# SCIENCE NEWS

*Science Service, Washington, D. C.*

## THE SPEED OF PHOTOGRAPHIC FILM

CONFUSION created by numerous methods of rating the speed of photographic film will be eliminated when manufacturers publish the American Standards Association speeds for their films.

In the past each manufacturer of films and exposure meters rated the many kinds of films now used by photographers with a system of his own. These many different ratings often left the user of film in doubt about the exposure needed for the film he wished to use; or the rating given him would not be the one best suited for the use of his light meter.

The single well-defined system of expressing the sensitivity characteristics of film now adopted will remove this confusion, and manufacturers need publish only one set of ratings.

All standard films will be rated by two methods. One method, called the ASA speed, gives an absolute value, indicating the minimum camera exposure which the film must receive in order to produce a negative from which an excellent print may be made. The other called American standard speed number, is the number giving recommended exposures for normal photographic practice to yield the highest number of excellent pictures.

The American standard speed number falls approximately halfway between the Weston and General Electric numbers. This makes possible its use with existing photoelectric exposure meters with no change in the dials. The latitude of most film will take care of the difference in the ratings.

Branches of the armed forces are now having meters made with the new numbers on the calculators. After the war probably all meters will use the new numbers. Film furnished the armed forces has been rated by the new method for some time, but the number is called exposure index and is designed to be used with the American Emergency Standard Photographic Exposure Computer, a small book which allows computation of exposure by observation of latitude, scene, brightness and type of day.

The American Standards Association had the cooperation of all leading film and equipment manufacturers, who will publish the film speed numbers and gradually incorporate the system in their products.

## THE SMALLEST "QUANTUM" OF ENERGY

THE smallest "quantum" of energy, the amount that would be emitted by a single atom making one vibration per second, if that were possible, has been somewhat enlarged by new measurements made with the help of x-rays. The measurements, reported in *Nature*, were carried out by the physicist, Professor Per Ohlin, of the University of Uppsala, Sweden.

Previous measurements by this method gave results 0.3 to 0.4 per cent. smaller than those calculated from the atomic theory and other experimental data. The discrepancy was due to the difficulty of determining just where the x-ray spectrum ends on the short wave side, which is the principal observation required by this method. This is as difficult as, or more difficult than, determining precisely where the edge of a rainbow is, especially on the blue side.

A more precise way of determining this limit removed the difficulty and gave results in satisfactory agreement with those calculated from the atomic theory. The quantity determined by this method is not directly the smallest quantum. Planck's radiation constant as it is more familiarly known to the physicist, but its ratio to the smallest electric charge, h/e. Professor Ohlin's final result for the ratio is 1.3787 divided by $10^{17}$ (1 followed by 17 zeros) which is the same, within the limits of experimental error, as that derived from the atomic theory. Since the smallest charge, e, is known, h is readily found.

To find the precise point where the x-ray spectrum fades to nothing, the method had been to use a narrow band of the spectrum near the end and measure its increasing intensity as the voltage was raised. A curve of these intensities was then plotted, and the curve was extrapolated downward, continued by the eye, to the level of zero intensity. This should have given the voltage at which that particular band of x-ray frequencies began to be emitted, but it didn't quite.

Professor Ohlin, by using a much narrower band and changing the voltage by very small steps (2 volts), which was made possible by the use of a more powerful and efficient x-ray apparatus, found an irregularity at the lower end of the curve quite undisclosed by the previous coarser measurements. This accounted for their failure to get a result in agreement with that derived from the atomic theory, which result is thus confirmed and may be taken to be correct together with the theory and measurements on which it is based.

## FUEL SHORTAGES IN GREAT BRITAIN

FUEL shortages in Great Britain, in wood, coal, oil and gasoline, are directly responsible for an intensive fuel conservation program put into operation early in the war, and also for the establishment of scientific research projects covering both the conservation of fuel and the development of special fuels from English coal. These measures were discussed at the New York meeting of the American Society of Mechanical Engineers by W. C. Schroeder, of the U. S. Bureau of Mines.

Conservation is being carried out through education and rationing, he stated. The gasoline rationing that the American public endures is mild compared with that in Great Britain. All pleasure driving is banned. Gasoline can be obtained only to go to work in essential industries and where no public transportation is available. Industrial users of coal are cut by nearly 8 per cent. of their normal amounts. Home owners are expected to maintain in their houses a temperature not over 60 degrees, and to avoid all waste of heat, water and electricity.

Research projects are those of immediate importance that can be solved quickly. They include the development

of producer-gas from coal to propel automobiles, trucks and buses; an efficient mixture of powdered coal and oil for factory furnaces, and the conversion of coal to oil and gasoline.

