of folding in the bud, whereby one side is deprived of light.)

In the vinous series (red on primrose) we have corresponding forms, one (var. *vinosissimus,* nov.) having the rays entirely dark wine red.

On the whole, and in view of the fact that there are no wild species of sunflowers with red rays, it seems reasonably certain that the red represents a "positive" variation; but, as with color variations in animals, there may well be also a diluting or inhibiting factor, which when present sensibly modifies the expression of the factor for red. It is not necessary, however, to suppose even this, since various degrees of stimulation might equally bring about the results. Miss Wheldale, describing analogous cases in chemical terms, suggests that if the local oxidizing capacity of any tissue is greater than its reducing power, this is indicated by the local appearance of anthocyanin; if the reducing power is greater than the oxidizing power, no pigment results. Thus, she says, the *loss* of a dioxidizing factor would produce color, as may be the case in the red-leafed beech.

Duggar found that in the tomato a red pigment (lycopin) and a yellow (carotin) both occur. In yellow varieties only the carotin occurs; but in genetically red varieties a high temperature precludes the formation of lycopin, and yellow fruits result. In the case of the red sunflowers, the red color very commonly fades more or less after the flowers open, probably in part owing to growth without corresponding increase of pigment, which thus becomes diluted. Dr. J. R. Schramm of the Missouri Botanical Garden informs me that in the hot summer of St. Louis this fading is excessive, good red forms becoming practically yellow before they are over. Also, on comparing notes with Mr. D. M. Andrews of Boulder, Dr. Schramm observed that roses with pale tints are much less colored at St. Louis than in Colorado.

With regard to a possible "dilution" factor, it is to be noted that in the series of yellow and orange pigments, which occur in visible particles, dilution can be seen, as explained in SCIENCE, August 21, 1914, p. 284. More recently we have obtained the fourth possible combination of this series, dilute orange, in plants of the *bicolor-vinosus* type.

In the paper just quoted, irregularities in the distribution of anthocyan pigments were described. I have now to record a similar peculiarity in which the solid pigments are involved. An F_2 plant from very pale *Helianthus cucumerifolius* $\times$ *H. annuus coronatus* had broad orange rays, with about the basal half strongly washed with chestnut. A single ray, however, was primrose color, slightly streaked with vinous. This ray had an orange longitudinal stripe on the under side. The difference here is only in the yellow, the difference in the red (chestnut and vinous) being entirely due to the character of the background.

A few words may be added regarding gigantism. In 1913, and again in 1914, there appeared among our red sunflowers a certain number of gigantic plants, fully ten feet high, nearly always with yellow rays. These numbered perhaps about 25 per thousand plants. The occurrence of these plants this year has been especially striking, in a large group of very good reds. One occurred, blooming very late, in the series of F_2 plants from *primulinus* $\times$ *coronatus,* which gave us our first vinous. Have we here a sort of jack-in-the-box effect, some inhibitor of growth being lacking in a certain number of cases? The *coronatus* we used had some "Russian" (var. *macrocarpus* D.C.) in its ancestry, which might bring a recessive tendency to gigantism. These large plants, however, were much branched and had dark discs.

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X-RAY DIFFRACTION PATTERNS

THE diffraction patterns discovered by Friederich, Knipping and Laue have been shown to be due to the arrangement of the atoms of crystals into planes. These patterns are used to indicate the spatial distribution of atoms in crystals.

An experiment illustrating these patterns can be very easily shown to an audience by permitting a beam of light to enter a dark room and fall upon the face of a diamond such as used in rings. The diamond is held a few inches from the hole through which the beam of light enters and upon this screen is thrown a large number of bright spots very closely resembling the X-ray patterns. By moving the diamond to and fro from the screen or by rotating it the form of the pattern can be altered. The portions of rays that enter the diamond and are reflected from the rear surfaces may show the spectral colors.

This experiment can be demonstrated to a class very easily and should be of some use in explaining crystalline structure.

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A NEW METHOD OF PREPARING SPIDERS FOR EXHIBITION IN MUSEUM GROUPS

The preservation of spiders for museum purposes has always presented serious difficulties on account of the fact that the abdomens of the Arachnids lose their shape and color on drying. The usual method of preservation in liquids is of course out of the question when spiders are to be used as part of a faunal group. By preparing an artificial abdomen of wood and fastening it to the cephalothorax of the actual specimen I have found it possible to produce an imitation which can scarcely be distinguished from the living animal.

A large number of specimens of the desired species must be collected, to allow for the selection of full-grown animals. It is advisable to keep them alive for several days and to supply them with plenty of food; as it often happens that either conditions of the weather do not allow an ample food supply or else the insect may be abnormal on account of a recent or impending molt. In such instances the abdomen may often be not quite half the size of that of a well-fed specimen or one filled with eggs.

After the insect body is fully developed, the imitation abdomen must be made before killing. For this purpose a piece of light soft wood is used, carved in the exact form and size. Then the coloration is put on in precise shade and pattern.

Next the spider is killed. The best way to kill it is by putting it in a corked bottle containing cyanide. According to the strength of the cyanide and the size of the spider this takes from one to two hours. If the length of time is not sufficient the spider may later recover. After being sure that the spider is dead an insect pin is driven through the center of the cephalothorax and the insect fastened into a cork sheet, the legs being put in position and supported with pins. After being prepared in this manner, the insect must be kept in a warm and dry place, protected from dust.

After a few days, when the insect is thoroughly dry, the shrunken abdomen may be carefully removed and replaced by the wooden model.

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SCIENTIFIC BOOKS

Igneous Rocks and Their Origin. By Reginald Aldworth Daly, Sturgis-Hooper Professor of Geology, Harvard University. New York and London, McGraw-Hill Book Company, Inc., 1914.

In a previous publication Professor Daly expressed the opinion that "to be more productive geology should be more speculative." In this sense the author has become highly productive. In the introduction to his book on "Igneous Rocks and Their Origin," which is an elaboration of his previous publications, he qualifies the estimate commonly put on the value of experimental research in physics and chemistry by remarking that, while the mathematical methods employed are precise the premises relied on are not. How much lower value then must be placed on the results of a procedure in which both the premises and the mode of reasoning are seriously at fault!

The author pays a just tribute to the effectiveness of a regulated imagination, but fails to warn the student of the havoc which may be wrought by a badly regulated one, which like a defective aeroplane may bring destruction not