formation derived from specimens taken throughout the entire range of the species, as well as casual field observations. The type specimen, H. J. Hodgson No. 234, was taken near Palmer, Alaska on July 29, 1955. This is deposited in the U. S. National Herbarium, Smithsonian Institution, Washington.

Cotype specimens have been deposited in various herbaria as follows: No. 230, University of California (Berkley); No. 231, Missouri Botanical Garden (St. Louis); No. 233, New York Botanical Garden; No. 235 Department of Agriculture, Ottawa, Canada; and No. 236, University of Wisconsin (Madison).

Other specimens have been deposited in the Herbarium of the University of Alaska, Fairbanks, Alaska.

Elymus pendulosus is a 28-chromosome species as is generally true of *E. canadensis*. Meiosis is predominately regular with almost all diakinesis figures showing 14 bivalents. Bridges occurred in about 10 per cent of the Anaphase I figures examined. About 75 per cent viable pollen is produced by this species. The cytology of this species and its presumed hybrids with *Agropyron sericeum* Hitch. will be presented in a later paper.

The author takes pleasure in expressing appreciation to Dr. Etlar L. Nielsen for reviewing the manuscript and for his constructive criticisms, to Mr. Jason R. Swallen for reviewing the manuscript and assisting with the latin description and to Mrs. E. Herbold Froeschner for the line drawings in figure 1.

SOME NEW PRIMITIVE MEXICAN CRUCIFERAE

Reed C. Rollins

Present day phylogenists will readily admit the *Cruciferae* and the *Capparidaceae* to adjacent rungs on the phylogenetic ladder of the higher plants even though they may not agree in detail as to the point of origin of each family. For some time it was contended that the *Cruciferae* arose from some prototype plant somewhat similar to certain taxa of the *Papavaraceae*, but evidence has been piling up in favor of the view that the *Cruciferae* arose from some capparidaceous-like plant and that the two families probably had a common origin (von Hayek, 1911; Schulz, 1936). Certainly there are genera of the two families

with marked similarities. Both *Warea amplexifolia* and *Stanleya pinnata*, for example, were originally described in the *Capparidaceae* as species of *Cleome*. Those who stress the similarities of these families usually point to the presence in the *Cruciferae* of characters such as a gynophore and spreading equal stamens, which are regular features of the *Capparidaceae* (cf. Rollins, 1939). These characteristics are by no means common in the *Cruciferae* but among genera of the Western Hemisphere they may be found in *Warea*, *Stanleya*, *Thelopodium*, *Romanschulzia* and a few others.

In the past, *Stanleya* has been thought of particularly as being a key to the phylogenetic link between these two families. Now as *Romanschulzia* is becoming better known, this genus may be viewed with increasing interest in this connection. *Stanleya* occurs only in the arid areas of western North America and appears to be somewhat isolated morphologically from most other crucifers. It ties in with *Thelypodium* but appears not to have any other close connections. This is not the case with *Romanschulzia*, because it ties in with *Thelypodium* in one direction and with *Sisymbrium* in another. Furthermore, it is not too distant from a genus like *Macropodium* of eastern Asia. The broad, flattened and reflexed siliques of *Romanschulzia apetala*, together with the long gynophore, the spreading exserted stamens and the greatly elongated inflorescence, particularly suggest such a relationship. Because of the increasing evidence that *Romanschulzia* may occupy a key phylogenetic position among primitive crucifers, the new material coming from Mexico and Central America is of high interest. However, the paucity of collections of this genus still does not permit a proper assessment of it in terms of the phylogeny of the family as a whole. The three species described below are clearly distinct from the eight species covered in my former treatment of the genus (Rollins, 1942). It is hoped that the illustrations of them will aid collectors in procuring more material of this interesting genus.

Romanschulzia Meyerii Rollins, sp. nov.

