

Rudbeckia and Aquilegia.

WHEN recently (July) collecting Eocene fossils in the vicinity of Roan creek, Colorado, I saw for the first time the singular composite *Rudbeckia montana* Gray in life. It abounds in the valleys and gulches, occupying similar positions to those in which one finds *R. laciniata* on the eastern side of the range. The latter, so far as I could ascertain, is absent from the region of *R. montana*, though it occurs in the south-western part of Colorado. The striking feature of *R. montana* is the total absence of rays. The large conical or cylindrical discs appear very black, slightly yellow from pollen when in flower. The involucrel bracts are coarse and pointed, surrounding the base of the disc and diverging at various angles. The whole effect is most peculiar and unusual. Rayless Compositae are known in various genera, and occasionally occur as mutations in normally rayed genera. The ancestor of *R. montana* was presumably rayed, but losing its rays through a germinal modification, how did it manage to survive and flourish to the exclusion of the rayed form?

On July 21 I took particular occasion to watch a large group of *R. montana* on Dry creek, a tributary of Roan creek. The plants appeared just as attractive to bees as the rayed species.



FIG. 1.—*Rudbeckia montana*, Gray. $\frac{1}{2}$ natural size.

They were being visited by great numbers of worker *Bombus*, the majority *B. rufocinctus phaceliæ* Ckll., but there were also many *B. edwardsii bifarius* Cresson. Other bees were fewer, but I collected females of *Megachile pugnata*, say, *M. grindeliarum* Ckll. and *Halictus trizonatus* Cresson. There were also two species of plant-bugs, *Lygæus reclinatus*, say, and *Lygus pratensis* L. Thus it seems certain that the loss of the rays has not interfered at all with cross-pollination by bees.

On the high mesa, between Roan creek and Salt Wash, in the aspen groves, I first saw the white-flowered sub-species of the Columbine, *Aquilegia cærulea* James. The large white flowers, with long spurs (up to 90 mm.), dotted among the green shrubbery, were truly magnificent. One got the impression of a perfectly distinct species; but some of the flowers were suffused with bluish, and rarely one found a genuine *A. cærulea* with blue, sepals. The flowers certainly averaged larger than those of *cærulea*, but the spurs were long enough for Tidestrom's *pinctorum*, which seems possibly to be a habit-form.

The locality on the Roan mountains is in the midst of a Canadian zone flora, with no pines, the only conifer being *Pseudotsuga mucronata*, which is abundant. *Pinus edulis* and *Sabina* occur on the slopes lower down. The underlying geological formation is the Green river Eocene. The white (*albiflora* Gray) sub-species of *A. cærulea* may well have arisen by mutation from the blue-sepal type, but how did it manage to supplant it? It cannot be a matter of the direct effects of the environment, since genuine *cærulea* grows rarely in the same localities. Both forms are visited by Lepidoptera, and there is no reason for supposing that *cærulea* is specially favoured by butterflies, *albiflora* by moths. In the locality of *albiflora*, as we found it, long-tongued moths must be very rare, but long-tongued butterflies (especially *Papilio*) abound.

These cases of *Rudbeckia* and *Aquilegia* are difficult to explain. Is it possible that, while there is no direct influence of the environment on the characters,

there is something in the soil (the shales being rich in peculiar organic products) which has affected the germ-plasm of the plants, bringing about a selective elimination of certain qualities?

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July 25.

The Rat and its Repression.

THE valuable contributions on rat repression by Lord Aberconway and Lieut. Alfred E. Moore, which have appeared in the columns of NATURE, may, I venture to think, be usefully amplified by some reference to one of Britain's paramount industries: shipping, considered in the light of the rat menace.

Undoubtedly, rats represent a serious problem to the shipping industry, and I only suggest some possibilities that occur to me in the hope that others more competent may be induced to table something more valuable. Among the avenues to be explored are:—

(a) The possibility of an international agreement in regard to ship fumigation and disinfection, having special regard to ships arriving at British Empire ports.

(b) The possibility of stimulating invention in regard to ship-proofing: e.g. anchor chains, mooring ropes, gangways, and all shore connexions are avenues of infinite possibility when one is considering rat invasion.

(c) The possibility of stimulating research into the most effective means of destroying rats aboard ship by means of fumigation, electricity traps, raticides, etc.

(d) The possibility of creating a national board composed of the representatives of port authorities, ship owners, authorities on rat repression, and ship store superintendents, and of providing in connexion with such national maritime board suitable laboratories for testing and research.

(e) The possibilities of asbestos-concrete plus barium carbonate as a light and at the same time poisonous covering in the place of wood where its use would not be inconvenient.

It is doubtful if man has a more cunning foe than the rat, and in view of the fact that the vermin is ever increasing, and the rat's adaptability when it is called upon to vanquish obstacles to its depredations, it seems to me well worth our while to concentrate upon effective measures to counter the activities of our enemy.

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August 4.

The Spectrum of Helium in the Extreme Ultra-Violet.

MR. FRICKE showed (*Phil. Mag.* 41, May 1921) that in the extreme ultra-violet the arc spectrum of helium probably contained but one line with a wave-length near 585 Å.U.

I have recently attacked the subject again using a vacuum spectroscope so arranged that a good vacuum could be maintained in the body of the apparatus while the discharge tube contained helium at a pressure of about a millimetre. No window was employed, the success of the device depending on the use of a very short and narrow slit and upon the suitable application of a powerful pump,

With a continuous current the line at 584.4 is of very great strength, and is accompanied by three new lines at 537.1, 522.3, and 515.7 whose intensities decrease with their wave-length and in a manner strongly suggesting a series relation. Luckily the