Science at the Fair

By HUGH O'CONNOR

X Rays for All

Visitors to the Hall of Man, at the New York World's Fair, are being introduced to a rapid X-ray unit which photographs the chests of about 150 persons an hour, at a cost of $1 each, where such chest X rays used to cost $12 or more.

Whether they feel well or not, visitors at this exhibit are urged to have themselves X rayed as a precaution, now that the cost has been so drastically reduced. A committee of competent doctors, appointed by the Queens County Medical Society, will interpret each X-ray picture and mail it, with a report, to any physician designated by the X-rayed visitor.

The advantage is mutual for the individual visitor and for the advancement of general medical knowledge concerning the occurrence of tuberculosis and heart disease. In both of these ills, and particularly in tuberculosis, the X ray has long been recognized as the indispensable instrument of diagnosis if treatment is to begin early enough to insure a cure.

Surveys of the existence of tuberculosis in persons who consider themselves healthy have already been conducted in special classifications, as in the fire and police departments, prisons, colleges and schools, and occasionally a large group has shown as much as 19 per cent unknowingly infected with early tuberculosis.

Cross-Section of Tuberculosis

This is the first time, however, that a survey of the cross-section of the whole American public has been undertaken. The importance of the undertaking rests on the fact that the high cost of X-ray pictures heretofore put them out of reach of low-income groups, among whom tuberculosis had its highest occurrence.

As long as they feel well, they do not wish to pay $12 or more for X rays; but, by the time they develop symptoms diagnosable on the surface, it may be too late. At least, they are then so tuberculous that their care costs hundreds or even thousands of dollars to themselves, their relatives or to the State.

The principal reduction in cost results from the elimination of photographic film, and the taking of the X-ray pictures directly on sensitized paper. The other savings are in taking the pictures with the patient standing on his feet, held firmly against the machine by a specially designed immobilizing band. Each patient is placed, photographed and dismissed in about twenty seconds.

Each picture roll is good for 100 X-ray pictures, which are developed as a large camera roll. When dried, they are examined as a roll in a viewing machine which turns them up one after another. Since the picture is on paper, not film, notations may be made on it directly.

Identification of Pictures

Each picture is identified by the X-ray impression left on it by a lead card which is typewriter-punched for each patient in the waiting line. The card shows in perforated lettering the patient's name and address, age, height, weight an other data, together with the name and address of the patient's designated physician. When the patient is placed in the X-ray machine, this lead card is clipped into the field of the picture and photographed at the same time.

Dr. J. A. Myers, one of the foremost American authorities on tuberculosis, former president of the National Tuberculosis Association, has characterized this rapid paper X ray as "one of the greatest contributions of all time to our tuberculosis-control program."

It resulted from a conversation between Henry C. Wright, president of the Queensboro Tuberculosis Association, and one of his Queens neighbors, Frank T. Powers, head of the Powers Photo Engraving Company. Mr. Wright had found that, even with the cooperation of five Queens County hospitals and the donated services of leaders of the Queens County Medical Society, a proposed survey of 2,000 school children over five years would cost $5 for each X ray. He discussed the problem with his neighbor.

F. T. Powers to the Rescue

A suggestion promptly emerged from Mr. Powers, who had previous experience photographing extensive public records, where he effected a saving by the direct use of sensitized paper instead of film. He proposed to make X-ray photographs likewise on paper.

Few technical difficulties were encountered. The new rapid paper X-ray machine was first tested in mass photography at the Little Neck School. It produced X-ray pictures which the doctors said they could read. Eight of the Powers machines are now in existence.

One of them was bought by Fulgencia Batista even before his recent visit to the United States. He said he intended to have every Cuban X rayed immediately. He wished to wipe out tuberculosis because his wife's brother died of it. The Powers machine is now operating at La Esperanza Hospital near Havana.

Sugar-Coated Scientific Pills

Science is being taught painlessly at the Fair. Thousands who might not be willing to make the effort to absorb a purely scientific lecture are making the acquaintance of science eagerly through its applications—through technology.

There is no scientific discourse on the ultimate nature of X rays, for instance, but they are presented in a variety of striking uses. At the Hall of Man the visitor may directly examine the bones of his own skeleton pictured on a fluoroscopic screen by X rays. At the Eastman Kodak Building he may see how radiographs uncover hidden flaws in products where soundness is so important as in an airplane propeller.

Studies in Diffraction

A further application of X rays, in a diffraction study, is presented as a safeguard for the government's huge investment at Boulder Dam. The exhibit points out that the impounded water at Boulder Dam is let down to the electric turbine-generators through tremendous steel pipes, some of them thirty feet in diameter and three feet thick, fabricated by welding.

