Prague for his opinion. At that time he was engaged on his Monograph of the genus *Euphrasia* (which excellent work is only recently published), so that he did not report on the specimen till this year, when he writes to me saying that he has no doubt from the intermediate characters, from the fact that the two supposed parents were growing together, and from the defective (58 per cent.) pollen, that the plant is a hybrid of the above plants, which he calls *G. Wettsteini*, Murbeck $\times$ *G. axillaris* (Schmidt). These names are synonymous with *G. germanica* and *G. Amarella* respectively. My friend, Mr. A. B. Jackson, has also found a hybrid of the two species at Watership chalk pit, on the north Hampshire chalk escarpment to the south of the Kennet, not far from Newbury.

G. CLARIDGE DRUCE.

Aug. 14.

THE HYBRIDS OF LINARIA REPENS AND L. VULGARIS IN BRITAIN.—The fact of the occurrence of hybrids of the two species above mentioned has been known for many years, but confirmatory evidence (if such were needed) of the strongest possible character has been afforded, during the last few years, in the neighbourhood of Oxford. In the counties of Oxford and Berks the distribution of *L. vulgaris* is fairly general, the plant being especially plentiful in light sandy soils. The occurrence of the second species is of a much more local character. Previous to the construction of railways, it was practically limited to the lower and upper chalk formations of the counties. The Great Western Railway, with its constant traffic, has much increased the area of its distribution, but until 1890 its northern limit may be said to have been at Didcot. On the soil which consists of bare chalk, *L. vulgaris* is practically absent, and there we may study *L. repens* in its natural condition. We shall find that it exhibits considerable variability in the colour of its flowers, which vary from nearly white to the darkest purple; it is rarely found of a coral pink tint; but the size of the flower, its shape, and the shape and direction of its spur, is fairly constant. When the soil is covered with a lighter subsoil, and *L. vulgaris* also grows with it, we shall then rarely search long without finding plants of an intermediate character. These plants are especially suitable for the purpose of observation, since, in the case of *L. vulgaris*, the large yellow flowers with an orange palate, and the much smaller flowers of *L. repens*, which are normally of a bluish or

purple tint and nearly always marked with striations (hence the name *L. striata*, which is one of its synonyms) of a deeper tint, offer such obvious characters for differentiation.

Up to the year 1890, only *L. vulgaris* occurred about Oxford; it then showed little variability either in its flowers or foliage. In that year a space of ground between the Great Western and the London and North-Western Railways was filled up with chalk rubble brought from the chalk district of Upton in Berkshire. With the chalk a considerable number of plants characteristic of that formation was introduced. In that year a profuse growth of *Iberis amara* and *Picris hieracioides*, and a less plentiful quantity of *Linaria repens*, *Campanula glomerata*, and *Bromus erectus*, covered the chalk with a very different vegetation from that which occupied the other side of the railway. In that year no hybrids of *L. repens* and *L. vulgaris* occurred; but the following year a very large number of hybrid plants occurred, in fact they were sufficiently numerous to attract the attention of Mr. B. S. Ogle to them as he was passing in a train. These hybrids can be roughly sorted into two groups, both of which are, however, much nearer to *L. repens* than to *L. vulgaris*, the influence of the latter plant being especially shown by the slightly larger size and the much paler (yellowish blue) tint, and by the more conspicuous orange palate. In 1892 the gap between the two species was practically filled up, but the plant with flowers nearly as large as those of *L. vulgaris* was quite rare, not more than eight or ten plants being seen. The influence of *L. repens* in this was practically limited to a very few pale striations on the corolla. The plant had narrower leaves than normal *L. vulgaris*, but the variation in the width of the leaves in that species is very considerable. To this I gave the name $\times$ *L. Baxterii* in the Report of the Botanical Exchange Club of the British Isles, 1893, p. 421. The commoner hybrid was one with nearly intermediate characters, but which was, on the whole, nearer to *L. repens*. This occurred by hundreds.

The year 1893 marked the maximum quantity of individual hybrids, when they considerably outnumbered the parent species. The chain of intermediates was again practically complete. Since that year the hybrids and *L. repens* have gradually diminished; this is owing to the competition of ranker weeds, which is assisted by the gradual covering up of the chalk with soil and refuse from the neighbourhood. It is probable that hybridization is assisted by the passing trains which

cause such a rush of air by the railway side where they grow. Seeds of plants which showed about a third of *L. vulgaris* and two-thirds of *L. repens* parentage when sown in light garden soil, yielded plants still nearer to *L. repens*; probably they were the result of crossing with the pollen of *L. repens*. Seeds of the second generation, however, yielded plants nearer to *L. vulgaris*; that is, they were about the same as the hybrid from which the first seeds had been collected. In this case pollen of *L. vulgaris* had been kept from them.

At Didcot the same series of hybrids has been noticed, but they occur in much smaller quantity.

G. CLARIDGE DRUCE.

Aug. 14.

THE ARRANGEMENT OF THE VASCULAR BUNDLES IN CERTAIN NYMPHAEACEAE¹.—One of the most remarkable characteristics of this order is the very extensive prevalence of the astelic system in the arrangement of the vascular bundles of their stems; however, during an examination into the structure of various members of the order, the fact that other systems of arrangement also are present came to light. Thus in *Nymphaea flava* and *N. tuberosa* the plants produce small tubers at the ends of stalks or stolons of greater or less length, and in these stalks or stolons the vascular bundles are not arranged in an astelic manner, but are grouped around three to five different centres, forming thus so many separate steles, or at least so many groups possessing all the characteristics of definite steles. Each of these is surrounded by its own endodermis, and is composed of three to four vascular bundles with very distinct and prominent phloems, while a small canal in the centre of the stele represents their disintegrated xylems.

The tubers formed at the end of these stolons bear buds which grow out into fresh rhizomes, the first internodes of which are very narrow and much elongated; in these, again, the vascular bundles (four to seven in number) exhibit a different arrangement, for they present none of the confusion found in the mature rhizome, but run perfectly longitudinally; either they all keep separate, or a varying number of them may be united to form pairs. When six of them are present and these are arranged in three pairs, the section presents

¹ Abstract of a paper read before Section K at the Liverpool Meeting of the British Association, 1896: see also *Annals of Botany*, Vol. x, p. 289.

Druce, George Claridge. 1896. "The hybrids of *Linaria repens* and *L. vulgaris* in Britain." *Annals of botany* 10, 622–624.

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