Because of the lack of forests, wood or charcoal can not be used extensively in England for producer-gas as they are in Germany and other countries. Anthracite and high-temperature coke are now yielding a satisfactory gas in Great Britain as a result of recent research. The coke-gas has greater activity when sprayed before using with a sodium carbonate solution.

Colloidal oil, made of a mixture of coal and oil, has been in use in England since World War I, but is more widely used now, perhaps because of better mixtures resulting from recent research. Experimentation in the conversion of coal to oil and gasoline did not start in England as early as in Germany, where research work started in 1913. About 1930, an English chemical company became interested, constructed a plant, and has been in commercial operation since 1935.

"Governmental and scientific circles in Great Britain are now fully awakened to the importance of these processes for making liquid fuels from coal. It is to be hoped that this same realization of the potentialities inherent in these developments will arise in the United States."

## DISEASE RESISTANCE AND DIET

A NEW link between diet and resistance to infection appears in studies reported by Dr. C. A. Mills and Dr. Esther Cottingham, of the College of Medicine of the University of Cincinnati, at the Cincinnati meeting of the American Society of Tropical Medicine.

When mice, rats and guinea pigs were starved of vitamins to the point where they failed to grow properly, the activity of their phagocyte cells was likewise reduced. Phagocyte cells play an important part in fighting off infection because of their ability to dispose of disease germs.

The reduction in phagocytic activity was found when the animals were on diets deficient in the following vitamins: thiamin, or $B_1$; riboflavin, pyridoxine, pantothenic acid and choline, also members of the vitamin B family, and vitamin C. Two other B vitamins, inositol and para-aminobenzoic acid, were without effect, but lack of vitamins A and D combined seemed to reduce the phagocytic activity.

A relation between diet, particularly its vitamin content, and resistance to infection has long been suspected. The authors point out that past evidence shows that this is not a matter of vitamin deficiency affecting directly the resistance given by another class of the body's germ-fighters, the antibodies. These substances are more specific in their germ-fighting activity than the phagocytes and are responsible for the kind of disease resistance obtained from vaccines.

It is suggested that the discovery of reduced phagocyte activity resulting from vitamin deficiency may give a valuable means for detecting slight degrees of vitamin starvation which do not show symptoms of frank sickness.

## ITEMS

CLOSE agreement between the observations of the abundance of clouds of calcium gas on the sun and Smithsonian Institution measurements of daily variations in solar radiation has lent new support to the theory that day-to-day weather changes can be predicted from solar observations. Dr. Charles G. Abbot, secretary of the Smithsonian Institution, reported to the Cincinnati meeting of the American Astronomical Society that a tentative trial of solar forecasting of temperature changes at Washington was carried on for 201 days. The results agreed about 60 per cent. of the time, which is better than can be ascribed to chance alone. The observations of calcium clouds were made by the monks at Ebro, Spain, independently of Dr. Abbot's work, and he used their work combined with his own as a basis for the weather forecasting. He stated that weather changes connected with a solar change of activity start about three days before and last for 14 days after such a change. Referring to the longer and better known solar cycle of 23 years, Dr. Abbot predicted that repetitions of past great droughts in the Northwest will occur about 1975 and again about 2020.

A NEW camera makes it possible to locate aerial photographs exactly in terms of latitude and longitude. By use of zenith cameras designed for night use, aerial maps made by the Army and Navy over New Guinea, North Africa and other regions of military importance can be located within 40 or 50 feet. Zenith cameras, developed by the Eastman Kodak Company at the request of the Army, offer an accurate shortcut to celestial navigation. Special camera outfits are placed at one or more points within the area being mapped. By coordinating the star data from the cameras with the land pictures from aerial mapping, all guesswork as to the exact location of a mapped area is removed. One camera photographs the portion of the sky immediately overhead; while another, connected by electrical cables, photographs three navigation watches set on Greenwich time. An automatic timing unit operates and synchronizes the two. This new device gives all the data necessary to determine latitude and longitude exactly. A catalogue of the stars makes it possible for men who know nothing about astronomy to establish the exact position of the scene.

GLASS fibers are helping the production of industrial alcohol needed by the new synthetic rubber industry and for other war uses in a relatively new application described by Dr. Joseph H. Koffolt, of the Ohio State University, at the annual meeting of the American Institute of Chemical Engineers. The glass fibers are used to pack columns employed for the distillation of industrial alcohol, replacing the tinned-copper bubble plates generally used for this purpose before the war. Tests in commercial production have now been running for a year or so with the glass fiber and prove that the material is satisfactory.