

# Proceedings of the Iowa Academy of Science

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Volume 6 | Annual Issue

Article 26

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1898

## The Flora of Southern Iowa

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### Recommended Citation

Fitzpatrick, T. J. and Fitzpatrick, M. F. L. (1898) "The Flora of Southern Iowa," *Proceedings of the Iowa Academy of Science*, 6(1), 173-202.

Available at: <https://scholarworks.uni.edu/pias/vol6/iss1/26>

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1892. Pamphlet, 29. E. Antony & Son, New Bedford, Mass., 1892. A list of almost 500 species and varieties with copious notes and three or four new species described.

95. Wilson, L. A. An Artificial Key to Lichens. Am. Mo. Mic. Jour. 16: 65-80. Mr 1895.

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## THE FLORA OF SOUTHERN IOWA.

BY T. J. AND M. F. L. FITZPATRICK.

### II.

On June 20, 1898, the first writer of this article started overland from Lamoni to Council Bluffs, in company with Prof. J. T. Pence. The route taken passed through the west side of Decatur county to Hopeville, in the southwest part of Clarke county, thence bearing west to Afton in Union county, on to Creston in the same county. As near as practicable the line of the Chicago, Burlington & Quincy railway was followed through Adams county, bearing southward with the railway to Villisca and northward to Red Oak in Montgomery county. From Red Oak a nearly northerly direction was taken until into Pottawattamie county, then westward to Wheeler and northward to Carson, where the overland trip, as far as this article is concerned, ended. Carson was reached June 24th. The five days of the journey were filled with frequent stops in order to collect by the wayside and from adjoining groves and fields. A week was spent at Carson collecting in the immediate vicinity and in Wheeler's grove.

On July 25th, the writer in company with J. P. Anderson, an ex-student of the Nebraska State University, left Lamoni in a covered wagon for an overland trip to Nebraska City, Neb. The route taken beyond Decatur county, was through the southern portions of Ringgold, Taylor, Page and Fremont counties, passing through in succession Caledonia, Redding, Blockton, Bedford, Shambaugh, Coin, Riverton, through the hills west of Riverton and across the valley to Nebraska City, Neb. An entire week was taken for the journey. Material was collected from the waysides and adjoining streams or occasionally covering the rougher uplands. From Nebraska City

we passed northward through Otoe county and stopped in Cass county, Neb., opposite McPaul, Iowa. Here two weeks were spent drying material and collecting on the Nebraska side of the river or on the Iowa side around McPaul. Wabonsie slough, which is mostly the remains of a lake about two miles north of McPaul, gave us many good specimens.

On August 25th we started from Nebraska City on our return. The route chosen was northwesterly across the valley and through the hills to Sidney in Fremont county, thence eastward to Clarinda, Page county; on across Taylor county to Mt. Ayr, in Ringgold county, the road scarcely varying a mile north or south from a due east and west line, the entire distance from Sidney to Mt. Ayr. From Mt. Ayr we turned southerly, toward Lamoni, arriving on the 18th of August.

The following list of species is the result of the trips here described and the additional species found in Decatur county since our last paper was written. The specimens are deposited in the private herbarium of T. J. and M. F. L. Fitzpatrick. The list is by no means complete but represents very well the flora of the region for the period of time covered. The order Leguminosæ is fairly well represented, midsummer being the time of its greatest development, while the great order Compositæ has only fairly started by the latter part of August. The spring flora had passed out by the time we began work.

The rectangle formed by the six counties, Union, Adams, Montgomery, Ringgold, Taylor and Page, presents much in common. A great portion of this region is an expanse of rolling prairie. Level ground is rarely seen save in the narrow bottoms or highest uplands. The ground near the streams rolls heavily, but gradually reduces to long swells as we go farther from the streams. Much of the land appears as long narrow ridges running parallel with the streams and flanked at sharp intervals with small lateral ones. The ridges are of the typical Kansas drift, covered with a thin black or blackish soil, while the valleys are alluvium, deposited from overflows of the streams or carried down from the uplands by surface wash.

Grand river and its tributaries cross diagonally the eastern portion of Union county, rolling southeasterly; Ringgold county is drained by the west fork of the Grand and Platte rivers, and their tributaries, rolling southwesterly. The southeastern portion of Union county is drained by the same

system. The divide, separating these two systems, passes southeasterly across the center of Union county, thence southward near the line of Decatur and Ringgold counties. Adams county rolls southwesterly and is drained by the Nodaway system, which system also drains the eastern portion of Montgomery and Page counties, the river system flexing from a southwesterly to a southerly direction, in the southeastern portion of Montgomery county. Taylor county has the Platt river system, and rolls to the southward.