Perennial from a deep root; stems up to 2 meters high, branched above, glabrous, pithy; basal leaves petiolate, runcinately pinnatifid to pinnately lobed, 1–2 dm. long including petiole, blade extremely thin and fragile, veins prominent, pubescent with sharp flat awl-shaped trichomes which

Fig. 1–4, *Romanschulzia Meyeri*. Fig. 1, basal portion of plant with basal leaves, × ½. Fig. 2, central portion of stem with auriculate cauline leaves, × ½. Fig. 3, upper portion of an infructescence, × ½. Fig. 4, basal portion of a silique showing gynophore, × 3. Drawings by Dorothy H. Marsh.

occur mostly along the veins and blade margins, lobes irregular, terminal lobe making up most of the blade surface, oval to nearly orbicular, irregularly dentate, incised or somewhat erose, lateral lobes remote and small, usually oblong, petiole variable in length, 5–15 cm. long; cauline leaves auriculate, clasping, thin, broadly oblong, obtuse or the upper pointed, prominently veined, glabrous or with an occasional trichome arising near a vein, reduced upwards, 1–2 dm. long, 3–8 cm. wide, margin smooth or with minute callosities which project very slightly; infructescence greatly elongated, 3–7 dm. long; pedicels spreading at right angles to descending, expanded at apex, glabrous, 7–12 mm. long; siliques terete, somewhat moniliform, stipitate, widely spreading, usually curved upward, rarely nearly straight, 6–10 cm. long, 1–1.2 mm. in diameter, glabrous, valves nerved from base to apex; gynophores 1.5–2.5 mm. long; styles slender, unexpanded at apex, 1–1.5 mm. long; seeds uniseriate, alternating on each side of the septum resulting in a marked displacement of the septum into the opposite valve, seeds plump, oblong, ca. 1.5 mm. long, < 1 mm. in diameter, with well defined but not high longitudinal ribs, circular scar at the funicular end prominent, radical shorter than the cotyledons; cotyledons incumbent, thick. Fig. 1–4.

Herba perennis robusta; caulibus glabris superne ramosis teretibus ad 2 m. altis; foliis radicalibus petiolatis lyrato-pinnatifidis membranaceis pubescentibus 1–2 dm. longis; foliis caulinis sessilibus integris auriculatis amplexicaulibus late oblongis obtusis glabris 1–2 dm. longis, 3–8 cm. latis; infructescentiis 3–7 dm. longis; pedicellis fructiferis patentibus glabris 7–12 mm. longis; siliquis glabris teretibus moniliformibus stipitatis 6–10 cm. longis; stylis tenuibus 1–1.5 mm. longis; seminibus oblongis ca. 1.5 mm. longis, cotyledonibus incumbentibus.

Type in the Gray Herbarium, collected along a dry stream at an altitude of 1900 meters on the east side of Cerro Linadero, Dulces Nombres, Nuevo León, just east of border into Tamaulipas, 24° N., 99.5–100.5° W., Mexico, August 9, 1948, *F. G. Meyer and D. J. Rogers 2892*. Isotype at the Missouri Botanical Garden.

This species possesses by far the longest siliques known in the genus and even though they are mostly above seven centimeters long, they show a marked tendency to curve upwards, being most frequently bow-shaped. The pedicels are widely spreading from a position nearly at right angles to somewhat reflexed, but remaining always at a wide angle of divergence from the rachis. There are no flowers present on the specimens.

Romanschulzia Meyerii appears to be most closely related to *R. elata*, but there is so little material available of these species that it is impossible to be sure where the relationship lies. *R. Meyerii* also has a number of characteristics in common with *R. turritoides*. The very long arcuate siliques of *R. Myerii* are

distinctive and indicate that it is without doubt an independent species.

Romanschulzia subclavata Rollins, sp. nov.

