rewarded inventiveness and creativeness, producing new products and processes which have placed the United States far ahead of other countries in the field of scientific and technological endeavour; (2) stimulated American inventors to originate a major portion of the important industrial and basic inventions of the past hundred and fifty years; (3) facilitated the rapid development and general application of new discoveries in the United States to an extent exceeding that of any other country; (4) contributed to the achievement of the highest standard of living that any nation has ever enjoyed; (5) stimulated creation and development of products and processes necessary to arm the nation and to wage successful war; (6) contributed to the improvement of the public health and the public safety; and (7) operated to protect the individual and small business concerns during the formative period of a new enterprise.

In view of a report so favourable to the present American patent system, it is of interest to note that the numerous important technical changes recommended by the Commission are almost uniformly of such a nature as to bring the American patent system more closely into accord with that of Great Britain.

TRICOTYLEDONY

By H. E. HOLTORP

TRICOTYLEDONY is well known as a sporadic occurrence in dicotyledonous plants, but it has apparently been treated in the past as a rare and somewhat trivial abnormality. I have been unable to trace any evidence of its being regarded as heritable.

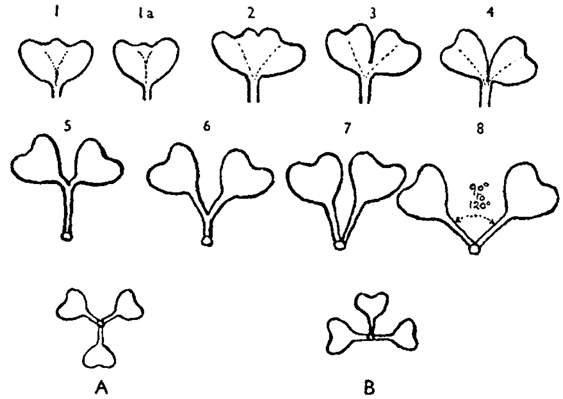
During the last few years I have collected tricotyledonous seedlings from a number of plants, the more important including various brassicas, wallflowers, *Dianthus sinensis*, carnations and carrots. These are mainly biennials, but I have also observed tricotyledony in certain annual dicotyledonous weeds and have more recently secured tricotyledonous tomatoes.

The observations, which I shall describe, have been made chiefly on brassicas (cabbage, savoy, cauliflower), for here the cotyledons are distinct in shape, substance and structure from the true leaves, even to casual inspection. This advantage is shared by tomatoes and carrots, but my investigations with these plants have not yet progressed so far.

I grew the first few tricotyledonous brassicas (generation P) to seed, isolated from other brassicas though not from one another. This seed yielded a considerable number of tricotyls in the S_1 generation. They were not counted, but there is no doubt that the proportion was higher than in the P generation. From this S_1 I selected seventeen of the most symmetrical tricotyls and again seeded them under similar conditions. The next generation (S_2) contained not only some hundreds of tricotyls, but also eighty tetracotyls—a form of which I had not seen a single example in thousands of brassica seedlings before this generation. Again I have selected and planted, in separate groups, the best tricotyls and tetracotyls for an S_3 generation in 1944.

It is thus clear that tricotyledony is a heritable character and one which can easily be changed by selection. Dicotyledony must then be adaptive and maintained by natural selection.

Pleiocotyls are not alike in form, and are not all to be traced to the same kind of variation in the seedling



structure. Seedlings must be grown to a considerable size before adequate description and classification are possible.

In brassicas I have recorded three main types of tricotyledony, each subject to its own characteristic variation, under the headings: (*a*) *simple fission*, (*b*) *twinning*, complete and incomplete, and (*c*) *supplementation*.

Fission. This appears as simple splitting of a cotyledon, from the notch in the terminal edge along the central vein towards the petiole. The split varies in length, the most extreme case seen being one of two elliptical pieces of tissue with separate stalks joined to form one petiole. Seedlings in this class are viable and grow into healthy plants, but the split cotyledon is always distorted and lags behind its normal fellow in growth.

