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The Infra-Red Ray and the Submarine

To the Editor of the SCIENTIFIC AMERICAN:

In the November 3d issue of the SCIENTIFIC AMERICAN we read a letter referring to our article "Air Transparency for Infra-Red Rays," published in the December 26th, 1914, issue of the SCIENTIFIC AMERICAN; the author of the letter wishing to know whether the greater transparency of air for red and infra-red rays could be used for the detection of submerged submarines.

To this query we beg to answer that, while the transparency of air for radiations increases from the ultra violet to the infra-red, a very different law holds good in the case of water: Abney and Festing (Philosophical Transactions. 172 p. 887 1882), have shown that, with the exception of a small region in the neighborhood of 1,000 A. U., for which water remains transparent, the infra red and even the extreme red radiations are more absorbed than any of the visible radiations.

GUSTAVE MICHAUD.

J. Fern. TRISTAN.

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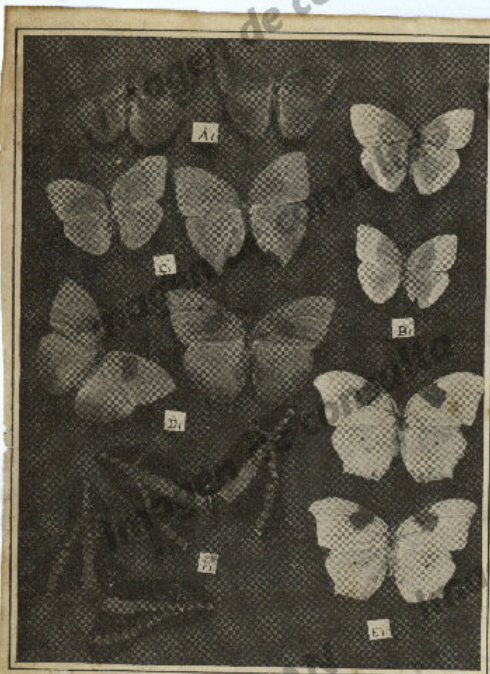
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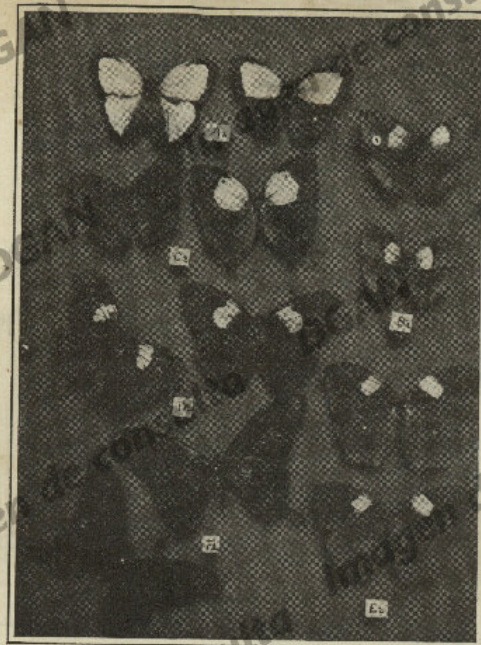
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Photograph No. 1. Made on an orthochromatic plate with weak yellow screen, showing the relative luminosity of colors about as the eye sees it



Photograph No. 2. Same subject as No. 1. Photograph made in ultra-violet light with Foucault's silver film, deposited on a quartz lens



Photograph No. 3. Same subject as No. 2. This photograph was made in infra-red light with Wood's filter, or sensitized plates

A 1.—*Phoebis Argante*; B 1.—*Rhabdodryas tite*; C 1.—*Phoebis rurina*; D 1.—*Callydrias philea*; E 1.—*Anteos chlorinde*; F 1.—*Papilio* sp.

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Effect of Ultra-Violet Rays on the Eye

THE peculiar luminosity of the eyes of animals at night has long been an object of interest, and there are countless allusions to it in the literature of ages. It is very recently, however, that attempts have been made to find a scientific explanation for the phenomenon.