Herbaceous perennial (?) basal portion unknown; stems up to 2 meters high, branched above, hirsute with short awl-shaped trichomes below, sparsely pubescent above; cauline leaves auriculate, clasping the stem, lanceolate, acute to acuminate, shallowly dentate to denticulate, some leaves with a pair or several larger teeth toward the base of the blade, greenish above, slate-colored below, often somewhat narrowed toward the base, 6–15 cm. long, 1–2 cm. wide, sparsely hirsute to glabrous; infructescence up to 10 dm. or more long, narrow; pedicels glabrous, spreading at right angles to rachis to very slightly ascending, 5–15 mm. long; flowers numerous in a long raceme; sepals oblong, white to slightly purplish, adjacent sepals united below into pairs, 3–4 mm. long, 1.5–2 mm. wide; petals absent; stamens nearly equal, spreading at anthesis, filaments slightly flattened, white, expanded at base, anthers 1.8–2 mm. long; siliques linear to somewhat subclavate, erect, nearly terete, stipitate, glabrous, 1.5–2.5 cm. long, ca. 1.5 mm. broad, valves with a single nerve from base to apex; gynophore 1.5–2 mm. long; pollen tricolpate, reticulately pitted, narrowly oblong, 24.14 × 13.13 (av. of 10 grains); styles slender, 0.5–1 mm. long, unexpanded at apex; immature seeds wingless, oblong, plump, ca. 2 mm. long; ca. 1 mm. wide, forming a single row in the siliques. Fig. 5A-D.

Herba perennis (?) basi ignota; caulibus superne ramosis teretibus pubescentibus vel glabris 1–2 m. altis; foliis caulinis auriculatis amplexicaulibus lanceolatis acutis vel acuminatis dentatis vel denticulatis sparse hirsutis vel glabris 6–15 cm. longis, 1–2 cm. latis; inflorescentiis 6–10 dm. longis; pedicellis patentibus glabris 5–15 mm. longis; sepalis oblongis, albis, 3–4 mm. longis, 1.5–2 mm. latis; petalis absentibus; siliquis subclavatis vel linearibus teretibus stipitatis glabris 1.5–2.5 cm. longis; stylis tenuibus 0.5–1 mm. longis; seminibus immaturis oblongis ca. 2 mm. longis, ca. 1 mm. latis.

Type in the Gray Herbarium, collected on Mt. Tancitaro in the Municipality of Tancitaro, Michoacán, Mexico, July 25, 1941, *Wm. C. Leavenworth and H. Hoogstraal 1207*. The site is noted as "just above cloud forest on exposed ridges" at an elevation of 9,500 ft. A second specimen from the same area has the following label data: "plant 5 ft. tall, straight, white flowers; damp cliffs in cloud forest, Mt. Tancitaro, 10,000 ft., July 9, 1941, *Wm. C. Leavenworth and H. Hoogstraal 4034*." (GH).

Romanschulzia schistacea Rollins, sp. nov.

Perennial or possibly biennial; stems relatively slender, 5–8 dm. high, glabrous, simple or branched; basal leaves not present; cauline leaves thin, over-lapping, auriculate, clasping the stem, green above, slate-colored beneath, glabrous or with a few scattered trichomes, 4–10 cm. long, 1.5–3.5 cm. wide, narrowly oblong to nearly lanceolate, broadest

FIG. 5A–D, *Romanschulzia subclavata*. Fig. 5A, upper portion of plant showing inflorescences, × ½. Fig. 5B, flowers at full anthesis, semidiagrammatic, × 5. Fig. 5C, flower at the beginning of anthesis, semidiagrammatic, × 5. Fig. 5D, silique, pedicel and area of attachment to stem, × 1.5. Drawings by B. Tugendhat.

