

BOTANY—ROENTGENOLOGY

New Beauty

Penetrating X-Rays Search Out Previously Undiscovered Grace and Delicacy in Shadow Photographs of Flowers

By DR. FRANK THONE

See Front Cover

X RAYS have been used for a number of things since the turn of the century when they first found employment in searching out bullets and broken bones in the frame of suffering humanity. Dentists seized upon them eagerly. Plumbers use them to hunt for lost pipes in old houses; machinists and metal workers to show up hidden flaws. Archaeologists X-ray mummies before they unwrap them. Prison wardens find saws and files with them, hidden in innocent-looking gift packages sent to prisoners. X-rays aid customs officers in thwarting would-be smugglers. The catalog of applications of X-rays has become almost endless.

And now they invade the field of art, as instruments for a new expression of beauty hitherto hidden in the heart of things. X-ray photographs of flowers are being made by a very few persons at present, but it is safe to venture the guess that once the possibilities of this relatively new medium are better understood there will be a whole school of X-ray artists. We may even live to see schisms and controversies—classicists and romantics, realists, modernists, super-extra-ultra-futurists, all having a grand time arguing with each other as they do in the already established fields of art.

Few in Field

But at present the artist's task of finding beauty and bringing it to the eyes of the world is entrusted to the hands and heads of too few X-ray pioneers to permit time or give cause for such rivalries. They all have plenty to do, opening up the great new field of X-ray art. Plenty of work, and plenty of recognition for all, as yet.

Prominent in the ranks of X-ray artists is a young California woman, Miss Francis Mildred Davis, of Santa Monica. Miss Davis earns her living with the X-ray, too, in a medical and dental consultant practice. Of course, there's nothing uncommon in this pulling of two bows with one string: many a cartoonist paints in oils on the side; many a

journalist writes novels or plays—successfully, too. It's all a matter of making full use of the particular skill you have learned.

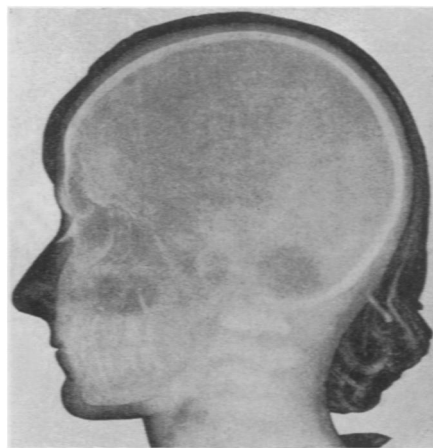
Miss Davis did not start as an X-ray technician. Her first experiences were as a photographer. But with surface photography she couldn't get everything she wanted, especially in pictures of flowers. So she learned X-ray technique, and eventually set herself up in practice. On the side, she kept up her artistic enterprises—and a lot of things besides.

Telling of her experiences to a group of businesswomen, she said: "It was a lot of fun going into business for myself and owning my own X-ray machine. I could play all I wanted to and look through anything I happened to get curious about—why my fountain pen would not work, if my new dress were pure silk or had a 'filler,' how a snake could swallow something larger than itself, was my girl friend's engagement ring genuine or glass, how many kittens was the cat going to have and was my golf score ruined because the ball's core was off center."

Flowers First

But always her interest remained with her first love, the flowers. The calm beauty of the Easter lily, the exotic delicacy of an orchid, the fantastic thick joints of a cactus contrasting with the ethereal, almost ghostly, loveliness of its blooms—these were the things she judged with swift and discriminating eye, and transferred to photofilm in new guise by means of the penetrating rays from her tubes.

The medium, like all artistic media, has its own necessary conventions. All X-ray pictures are like shadows on the wall—they are silhouettes. With an ordinary camera you take the light as it is reflected back to your lens from the subject, and so can picture things in the round—a whole group of people, a whole basket of flowers. But with X-rays you shoot straight through your subject, and the film is on the other side. The images fall on it like shadows. So you can have no mass effects. You must use a single object, or a very few, and there must be



"CANDID"

A revealing self-portrait of Miss Francis Mildred Davis

little or no overlap. The end result has something of the perspectiveless character of an Oriental painting or mosaic.

But it is not merely the selection and arrangement of the flowers or other things to be pictured that tests the skill of the X-ray artist. The arrangement of the single subject is as difficult as its placing in a group, if more than one is taken at a time.