In order to insure the project from failure of the weld under the extremely high pressures, every inch of eighty miles of this great pipe was radiographed by diffracted X rays.

Safety Through Vitamins

Fermentation is a featured subject at the Fleischmann Building. The molecular structures of vitamins A, B, C and the subdivided G, all in yeast, are shown in three dimensions. Each atom in the molecule is a two-inch ball, and their chemical bonds are thin rods holding the structure together.

The public, however, seems to regard these pure scientific exhibits as decorative rather than informative; and the visitors at Fleischmann's pay little attention to them. They crowd, however, around a booth which displays one of the consequences of shortage of Vitamin A.

It is a device to determine whether or not the visitors are safe automobile drivers at night. It was installed at the Fleischmann exhibit because one of the consequences of deficiency in body supply of Vitamin A has been found to be slowness in adjusting vision to changes of light. A-vitamin-deficient drivers are blinded too long for safety by the glare of the headlights of a car passing in the opposite direction.

Reaction to Glare Tested

The visitor looks into a light chamber through an eye-piece, at an object which an attendant can shift. The object is shifted first under daylight conditions to determine the visitor's reaction-time under interrupted daylight—usually a fraction of a second. Next a blinding glare is thrown into his eyes. He is required to press a lever as soon as he can rediscover the shifted object, as his vision clears.

Three seconds are regarded as good time. That means an automobile traveling at forty miles an hour would have proceeded about sixty yards in the hands of a blind driver.

One visitor could not rediscover the object, however, for fifteen seconds. That meant he would have driven 300 yards blind. The attendant remarked that he was unsafe—at least until he had corrected his vitamin A deficiency by much drinking of milk and consumption of other substances containing vitamin A. Fleischmann's yeast was mentioned, of course, as a notable one of these substances.

Technology Dramatized

The absence of purely scientific demonstration of the theories on which the technologic world of tomorrow will continue to rest is explained by the World's Fair authorities.

They say it has been left to each industry to teach the special theories on which that particular industry depends. The Fair is based on the expectation that the commercial exhibitors could most effectively dramatize technology. That expectation seems to be justified by the attention of the visitors.

From the exhibits of the large basic industries, such as steel and petroleum, the visitor may acquire an acquaintance with their underlying technogolic scheme, which may make some of the huge plants of the country less bewildering and fearsome spectacles.

At the same time, superposed on the relative simplicity of scientific theory in these industries, the exhibits indicate the complexity of control operations when a simple theory is applied practically on a large commercial scale.

Distillers Stage Demonstration

Not far from the Fleischmann Building, yeast was once more shown in action, as the basis of the whisky industry, at the Distilled Spirits exhibit.

The great rotunda was inscribed: "Dedicated to public enlightenment. America wants liquor and will get it from some source. It is better to have this source legal, controlled and dependable."

The present technology of whisky is unfolded, from the sowing of the grain to the last distilling and ageing process. There is no spirituous liquor on the premises.

Electric Eyes Everywhere

The photoelectric eye now makes its appearance in industry as often as the test tube and the weighing scale.

It determines whether or not a billet of steel, sliding along a conveyor from one roller to another, is still hot enough to be rolled paper-thin without cracking or breaking up.

The Johns-Manville Company, manufacturers of asbestos and other heat insulators, use the electric eye to control a man-made volcano. It manufactures wool out of rocks, just as rockwool was first found to be manufactured by active volcanoes.

Rock is melted in a furnace and blown out through a crater with steam, settling as it does in nature during an eruption. It forms a matted wool made of fine rock fibers, a heat insulator, to be put between the wall spaces of homes to keep them warm in Winter and cool in Summer.

Foiling the Stick-Up

The Westinghouse Company shows how the electric eye may be installed in a cashier's cage to snatch piles of currency out of reach of any thieving hand which may thrust suddenly through the teller's window.

An electric eye counts the visitors at the Elgin Watch Building.

It also is installed on the newest cameras, to determine automatically what period of exposure the light conditions require. The operator simply loads the camera and fires it, and the exposure takes care of itself—or rather, the electric eye takes care of it.

Curiosity About Cameras

The Eastman Kodak Company's extensive technologic exhibits are based on the assumption that the public still has a curiosity about the working principles of a device as familiar as the camera.

Consequently the first exhibit is designed to show that the camera works exactly like the human eye—or vice versa. The film corresponds to the sensitive eye retina. The lens is called by the same name in camera and eye. The camera dark box is the equivalent of the eyeball. The camera aperture is the diaphragm; in the eye it is the iris.

From this beginning, the exhibit carries the visitor through the process of timing shutters correctly to 1-1000th of a second and the grinding of lenses. The interior structure of a sound-motion picture camera is laid out for those who like to look into things.

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