for producing beats. This apparatus, submitted by Harold Waage of Princeton, won first prize in the lecture demonstration category.



Adjustment of one of the Harvard exhibits—a circle of reference apparatus showing simple harmonic motion. In far background is device for demonstrating Doppler effect in sound; submitted by R. H. Randall of the College of the City of New York, it received honorable mention in lecture demonstration category.



Same equipment undergoes rigid examination by two of the number of students who were to be seen among the visitors thronging the mezzanine of the Hotel New Yorker during the three-day exhibition.

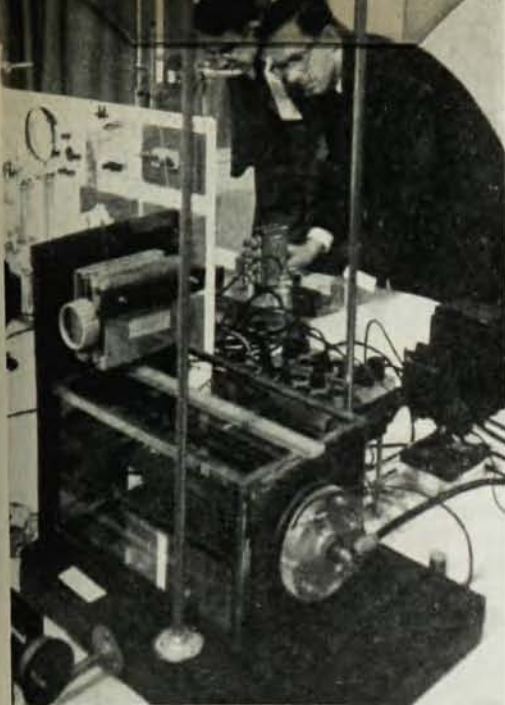
through a narrow gap energized at 60 cycles by a small electromagnet. The third prize went to the Department of Physics at Western Reserve University for their neat closed tube containing argon separated from an evacuated region by a mercury column. The apparatus was mounted in such a way as to permit immediate measurement of the argon volume as its pressure or temperature changed.

In addition to the Bockstahler entry previously described, three other honorable mention awards were given in the Lecture Demonstration category. One of these went to Robert H. Randall of the College of the City of New York for an instrument which really demonstrated the Doppler Effect. T. C. Hardy and M. W. Zemansky of the same institution received an award for their apparatus designed to amplify the temperature effects arising from adiabatic expansion or compression of a gas. The third award went to Harvey E. White of the University of California and television's "Continental Classroom" for his apparatus showing the Coriolis force. The setup had previously won renown on its television appearance.

The Laboratory category provided a number of interesting honorable mentions. Nathaniel Hager, Jr., of the Armstrong Cork Company Research and Development Laboratories demonstrated a quantitative measurement of the thermal conductivity of insulating materials. Highly feasible as an elementary exercise the apparatus was unique in offering a measurement

usually not attempted in college work. M. R. Wehr of Drexel displayed a large number of specialty items and component parts thoughtfully and carefully designed for low cost and ruggedness. The items were selected both from his elementary electricity laboratory (student potentiometer) and his optics laboratory (geometrical optics including a novel 65° prism designed to detect falsifiers of laboratory data!). A. W. Nolle of the University of Texas entered a unique and interesting double mechanical oscillator for studying forced vibration and resonance. Again this entry was noteworthy for the finesse and simplicity of its execution. Achille Capececiatro and Marcus N. Mainardi of the Newark College of Engineering mounted a compact unit for measuring the h/e ratio using a non-commercial photo tube of their own design.

The two foreign exhibits in the laboratory category, one by H. G. Jensen of the Institute of Theoretical Physics in Copenhagen and one by A. Heimer of Gulheden Folksskolan Seminarium of Gothenburg were particularly noteworthy because of the great beauty and finish of their component parts. The Danish contribution consisted of a Regnault calorimeter for measuring the c_p of a gas, and the Swedish contribution consisted of a neatly packed kit containing all necessary parts (including electrical connection!) for setting up some twenty basic or otherwise interesting experiments demonstrating the interplay between electricity and magnetism.



Plane-wave ultrasonic generator exhibited by Brother Columban, CFX, of Xavierian College. In background, Donald Albert of the Adelphi staff and the author makes final adjustments to a Geiger counter circuit.



T. C. Hardy and M. W. Zemansky of CCNY received honorable mention award in demonstration category for exhibit showing temperature changes on adiabatic compression and expansion. It is examined by Paul H. Kirkpatrick, who received this year's Oersted Medal of the AAPT for notable contributions to the teaching of physics.

There were a number of other exhibits which, while not receiving a ribbon at the hands of the judges, did receive the possibly greater reward of arousing considerable interest on the part of the public. It is only possible to mention a few of them. There were two exhibits of Geiger counters and circuits. That shown by Raymond E. Benenson of CCNY was particularly simple and made use of hand counters in lieu of extra stages on a scaler. The Harvard circuit exhibited by R. B. Marr, N. P. Carleton, and Gerald Holton was designed primarily to study the statistical behavior of counting and used a single source, the pulses from which were fed through a number of individual counters which could be plugged in at will. Such a device has the obvious advantage of cutting down the high background arising when each student uses his own source. Philip G. Youngner of Saint Cloud (Minn.) State College exhibited an apparatus for measurement of the Hall effect. Frank Verbrugge of the University of Minnesota deposited (but, since he is an officer of the AAPT, did not enter) apparatus demonstrating the Larmor precession. S. W. Leifson of the University of Nevada entered a simple magnetometer (homemade from a strip of steel spring) for experiments on the inverse square law and on hysteresis in iron. Howard P. Stabler of Williams College showed a set of rod resonators driven by barium titanate which again demonstrated that neatness and simplicity of execution often go together.

Among the demonstration equipment which merits comment was a particularly simple optical-ray tracing device exhibited by Stanley Pearson of the Pasadena city school system. The slits for the parallel rays in this unit were made by photographing a parallel wire grid, the resulting negative acting as the actual slit system. John Brooks of Washington University entered three driven conical pendulums. This exhibit drew considerable crowds which at times became so great that they threatened to block the entrance to the competition itself. Brother Columban, C.F.X., of Xavierian College entered a plane-wave ultrasonic generator by means of which evaluation of the Debye-Sears diffraction effect could be carried out quantitatively.

Your reporter was more than gratified by the response of the exhibitors and their willingness to fill out numerous forms according to directions which to some may have seemed unusually burdensome and arbitrary. By this preplanning, however, the nightmare of setting up some 60 entries and turning a hotel ballroom into a workable physics laboratory within twenty-four hours was adequately overcome and, with one possible exception, everything worked for at least the beginning of the exhibit. Credit for this transformation goes to Messrs. Albert, Cake, and Scheygrond of the Adelphi College Physics Department, who served as demonstrators and exhibition mounters extraordinary.