In June, 1913, Prof. Bugniou of the Vandois Society of Natural Science, advanced the following hypothesis as an explanation: "May we not suppose that certain obscure rays are transformed, by the effect of a chemical action, into visible rays at the instant of reflection from the depths of the eye? It is a fact that the eyes of nocturnal animals—mammals, birds, insects,—exhibit a very beautiful luminosity in certain circumstances, although the lamp which illuminates them may appear to be shining very feebly."

The *Revue Scientifique* (Paris), of August 7th, quotes these words and adds a description of the very curious experiments as to the effect of ultra-violet rays on human and animal eyes made by two Costa Rican professors, Mr. G. Michaud and Mr. J. E. Tristan. In

a perfectly dark room a beam of sunlight was allowed to enter after being filtered by the so-called Uviol filter invented by Zeiss. This is composed of a cell of Uviol glass containing a solution of copper sulphate and a pellicle colored by nitroso dimethyl aniline.

When the sheaf of ultra-violet rays thus obtained was allowed to fall upon the eye of an animal in the dark room, a startling effect was produced. The pupil of the eye was sharply defined in luminous green against the violet-black background of the iris. This was observed in human beings as well as in dogs. "This curious appearance of the eye is probably due to the fluorescence of one of the external media of the eye, perhaps the purple of the retina, and also to a very high degree of absorption of the ultra-violet rays by the iris, whose pigment in this case plays the same protective rôle as that of the pigment of the skin." The same observers have already demonstrated that if a white man, a negro, and an Indian be photographed with an objective covered glass, there is no appreciable difference in the white, black and red skins in the degree of absorption of the ultra-violet rays comprised between 3,160 W A and 3,260 W A, the white skin looking as black as the red and black skins.

In performing the experiment referred to above the "eyes like green carbuncles," it is necessary to remain in the dark room for 15 minutes previously.

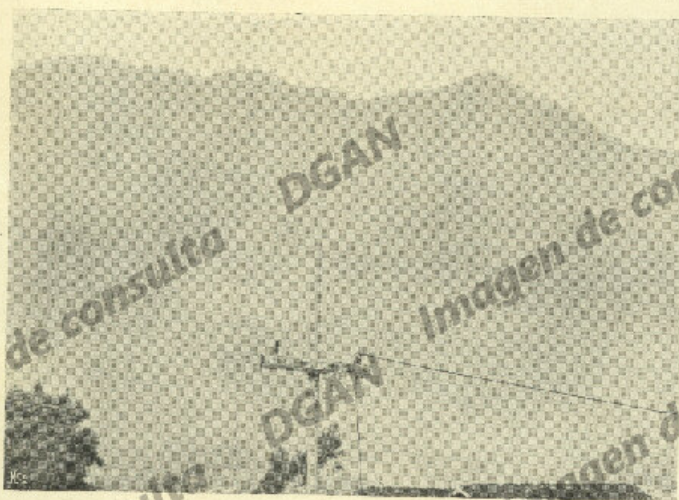


Fig. 1. — Le Mont Escasu vu de San José (Costa-Rica).
Photographie faite sur plaque orthochromatique.

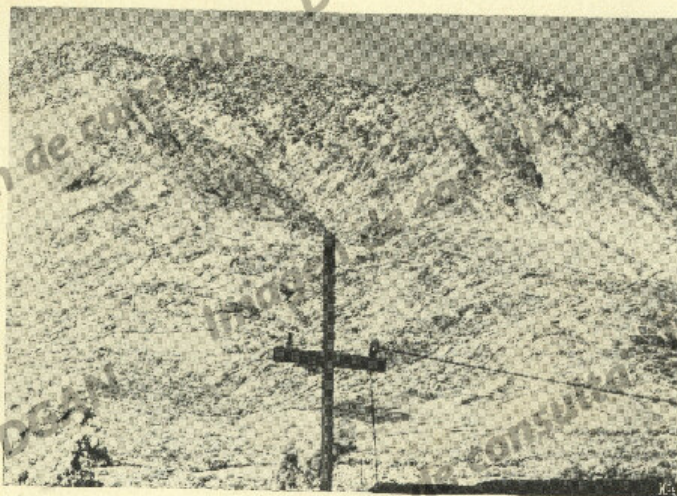


Fig. 2. — Même photographie faite en lumière infra-rouge
avec l'écran chrysoidine-vert de méthyle-vert naphtol.