RED COLOR IN APPLES[1]

IN 1936 the authors[2] published a paper identifying and describing the chemical nature of the red pigment of the Winesap apple, and a few months later Sando[3] confirmed these findings with the Stayman and Jonathan varieties. The red pigment of three varieties thus has been shown to be idaein, a glycoside which yields cyanidin and galactose on hydrolysis.

At the time the pigment was identified the work was carried out of the laboratory into the orchard in an effort to study the various factors involved in its formation and, if possible, to influence the color produced in certain varieties of moderate or low color. In the summer of 1936 we were fortunate in finding a substance which seemed to enhance the red color of the Stayman, and subsequent work in each succeeding summer has confirmed this result and developed a method of treatment which has been more or less effective in improving the red color of several varieties, including Stayman, Rome, Delicious, McIntosh, Jonathan and others. Under certain conditions even such varieties as Golden Delicious and Grimes Golden, which normally carry little or no blush, were affected by the treatment in such a manner as to increase *slightly* the amount of blush present on the fruit.

We are now conducting trials for the fourth consecutive season and believe that the tests have gone sufficiently far to indicate the general trend involved and to justify announcement of the method employed. The effective agent appears to be the thiocyanate ion applied in combination with any one of a number of substances representing the positive group. The materials are applied in relatively low concentration, as a spray, to the foliage and fruit on the tree during the growing season. Up to this year all treatments have been applied with a hand-sprayer, but at present the university power-spray outfit is being employed on somewhat larger-scale operations than have been tried heretofore. Many important questions remain unanswered and final evaluation of the procedure including practical application, if any, must await future work. This notice is being written to invite the attention of any or all interested in the improvement of color in fruits.

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A FIRE-FLY "SPINTHARISCOPE"

IT must be well known that the lantern of a fire-fly, teased by being held with the fingers, emits irregular flashes from minute point-sources in the lantern which follow the normal flash, the light of which fills the entire lantern. I am wondering, however, if the very astonishing spectacle presented by a fly which has been bitten by a spider has been described. Within a few minutes after a few "nips" have been made by the spider, if the fly is removed from the web, the lantern will be observed to glow with a faint green light which shows the same "shimmering" quality as the radium paint on the dial of a watch. Examination with an ordinary hand magnifying glass, of moderate power, shows the lantern filled with bright points of light, which at first sight appear to be in rapid vibratory motion, and at the end of half an hour we have a seething cauldron of hundreds of bright points, dancing and flashing, and giving an almost perfect picture of a screen of zinc sulphide under a terrific bombardment of "Alpha" particles (spinthariscope). The phenomenon persists with undiminished intensity for 48 hours but finally dies out, the fly apparently having returned to normal. The spinthariscope effect is frequently accompanied by an occasional normal flash, which ceases if the fly is decapitated, though the other effect continues.

The normal flash of the lantern is obviously due to the simultaneous excitation of all the luminous centers by nerve impulses from the brain, but the scintillations persist even after the lantern has been severed from the body. Both types of illumination cease if the fly is placed in a narrow glass tube through which a stream of carbon dioxide is flowing. I have produced the spinthariscope effect by inoculations with 1:1000 solution of snake venom, but in this case the fly did not recover.

Under a microscope, with a low power objective, the individual flashes of green light are seen against a black background and the strong vibratory movement, seen with a hand magnifier, appears to be due chiefly to the quenching of a flash at one point accompanied by the successive flash of a luminous center in its immediate vicinity. My impression is, however, that I have seen single flashes quiver, though in this case it may be merely the spreading of the chemical reaction which produces the light, from one part of a cell to another. The phenomenon, seen with the microscope, is really an amazing sight.

The spiders were, in most cases, small ones found in window webs, with bodies not much larger than a grape-seed, and they usually made their first bites on the leg joints of the fly. The sparkling green flashes appeared first along the upper edge of one or both of the two lanterns, sometimes on one side only. The phenomenon then spread rapidly throughout the entire volume of the lantern. It seems possible that some

[1] Published with the approval of the director of the West Virginia Agricultural Experiment Station as Scientific Paper No. 224.