Twinning. The diagram represents various forms of twin cotyledons and their petioles as found, together with all intermediate forms, in the brassicas. The simplest form (1) is a two-notched broad cotyledon in which the central peak is quite commonly not prominent (1*a*). The mid-vein is noticeably forked. *This form is very common and is the only one which* (except for true tetracotyls) occurs often in both cotyledons of a seedling. The remaining types are not infrequent though the symmetrical tricotyl (*A*) is somewhat rare, just as is a perfectly symmetrical dicotyl.

Supplementation. This variant has been quite common in the progeny of tricotyls after selection. Three main classes have been distinguished.

(1) The seedling is apparently normal and dicotyledonous, but the first subsequent true leaf, instead of being of the characteristic rough type, develops as a third cotyledon identifiable by substance, structure, venation and petiole, and even, in many cases, by its shape. It is, however, never a normal cotyledon, for its shape never changes by growth once it has developed. It grows but little after development, unlike the normal true leaf. This third cotyledon replacing the first true leaf may be (*a*) nearly but not quite a normal cotyledon, (*b*) clearly cotyledonous but incomplete, varying from the major portion of a cotyledon down to little more than the central vein, (*c*) clearly cotyledonous but with one lower quadrant, or perhaps a little more, showing a serrated edge like a true leaf, or (*d*) rarely, with about one half cotyledonous and the other more like a true leaf.

(2) The third cotyledon appears in rare cases in place of the second true leaf, after a first normal true leaf has been produced. It may even appear in place of the fourth leaf after three true leaves. Though

definitely cotyledonous, these were deformed and incomplete. In the case where the cotyledon replaced the fourth leaf, it consisted of a petiole about 3 in. long, bearing a relatively small lamina split down the centre with the two halves divergent.

(3) The third cotyledon is occasionally borne opposite the first true leaf at one node instead of being at a separate node.

Seedlings showing supplementation grow well into good plants. In general, however, fission and supplementation do lead to local malformation, though twinning does not.

Tricotyledonous brassica plants sometimes bear a pair of true leaves at the first node, or the first or second leaf may be incompletely twinned. Similarly in the wallflower, carnation and *Dianthus sinensis*, tricotyledony is often accompanied by the occurrence of three true leaves at the first, and sometimes also at the second, node.

Thus pleiocotyledony in brassicas occurs, as I find it, in several forms, counts of which should be made in the progeny of each type of tricotyledonous parent for the various forms can all be found among the offspring of one plant. I have estimated that the S_2 generation contained 25 per cent pleiocotyls of one kind or another, and a similar percentage has been found in a small test with the tomato. Pleiocotyly in an S_2 of wallflower, however, is as high as 40 per cent. Full analysis, however, involves growing all the seedlings to a size hitherto impossible in the conditions under which I have worked. I hope to obtain improved facilities in the future and so to obtain adequate counts in the selection lines.

I am indebted to Dr. K. Mather, of the John Innes Horticultural Institution, for advice on the interpretation of these observations.

SCIENTIFIC CENTENARIES IN 1944

By ENG.-CAPT. EDGAR C. SMITH, O.B.E., R.N.

AMONG the many men of science whose centenaries occur this year are representatives of England, Scotland, Ireland, France, Belgium, Sweden, Italy, Austria and America. Four hundred years ago, according to Silvanus Thompson, Gilbert was born; three hundred years ago, Castelli, Gascoygne and van Helmont died and Römer was born; two hundred years ago Celsius and Desaguliers died and Lamarck and Mechain were born, while among those who died a century ago were Dalton, Baily, Hope, Henderson and Geoffroy Saint-Hilaire.

