PHYSICS

From Invisible to Visible

New microscope converts ultraviolet image to a picture in full colors. The colors of the image correspond to the different ultraviolet wavelengths.

➤ A NEW FIELD of microscopic research will doubtless be opened by an ingenious new microscope which converts an invisible ultraviolet image into a visible picture in full colors.

The microscope is the invention of three Russian scientists, E. M. Brumberg, S. Gershgorin, and P. Radchenko of the State Optical Institute of Leningrad, and it is described in the issue of the British journal, *Nature* (Sept. 25), just received.

The colored image has the same advantage that the use of colors has on a map in making the various parts stand out in stronger contrast. It permits also the use of ultraviolet stains to make visible details that would otherwise be invisible, just as the biologist now uses visible stains with the ordinary microscope for the same purpose. This is of great importance not only in biology but also in micro-chemistry.

The colors of the image correspond to and are an index to the different wavelengths of the ultraviolet light used to illuminate the object. The image is thus shifted in wavelength from the ultraviolet to the visible.

Ultraviolet light has long been used in high-power microscopes because its short wavelength permits smaller details to be revealed than would be revealed by the longer waves of visible light. But the image, being invisible, had to be photographed or caught on a fluorescent screen, and gave, of course, the ordinary black and white photograph or a one-color image.

To obtain a colored picture, a sort of ultraviolet version of three color photography was devised. The object was photographed with three different wavelengths of ultraviolet light, and the three negatives were then reproduced with the aid of red, green and blue light. The combination gives all the other colors.

To obtain a directly visible image without the use of photography the images given by the three ultraviolet wavelengths were thrown on a screen covered with three fluorescent substances which respond to the three ultraviolet radiations with red, green and blue light respectively.

In a later form a white fluorescing screen was used and the colors were given by an arrangement of rotating disks and light filters.

All this would have been quite easy to accomplish but for one thing. No microscope objective existed that could take care of the large range of ultraviolet wavelengths required. Existing ultraviolet microscopes use monochromatic or one-wavelength light, for the reason that it is impossible to make a satisfactory achromatic lens for ultraviolet light.

An uncorrected lens used with visible light produces rainbow-colored fringes around the image, as can be seen when you form an image of the sun with a magnifying glass. With ultraviolet light of many wavelengths similar fringes are formed, giving a blurred image which is quite useless.

To overcome this difficulty and put the method into successful practice, a brand new microscope objective had to be devised and this was done. It is an ingenious combination of tiny concave and convex mirrors, for the mirror has no chromatic abberation. For this reason, too, the mirror has largely supplanted the lens in our great modern telescopes.

Science News Letter, December 4, 1943

PHOTOGRAPHY

Exact Location of Aerial Photographs Now Possible

➤ 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 catalog of the stars makes it possible for men who know nothing about astronomy to establish the exact position of the scene.

Science News Letter, December 4, 1943

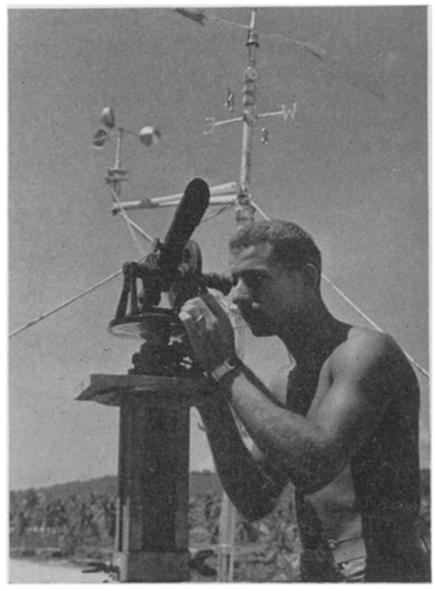
METEOROLOGY

Tree Hut Houses Marines' Aerographical Workshop

See Front Cover

➤ MARINE aerographers, who make balloon, radiosonde and other observations of the earth's upper atmospheric layers for information needed by the air forces, sometimes work in unusual places. One such scene is shown in the official U. S. Navy photograph, taken on the island of Espiritu Santo in the Pacific, reproduced on the cover of this SCIENCE NEWS LETTER. The aerographers carry on their work in the hut ingeniously built in the fork of a tropical tree.

Science News Letter, December 4, 1943



WEATHER WATCHER—A Marine aerographer is shown here working with one of his meteorological instruments on the Pacific island of Espiritu Santo.