[2] *Jour. Amer. Chem. Soc.*, 58: 1511–14, 1936.

[3] *Jour. Biol. Chem.*, 117: 45–56, 1937 .

information about the nervous system of the fly might be gained by recording the position of points inoculated by the spider and the point or points in the lantern at which the scintillations first appear, but the problem is one for a biologist rather than a physicist.

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THE FIRST ARTICLES ON GROUP THEORY PUBLISHED IN AMERICA

IN 1878 the first volume of the *American Journal of Mathematics* was published under the auspices of the Johns Hopkins University. This volume was edited by J. J. Sylvester (1814–1897) and contains two very short articles written by A. Cayley (1821–1895), who was then professor of mathematics at Cambridge University, England, and one of the most eminent mathematicians in the world. Each of these two articles covers less than three pages, and the former was largely embodied verbatim by its author in a longer article which appeared during the same year in the *Proceedings of the London Mathematical Society*. It contains the absurd statement that there are three groups of order 6, notwithstanding the fact that about twenty-four years earlier A. Cayley stated correctly that there are only two such groups, in the *Philosophical Magazine,* Volume 7, page 40 (1854).

The two articles by A. Cayley to which we called attention in the preceding paragraph seem to be the earliest articles on group theory published on the American Continent, but it is not true that the *American Journal of Mathematics* was the first mathematical journal founded on this continent, as stated by H. Weyl in his "The Classical Groups," page 27 (1939). The most conspicuous exception is *The Analyst,* founded at Des Moines, Iowa, in 1874, which appeared in ten volumes and was noted in the "Jahrbuch über die Fortschritte der Mathematik" for 1875 and later. It contains articles by G. W. Hill, S. Newcomb and other well-known mathematicians of that time and was the forerunner of the *Annals of Mathematics,* which is now published by the Princeton University Press.

The fact that no article on group theory was published in America before 1878 throws much light on the early history of mathematics in our country, since articles on this subject began to appear in Europe about one hundred years earlier and soon attracted considerable attention on the part of various European mathematicians living in different countries. This interest was greatly stimulated by the work of N. H. Abel (1802–1829) and E. Galois (1811–1832), both of whom died early but attracted much attention by their tragic lives and fundamental discoveries at an early age. The work of these men was published in Europe about fifty years before work along similar lines was published in America and the latter work had actually been done by a European mathematician and was only published in our country. It took about ten years more until such work was both accomplished and published in this country.

At present important advances made in Europe soon attract attention in America so that the slowness with which American mathematicians entered upon the study of group theory is in striking contrast with present conditions and throws light on the isolation of early American mathematicians. Their interests were for a long time practically confined to the writing of elementary text-books which were frequently based largely on the European text-books which had been in great favor but confined themselves to the treatment of elementary mathematical subjects. About half a dozen mathematical periodicals were published in America before the *American Journal of Mathematics* was established, and some of them had contributors who resided abroad, but the *American Journal of Mathematics* was the first to publish articles by eminent mathematicians residing abroad.

Just as in the case of the first article on group theory published in America the first text-book on this subject to be thus published was written by a mathematician residing in Europe. This text-book appeared in 1892 under the title "Theory of Substitutions" and was a translation of a work by E. Netto. This was about twenty-two years after a similar work had appeared in Europe under the title "Traité des substitutions," by C. Jordan. Enough may have been said to show how the backwardness of the early mathematics in America is reflected in the history of one advanced subject and to emphasize once more the rapid forward strides made by American mathematicians in recent years. The developments in group theory represent some of the most conspicuous advances, especially in the central and the western parts of our country.

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SCIENTIFIC BOOKS

AN ANECDOTAL HISTORY OF ELECTRICITY

Sparks, Lightning, Cosmic Rays. By DAYTON C. MILLER. ix + 192 pp., 183 illustrations. The Macmillan Company, 1939, $2.50.

THE author describes his book as an anecdotal history of electricity. It is based on the Christmas Week Lectures for young people by the Franklin Institute in December, 1937. Both the book and the lectures