The western portion of Montgomery county is drained by the Nishnabotany system, which runs southwesterly, crossing the northeastern portion of Page county; thence bearing westward to Riverton, in Fremont county, where the different systems of the Nishnabotany unite into a single stream; the whole system lies east of the loess hills which border the Missouri river bottoms. The river systems of the rectangle, in general, flow southwest, except in the extreme eastern portion, where they flow southeast. The whole county is cut into numerous north and south divides by the many tributaries of the Platt.

Throughout this rectangle of six counties, the flora presents a complex nature, which is common throughout the region. The native flora is much restricted in extent, though it persists in many portions where the primeval sod has as yet been unfurrowed. The waysides, the narrow strips along the railway, and portions next the back settlements, still grow the original prairie grass and the accompanying flora, while many similar tracts are continuously pastured, and present little flora, except here and there a thicket.

In this region the western flora is passing eastward and the eastern flora westward. Many species, on their tramps in opposite directions, seem to have met in this region, and established themselves, and to have become an integral part of the flora. Examples of the western forms are *Lactuca pulchella* D. C., *Plantago aristata* Mx., *Solanum rostratum* Dunal., *Hordeum pusillum* Nutt., and many others as will be seen from the list. Among those moving westward are the Lepidi- ums, *Brassica nigra* Koch., *Capsella bursa-pastoris* Moench., *Xanthium canadense* Mill., *Ambrosia artemisiifolia* L., and *A. trifida* L., *Anthemis cotula* D. C., *Datura stramonium* L. and *D. tatula* L., all of which are becoming conspicuous in the waste land throughout the region. The prairie portions yield Silphiums, Helianths, Lili- ums, Psoraleas, Anemones, Ceanothus, Asters, and

Solidagos, the two latter genera appearing in their best development a month later than the time of our explorations. The bottoms of the small rivers or streams frequently have marshes, or long ponds, formed from old river beds. Here may be found *Typha*, *Sagittaria*, *Lemna*, *Sparganium*, and other water plants hereafter listed. The woods were composed of elms, oaks, cottonwoods, linn, an occasional sycamore, and great abundance of willows in the lowlands. The older trees have mostly been pressed into use for local purposes. The woods are largely made up of young trees. Upland thickets are common and are mostly composed of hazel, red haws, sumac, plum, buckthorn, bittersweet, and shrubby oaks. The flora is much restricted by agricultural operations, which yearly reduce the amount of free ground for the native flora, while more careful culture renders difficult the existence of the introduced flora which, however, takes refuge in waste lots and along fence-ways and borders. The native flora takes refuge in the railway right of way, where the plants have been enjoying a brief respite, but will, ere long, either be compelled to turn tramps or cease to exist.

The counties west of the rectangle have many species peculiar to that portion of Iowa. The bluffs bordering the Missouri river valley are composed of a remarkable series of loess hills. The flora of these hills includes Yuccas, Legumes, and grasses that are not found anywhere else in Iowa. The valley of the river has quite a number of introduced plants, common enough now, and which are migrating, and destined to extend from here eastward and become a source of trouble to farmers.

In the preparation of this paper we are indebted to Mr. J. P. Anderson, of Lamoni, Iowa, for constant assistance as a collector. To R. I. Cratty, F. Lamson-Scribner, and the officers of the Missouri Botanical Garden, we are under obligations for determinations of difficult species.

We present the results of our labors, and hope they are worthy as a contribution to a better knowledge of the flora of this portion of Iowa.

LAMONI, Iowa, January 1, 1899.

#### RANUNCULACEÆ.

*Clematis virginiana* L. Union, Ringgold, and Page counties. Thickets and waysides; frequent.

*C. pitcheri* T. & G. Union, Fremont, and Pottawattamie counties. Thickets; frequent.

*Anemone cylindrica* Gray. Union, Ringgold, Fremont, Adams, Montgomery, and Pottawattamie counties. Prairies, waysides; frequent.

*A. virginiana* L. Ringgold, Page, and Fremont counties. Woods; frequent.

*A. pennsylvanica* L. Ringgold and Pottawattamie counties. Prairie; frequent.

*Thalictrum purpurascens* L. Union, Ringgold, Page, Taylor, Fremont, Adams, and Pottawattamie counties. Open woods; frequent.

*Ranunculus multifidus* Pursh, Decatur county. A few specimens found in a moist locality.

*Aquilegia canadensis* L. Ringgold and Pottawattamie counties. Woods; common.

