sity (*Journal of Experimental Psychology*, July).

This function of the stapedius muscle may be partly the explanation of why you become temporarily deafened, especially to conversational tones, while you are exposed to loud noise like that of an airplane engine or a boiler factory.

Not only does tension of this muscle reduce the sensitivity of the ear to all noise, but it acts differentially to reduce the response more to low tones than to high ones. A peculiarity of its action is that for certain tones of middle range, a slight tension of the muscle actually improves the hearing.

This would seem to indicate a minimum amount of noise may aid the hearing of some tones, such as those used in speech.

*Science News Letter, July 11, 1942*

PHYSICS

# Electron Microscope Pictures May Be Sent By Television

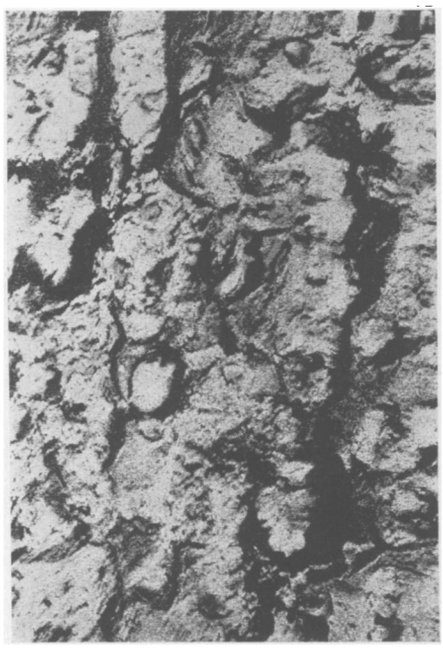
## New Combination With Radio Facsimile Attachment Has Many Unexplored Uses; Now Used To Study Metals

ELECTRON microscope pictures transmitted by television may be one of the future uses of a new scanning microscope now, however, devoted to metallurgical studies to produce better metals for America's war industries.

The new instrument was described by Dr. V. K. Zworykin, associate director of the RCA Laboratories, in a paper read at the Institute of Radio Engineers meeting in Cleveland. Dr. James Hillier and Richard L. Snyder, also of the RCA Laboratories, collaborated in the development of the instrument.

*THE SCANNING ELECTRON MICROSCOPE*

***This instrument scans the specimen television fashion and then builds up its picture on a fluorescent screen. The light from this is then focussed on the sensitive element of a facsimile printer where a print is made. This set-up is especially adapted to examining the surface grain of metals and other opaque objects. The scientists are left to right Dr. James Hillier in the foreground, Dr. V. K. Zworykin and Richard L. Snyder, all of the RCA Laboratories, who developed the instrument.***



*ETCHED NICKEL*

***This picture was made by the facsimile printer of the new televising electron microscope and shows what the surface of etched nickel looks like.***

The scanning electron microscope, developed over a period of years, combines the electron microscope, television and radio facsimile. It permits study of the grain structure of opaque objects, such as metals, to an order of minute detail never before realized. The full range of its possible uses cannot be judged at this time, Dr. Zworykin cautioned.

In the ordinary electron microscope, the electron beam, like the light in an optical instrument, throws an image of all parts of the object simultaneously on the fluorescent screen. In the scanning instrument, the beam is narrowed down to a spot no more than 1/2,000,000 inch (100 Angstrom units) in diameter — about 1/1,000 the size of a pin point. This tiny spot sweeps back and forth over the specimen, itself only a fraction of an inch in size, scanning it as in a television transmitter, and builds up the image on the fluorescent screen in successive parts. Great difficulties were encountered in obtaining and handling this sub-microscopic spot, Dr. Zworykin said, but they were overcome.

In the present arrangement, the light from the fluorescent image, now ordinary light, is concentrated by an optical lens on the photo-cathode of an electron mul-

tiplier which operates a facsimile printer.

Only a few days before at the Penn State College meeting of the American Physical Society, Dr. Hillier, R. F. Baker and Zworykin announced another major improvement in electron microscopes. (See following article.)

*Science News Letter, July 11, 1942*

PHYSICS

# Electron Microscope Now Analyzes Molecular Structure

## Adapter Applied to Standard Instrument Converts It To Diffraction Camera; Can Be Used on Same Specimen

**See Front Cover**

THE ELECTRON microscope can now not only make an enormously magnified picture of a minute object but also peer into its insides and determine its molecular structure. You cannot see the atoms but you can find out where they are.

This of course could be done before by means of another instrument, the diffraction camera, using either X-rays or electrons. But now an "adapter" applied to the standard commercial electron microscope, quickly converts it to a diffraction camera, thus dispensing with the second instrument and with a second source of radiation.