above middle, only slightly to rather markedly narrowed toward base, acute to acuminate, entire, denticulate with minute teeth along margins, midvein prominent; infructescence relatively short, 1–2 dm. long; flowers not numerous, about 12–36 in each inflorescence; pedicels spreading, expanded into receptacle, 6–10 mm. long; sepals caducous, yellowish white, nonsaccate, glabrous, 3–4 mm. long; petals linear, widely spreading at anthesis, not differentiated into blade and claw, yellowish-white, 4–5 mm. long, 0.5 mm. or less wide, only slightly narrowed below; stamens spreading at anthesis, nearly equal, filaments ca. 4 mm. long, expanded at base, anthers 1.5–2 mm. long; pollen tricolpate, reticulately pitted, narrowly oblong, 29.18 × 12.54 (av. of 10 grains); glands well developed around the stamens and petals and forming a disc around the ovary; siliques stipitate to nearly sessile, glabrous, terete, somewhat constricted between the seeds, widely spreading, curved upward, 2.5–3.5 cm. long, < 1 mm. in diameter, lowest portion sterile and resembling a gynophore, valves without a prominent nerve; gynophore 0.5 mm. long to nearly wanting; style slender, unexpanded at apex, 1–1.5 mm. long; immature seeds oblong, in a single row in the silique. Fig. 6A-D.

Herba perennis (?) caulibus tenuibus glabris simplicibus vel ramosis 5–8 dm. altis, foliis radicalibus ignotis; foliis caulinis sessilibus auriculatis amplexicaulibus imbricatis oblongis vel lanceolatis integris denticulatis acutis vel acuminatis 4–10 cm. longis, 1.5–3.5 cm. latis; pedicellis fructiferis patentibus glabris tenuibus 6–10 mm. longis; sepalis caducis glabris 3–4 mm. longis; petalis patentibus ochroleucis linearibus 4–5 mm. longis, 0.3–0.5 mm. latis; siliquis teretibus patentibus glabris 2.5–3.5 cm. longis stipitatis, seminibus uniseriatis.

Type in the Gray Herbarium, collected in moist woods, Barranca de las Verduras, north side of El Monte on trail from Zimapan to Mines of El Monte, August 11, 1948, *H. E. Moore, Jr. and C. E. Wood, Jr. 1945*. Isotype at the Bailey Hortorium.

This taxon has a shorter inflorescence than most species of *Romanschulzia*, approaching some specimens which I have determined as *R. arabiformis* in that respect. However, the widely spreading, upcurved, relatively long siliques are distinctive. The seeds are definitely uniseriate in *R. schistacea* and the sepals lack the horn-like thickening at the apex, as found in *R. arabiformis*. The slender yet prominent styles are not common characteristics of any closely related species in the genus. The leaves are exceedingly thin and fragile. *R. schistacea* lies about as close to *Sisymbrium* as any species of *Romanschulzia* and were it not for the spreading petals, the equal and spreading stamens, and the caducous calyx, I should be inclined to place it in that genus.

Fig. 6A–D, *Romanschulzia schistacea.* Fig. 6A, plant with basal leaves missing, × ½. Fig. 6B, silique, pedicel and area of attachment, × 2. Fig. 6C, flower at the beginning of anthesis, × 5. Fig. 6D, flower at full anthesis, × 5. Drawings by B. Tugendhat.

Romanschulzia apetala Rollins

The original description of this species was based on a single flowering specimen. Since then, a second collection made by Richard W. Holm and Hugh H. Iltis in 1949 in the general area of the type locality, has been available for study. Fortunately,

part of an old raceme of fruits is included as part of the specimen preserved at the Missouri Botanical Garden. These are the first fruits I have seen of *R. apetala* and they are unique in the whole genus in being broad, flattened, and with a relatively long slender style. As predicted from the flowering material, the pedicels are somewhat reflexed although they are not strictly so. The flat siliques are tapered both above and below into a more or less lanceolate shape. However, the body of the silique has roughly parallel sides. The fertile portion of the silique is 3–4 cm. long and 3.5–4.5 mm. wide; the gynophore varies from 5–8 mm. long; and the slender style is 4–5 mm. long.