This is evident even on the surface, for of course your flower must present a good general silhouette, just as though it were being shown in outline only. However, this is only the beginning of the matter, for if you are using X-rays you have to remember the internal structures as well, and what kind of a silhouette *they* will present when the rays project them against the exterior outline.

Difficult Subject

In X-raying an orchid Miss Davis found her skill subjected to a severe test. Orchids are about the most complicated of all flowers, both in external appearance and internal structure. (See front cover for illustration.)

"The orchid," she says, "looked like a big ugly spider in a front view and I was about to give it up when the sixth trial turned out with graceful lines to make a well balanced picture."

Another consideration, perhaps calling for the highest technical skill of all, is the matter of bringing out structural details. One very important factor in this, possibly the most important, is the

quality of rays used. There are rays and rays, just as in visible light there are different colors and intensities of radiation. "Hard" rays give very different effects from "soft" ones, and the length and intensity of exposure have to be adapted very carefully to the thickness and density of the plant tissue being photographed.

Cactus Poses

A particularly difficult subject from this angle was the cactus which Miss Davis X-rayed. Its leaf-like stem-joints are thick and fleshy, its flowers almost ghost-like in their delicacy, with petals wraith-thin and scores of thread-like stamens. Yet by choosing the right kind of rays and the right conditions of exposure it was possible to obtain a picture that catches the spirit of the flowers and the flesh of the stems, and even shows the central column of water-conducting vessels and its branches that run out to the stem-notches.

Somewhat on the same order, though with less wide contrast between thickness of parts, was the problem of the begonia. The petals of this flower were widely expanded and quite thin; the leaves were thickish and much tougher than the petals. Less difficult, in this matter of consistency-contrasts, were the Easter lily and the orchid already mentioned, and also the calla lily. Miss Davis

was especially successful in these three with the venation of both leaves and floral envelopes.

Miss Davis has treated her own head as though it were one of her flowers, taking a profile view with the X-ray, and then giving the film special treatment where the exterior, non-bony parts had been dealt with over-severely by the quality of rays necessary to bring out the outlines of skull, teeth, neckbones, etc. She says it is her favorite portrait.

It must have taken more than a little courage, for a girl to stand herself up for such a super-candid-camera shot. But she passes the test all right. And there's another thing you can see at a glance, that isn't so easily evident from an ordinary photograph. The girl has brains!

Inside Boxes

A striking example of Miss Davis's wide-ranging curiosity about the insides of things is furnished by two pictures of a small medicine cabinet, containing rolls of bandage, an insulin syringe, and some miscellaneous bottles and boxes of medicines and pills. One picture is an ordinary photograph showing their outsides. Below is an X-ray photograph showing their insides: The adhesive tape on its spool, the syringe with its needle, the droppers in some of the bottles, etc. Striking is the view of a bar of Castile soap, which shows both sides at once;

the lettering stamped in the back has to be read reversed, as a printer reads type. (See page 332 for photograph.)

X-ray photographs of plants, such as Miss Davis takes, have possibilities outside the field of art. Already botanists have shown interest in their potentialities in the study of plant development, diseases, etc. And a tree surgeon, asked to treat a tree that had already been filled with cement, requested her to take an X-ray of the trunk, as a dentist might take of a suspicious tooth, to see whether new decay were starting under the old filling.

A possibility not yet explored, in the field of X-raying plants, is the testing of imported bulbs for worms or other pests that might be hiding in them. The depredations of such forms of animal life, as well as of insects, can readily be detected in plants by means of the rays. The only other way of seeking them, in many cases, is to cut the bulb to pieces.

Bud Unfolding

More strictly scientific in its application would be the taking of series of X-ray pictures of the same bud or other plant part, as it unrolls into a flower, or opens up into a leaf, or develops into a new branch. You can see several stages of flower development in the four shown in the lily picture. (See SNL, March 27, cover.) It should be possible to show all stages of development in a single flower, by taking as many as you choose, at appropriate time intervals.

There is even the possibility of getting X-ray motion pictures of such a development, though this would be unusually difficult. Since all X-rays are shadow-pictures, taken full size of the object, only very small plant parts could be "shot" directly on the frames of motion picture film. But if anyone wanted to take the pains (and go to the expense) of first making an X-ray picture at full size every few minutes during the opening of a flower, and then photographing these pictures, one by one, on a movie film, a picture could be obtained that would really be something new under the sun. It would be a film of real scientific value as well as a work of art of high and unique beauty.

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Science News Letter, May 22, 1937



THE BEGONIA

An old favorite potted plant in a new aspect.