Within a few minutes of each other a picture and a diffraction pattern of the same specimen can be made without remounting it, without removing it from the vacuum, and without tampering with it in any other way. In many fields of investigation this is a great advantage.

How it is done was described by Dr. J. Hillier, R. F. Baker and Dr. V. K. Zworykin of the Research Laboratories of the RCA Manufacturing Company, Camden, N. J., at the meeting of the American Physical Society at State College, Pa.

To pass from microscope to diffraction camera, it is only necessary to shift the position of the specimen in the tube, which is done by gadgets on the outside, and to change the lens. The latter is easy. An electron lens is merely a coil of wire in which an electric current is flowing. When the current stops, it ceases to be a lens. Hence, to switch from the projection lens which makes the picture to the lens which produces the diffraction pattern, it is only necessary to switch the current from one to the other.

The instrument is so arranged that diffraction patterns can be made either by transmitted light or (for opaque objects) by reflected light. For the latter the specimen is turned so that the electrons are reflected at a grazing angle. Provision is also made for rotating the specimen in its own plane, which is useful in making diffraction patterns.

The diffraction pattern produced in this way is a set of concentric circles, some sharp, some diffuse. From dimensions and intensities, the arrangement of the atoms in the material can be determined.

The incorporation of the adapter in the standard instrument does not increase its dimensions nor interfere with its functioning as an electron microscope, the scientists said. But it does considerably widen the usefulness of an already widely useful tool, saves time, expense and labor, and makes it possible to investigate materials that change.

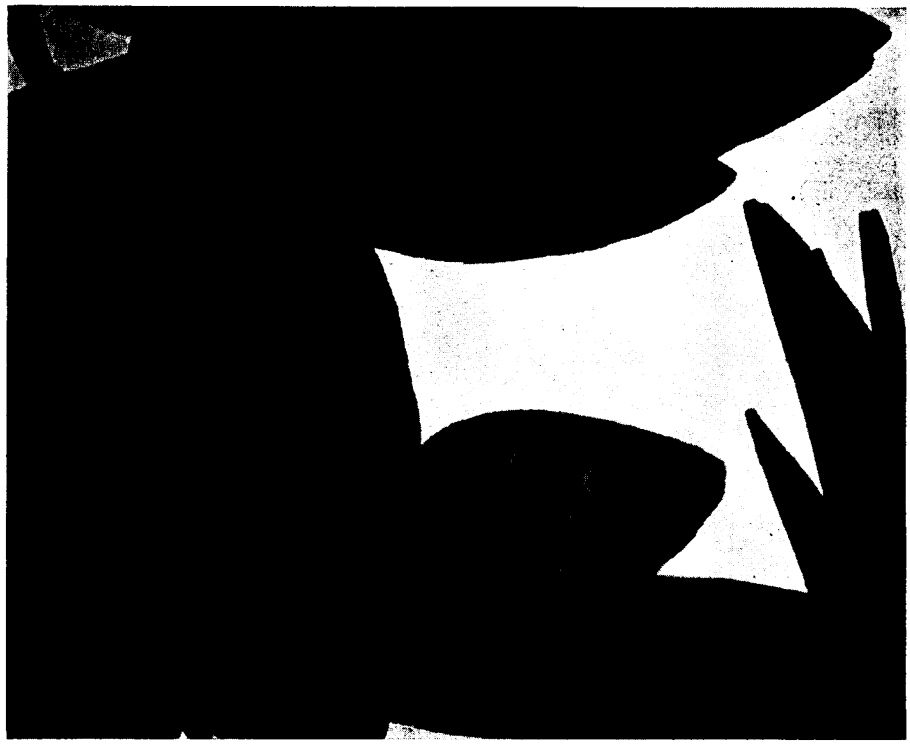
*Science News Letter, July 11, 1942*

MEDICINE—PHYSICS

## Electron Microscope Shows Germ Killers at Work

THE ELECTRON microscope, science's latest weapon for seeing the invisible and peering into the structure of life, now promises to show just what happens to an individual disease germ when it is attacked by a germ-killing agent such as bichloride of mercury.

First studies along this line will be reported by Dr. Stuart Mudd, of the University of Pennsylvania, and Dr. Thomas F. Anderson, of the RCA Manu-



*ELECTRON MICROGRAPH*

***Each of the large dark masses in this picture is a tiny speck of aluminum oxide no larger than the point of a needle. The electron microscope has magnified these specks 40,000 times. When the microscope is changed over to a diffraction camera, the pattern shown in the picture on the front cover of this week's SCIENCE NEWS LETTER is produced by the same substance.***