The data from the label of this specimen are as follows: loose shrub up to 3 m. tall; flowers dark purple; disk after dehiscence of sepals prominently whitish green; young stamens purple. Virgin cloud-forest, 3000–3300 m., vicinity of Millsville, Pan-American Highway, about 3 km. above Nivel, Province of Cartago, Costa Rica, 22 July 1949, *Holm and Iltis 536* (MO).

Sisymbrium Standleyi Rollins, nom. nov., based on *Romanschulzia alpina* Standley and Steyermark, Fieldiana **24:** 377. 1946, not *Sisymbrium alpinum* Fourn., Recherch. Crucif. 131, 1865, which was based on *Braya alpina* Sternb. and Hoppe.

At the time I was studying *Romanschulzia* previously (l. c.), I put aside an undetermined specimen collected by Alexander F. Skutch from the Department of Quezaltenango in Guatemala that represented an undescribed species of *Sisymbrium*. The material was considered for possible inclusion in *Romanschulzia* since the cauline leaves are auriculate, but the flowers do not have the equal spreading stamens, the caducous calyx, nor the gynophorate siliques of *Romanschulzia*. In the meantime, Standley and Steyermark have described *R. alpina* based on specimens collected by Steyermark in the Department of Huehuetenango, Guatemala. Now a comparison of the type of *R. alpina* with the Skutch collection shows that they belong to the same species. The species is not closely related to any in *Romanschulzia* and does not possess the essential characters of the genus. On the other hand, it is related to species included in *Sisymbrium* by Payson and others, where it is best placed, pending further studies of that genus. The known collections, all from Guatemala, referable to *Sisymbrium Standleyi* are as

follows: dry, rocky, grassy slopes, between Tojquiá and Caxín Bluff, summit of Sierra de los Cuchumatanes, Dept. of Huehuetenango, Aug. 6, 1942, *Julian A. Steyermark 50144* (F, type); near Tunimá, Sierra de los Chuchumatanes, July 6, 1942, *Steyermark 48923* (F); Volcán Santa María, Dept. Quezaltenango, July 27, 1934, *A. F. Skutch 864* (GH).—GRAY HERBARIUM, HARVARD UNIVERSITY.

LITERATURE CITED

VON HAYEK, AUGUST. 1911. Entwurf eines Cruciferen-Systems auf Phylogenetischer Grundlage. Beiheft. Bot. Centralbl., Beib. **27** (127): 127–355.

PAYSON, E. B. 1922. Species of Sisymbrium Native to America North of Mexico. Univ. of Wyo. Publ. Sci. **1**: 1–27.

ROLLINS, REED C. 1939. The Cruciferous Genus Stanleya. Lloydia **2**: 109–127.

————. 1942. A Tentative Revision of the Genus Romanschulzia. Contrib. Dudley Herb. **3**: 217–226.

SCHULZ, O. E. 1936. Cruciferae. Die Natur. Pflanzenf. **17b**: 227–658.

CLARENCE HINCKLEY KNOWLTON

RALPH C. BEAN

The New England Botanical Club has had in its membership through the years many enthusiastic amateur botanists, men in business or professional life who have gained physical vigor and intellectual enjoyment in their botanical pursuits. Perhaps none of these has been so active in the Club for so long a period as Mr. Clarence Hinckley Knowlton who died May 10, 1956 at the South Shore Hospital in Weymouth, Massachusetts.

Mr. Knowlton was born in Farmington, Maine September 9, 1876, the son of David Hunter Knowlton and Clara Armine (Hinckley) Knowlton. His father was the publisher of the local paper and had a job printing business in Farmington. There Mr. Knowlton began to study plants and for many years he collected in Farmington and the surrounding towns. Day Mountain, Mount Abraham and Mount Saddleback, all in Franklin County, stimulated his early interest in unusual plants. Even after he had established his home in Massachusetts he would return to Farmington to search for plants which might have escaped his attention in his earlier collecting.

Mr. Knowlton's preparation for college was at the Farmington