The word bird comes from Anglo-Saxon bridd, and was originally the brood or young of any animal—wolf cubs, for instance, being wolf-birdis.



OUTSIDE AND INSIDE

A shelf of medical sundries, such as might be found in almost any household, and the same shelf, as the X-ray sees it. Note that both sides of the bar of castile soap are visible at the same time: the lettering on the back side is reversed.

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pig opened the box. This forced the pig to come to a decision and act on it. But the effort to do this was evidently too much for the pig and within a few days it developed neurotic symptoms. Since its whole disposition has changed and from being friendly and docile it became morose and hostile.

Because the pig or sheep has a simple way of life, uncomplicated and unobscured by the ethical standards and social traditions of human life, it provides an ideal test subject, Dr. Liddell pointed out, for analyzing the essential conditions that produce nervous strain and derangement.

Use Little of Brain

The very small part of man's relatively large brain necessary for intellectual processes, or what is commonly called thinking, was described by Dr. Leland B. Alford of St. Louis.

This might be called the seat of the intellect or the brain center for thought except that such psychological terms have gone out of fashion. It is located,

in right-handed persons, at the center of the left side of the brain.

Any other part of the brain can be injured or removed without interfering with intellectual processes, Dr. Alford and other scientists have found. Dr. Alford illustrated this point with several case histories, among them that of a 60-year-old business man. Apoplexy left this man almost completely paralyzed and unable to speak except for one expression of two words and the ability to swear when angry. In spite of this, the patient for two years has been conducting his business and managing several farms through an agent who is able to make out the patient's incoordinated gestures. Although the patient could not write his name upon request, he recently drew a plot of some farms without error. His mentality is excellent, Dr. Alford said, though X-ray pictures show a large part of his brain has been injured.

This and several other cases show that, contrary to general opinion among psychologists, different parts of the brain are responsible for speech and for thinking or intellectual processes. The brain area concerned with speech can be injured without affecting mentality.

The cortex or outer part of the brain is not so much concerned with thinking processes as psychiatrists have believed, Dr. Alford said.

Calcium for Hallucinations

Discovery that calcium, harmless chemical normally present in the body, can be used to calm the excitement and banish the hallucinations of mental disorders was reported by Dr. R. W. Robb of the Osawatomic (Kansas) State Hospital.

Scientists have known many drugs that would produce hallucinations but very few, other than narcotics such as morphine, have been known to relieve hallucinations, Dr. Robb pointed out.

The fact that lack or deficiency of calcium in the body causes nervous irritability is well known. Dr. Robb discovered its soothing effect when he gave it to a patient in the course of certain tests he was making. This patient's improvement led him to try it in 40 other cases of long standing. All were improved by the weekly injections of calcium.

Science News Letter, May 22, 1937

Soviet health officials are to study medical lore of India and Tibet, to see whether certain native remedies may have scientifically sound value.

RADIO

Hope to Predict Radio Conditions in Advance

HOPE that scientists will be able to predict radio transmission conditions a month or more in advance was held out by A. K. Ludy of the U. S. Coast and Geodetic Survey and A. G. McNish of the Carnegie Institution's Department of Terrestrial Magnetism. To correlate more closely the activity of the earth's magnetic field with radio transmission, these scientists are compiling a twice daily measure of the magnetic conditions as observed at seven world-wide stations. These "character figures" will be distributed by Science Service throughout the world and are expected to reveal practical useful relations between radio and earth's magnetism.

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electricity and repeats the process at regular intervals. Thus is produced a rapid succession of electrical pulses which are sent through a radio tube amplifier to a loud speaker. If the pulses come 256 times a second, for example, the note middle C is produced by the instrument.

The frequency of the pulses and therefore the pitch of a note is determined by the value of electrical resistance through which the condenser discharges, just as the speed of filling a water tank depends on the size of the pipe through which the water flows. Movement of the fingers on the strips atop the little instrument box changes the electrical resistance and, hence, the tone produced.

"Admittedly," said Dr. Danforth, "no electrical device at present available can imitate all the effects available in conventional instruments. But electrical systems can simulate these effects and, moreover, can produce effects which the conventional instruments cannot. Among these are unlimited volume, unlimited range of pitch, wide variations in timbre and sensitivity of the instrument to a very light touch. Acceptance of these features must await the day when trained composers are moved to weave them into artistic creations."

Science News Letter, May 22, 1937

Guatemala plans to use airplanes to spray banana plantations.

The decimal system was used in India about 2,700 B. C., judging by discovery of a regularly marked measure.