On December 10, 1903, the exact tercentenary of the death of William Gilbert was commemorated by a meeting of the Institution of Electrical Engineers held at the Institution of Civil Engineers, at which the Royal Society, the Royal College of Physicians, St. John's College, Cambridge, the cities of Colchester and Westminster and the Société Internationale des Electriciens were represented. The address was given by Silvanus Thompson, who said "that electricians owed an enormous debt of gratitude to Gilbert, who, for them, was pre-eminent among all the great men of Elizabeth's time". The occasion was marked by the presentation to the City of Colchester of a picture representing Gilbert showing his experiments to Queen Elizabeth and her Court. The tomb of Gilbert in Holy Trinity Church, Colchester, gives the year of his birth as 1540, but Silvanus Thompson considered the correct date to be May 24, 1544.

Van Helmont (1577–1644), like Gilbert, was a physician, and for a short time filled a chair at Louvain; but his life was spent in philosophical studies and he was the first to recognize the existence of various aeriform substances to which he gave the name 'gases'. He was born in Brussels but died in Holland. Benedict Castelli (1577–1644) was an exact contemporary of van Helmont, and had the privilege of being taught by, and assisting, Galileo; he held chairs both at Pisa and Rome. William Gascoygne (1612 ?–1644), the inventor of the micrometer and a correspondent of Horrocks and Crabtree, died at about the age of thirty, fighting on the Royalist side at Marston Moor on July 2, 1644. Olaf Römer, the Danish astronomer, was born at Aarhuus, in Jutland, on September 25, 1644, and died at Copenhagen on September 19, 1710. His discovery of the velocity of light was made in Paris, when he was thirty-one; his famous transit instrument was made at Copenhagen, where he held the chair of astronomy. Many of his manuscripts were destroyed in the Copenhagen fire of 1728. The year 1744 saw the death of both Andreas Celsius and John Theophilus Desaguliers. Celsius was born at Uppsala on November 27, 1701. His travels took him to Germany, Italy and France, and then he went to Lapland with Maupertuis to measure an arc of the meridian. According to Cajori, Celsius marked his centigrade thermometer with boiling point as 0° and freezing point as 100°, and it was his colleague Mårten Stromer who inverted the scale. Desaguliers was nearly twenty years senior to Celsius, having been born at Rochelle on March 12, 1683. He was brought to England by his father, a Calvinist pastor who left France on the Revocation of the Edict of Nantes. The child, it is said, was smuggled aboard the refugee ship in a barrel. France's loss was England's gain, for Desaguliers succeeded Keill as a lecturer on experimental philosophy at Oxford, and then in 1713 began his work in London "where," he wrote, "I have with great pleasure seen the Newtonian Philosophy so generally received among persons of all Ranks and professions, and even the Ladies by the help of experiments". At his death, Desaguliers was buried in the Savoy. Of the two Frenchmen, Lamarck and Mechain, the former was born in the village of Bazentin (Somme) and the latter at Laon (Aisne). Lamarck began life as a soldier, and then held a post in a Paris bank. In 1774 he became a keeper in the Jardin des Plantes, and there, for a quarter of a century, he lectured on invertebrate zoology. He died in 1829, blind and poor. Pierre F. A. Mechain was a geodesist as well as an astronomer and hydrographer, and it was while still employed on the extension of an arc of the meridian to Barcelona that he died on September 20, 1805.

Coming to those who died a hundred years ago, one of the most famous was Étienne Geoffroy Saint-Hilaire, who was born at Etampes on April 15, 1772, and who did great work both for the Jardin des Plantes and the Museum. In Scotland, few were better known than Thomas Henderson (1798–1844) and Thomas Charles Hope (1766–1844). Henderson, a native of Dundee, began life as a lawyer's clerk, but his studies led him to become acquainted with Wallace and Leslie, and through his papers he gained recognition as an astronomer. After a year or two at the Cape of Good Hope, on October 1, 1834, he became the first Astronomer Royal for Scotland. His contemporary, Hope, was always a chemist, and from 1799 until 1843 occupied the chair of chemistry in