*Delphinium tricornes* Mx. Clarke, Union, and Decatur counties. Fields and woods; moist places; common. Many specimens were found with double flowers, the two upper petals, as usual, and six others, the lower sepal spurred similar to the upper, but with a smaller spur. Specimens with six or seven petals were also found.

*D. azureum* Mx Clarke, Union, Adams, Montgomery, and Pottawattamie counties. Prairies; common.

#### MEMISPERMACEÆ.

*Menispermum canadense* L. Union, Ringgold, Page, Taylor, Fremont, and Pottawattamie counties. Woods; common.

#### BERBERIDACEÆ.

*Podophyllum peltatum* L. Union and Ringgold counties. Rich woods; common.

#### NYMPHÆACEÆ.

*Nymphaea tuberosa* Paine. Fremont county. Common in Wabonsie slough.

#### CRUCIFERÆ.

*Arabis canadensis* L. Page county. Woods; infrequent.

*A. dentata* T. & G. Decatur county. One specimen found.

*Nasturtium sinuatum* Nutt. Fremont county. This species is a very common weed in the Missouri river bottoms.

*N. sessiliflorum* Nutt. Decatur and Page counties. Low, wet places; frequent.

*N. palustre* D. C. Union county. Moist places; common.

*N. armoracia* Fries. Adams county. Waste places; common.

*Erysimum cheiranthoides* L. Decatur county. One specimen found.

*Sisymbrium officinale* Scop. Clarke, Union, Adams, Montgomery, Pottawattamie, Ringgold, Taylor, and Fremont counties. A common weed in waste places.

*Brassica nigra* Koch. Ringgold, Page, Montgomery, and Pottawattamie counties. Fields and waste places; common.

*Capsella bursa-pastoris* Moench. Clarke, Union, and Ringgold counties. A common weed.

*Lepidium virginicum* L. Clarke, Adams, and Pottawattamie counties. Waste places; common.

*Raphanus sativus* L. Taylor county. A few escapes.

CAPPARIDACEÆ.

*Cleome integrifolia* T. & G. Fremont county. A common weed in the Missouri river bottoms.

CISTACEÆ.

*Helianthemum majus* (L.) B. S. P. Union and Taylor counties. Prairies, frequent. We have heretofore listed this as *H. canadense* Mx. *Lechea major* Mx. of our previous lists is only a form of this species.

*Lechea stricta* Legget. Johnson county. Listed before as *L. minor* L.

VIOLACEÆ.

*Viola palmata* L. Fremont county. A few found in low places.

*Viola cucullata* Ait. Union, Ringgold, and Pottawattamie counties. Fields and woods; common.

*Viola pubescens* Ait. Pottawattamie county. Woods; frequent.

CARYOPHYLLACEÆ.

*Saponaria officinalis* L. Ringgold, Taylor, and Fremont counties. Waysides; infrequent.

*Silene stellata* Ait. Ringgold, Page, Fremont, and Pottawattamie counties. Woods; frequent.

*S. noctiflora* L. Fremont county. A few found by the wayside.

## PORTULACACEÆ.

*Portulaca oleracea* L. Pottawattamie county. Waste places; common.

## HYPERICACEÆ.

*Hypericum ascyron* L. This species was frequent in Otoe and Cass counties, Nebraska, opposite Fremont county, Iowa. It was not noticed eastward of the Missouri river.

*H. prolificum* L. Johnson county. Frequent, locally.

*H. mutilum* L. Johnson county.

*H. cistifolium* Lam. Fremont county. Several specimens were obtained.

*H. maculatum* Walt. Ringgold and Taylor counties. Open places; frequent.

## MALVACEÆ.

*Althæa rosea* Cav. Decatur county. Occasionally an escape.

*Malva crispa* L. Decatur county. Several specimens obtained in waste places.

*M. rotundifolia* L. Union, Taylor, and Fremont counties. Waste places; common.

*Sida spinosa* L. Page and Fremont counties. Waste places; frequent.

*Abutilon avicennæ* Gaertn. Union, Adams, Pottawattamie, Ringgold, Page, Taylor, and Fremont counties.

*Hibiscus militaris* Cav. Fremont county. Wabonsie slough and elsewhere; frequent; also in Cass county, Nebraska, opposite Fremont county.

*H. trionum* L. Ringgold and Fremont counties. Fields; frequent.

## TILIACEÆ.

*Tilia americana* L. Union, Montgomery, Ringgold, and Fremont counties. Low woods; frequent.

## LINACEÆ.

*Linum sulcatum* Riddell. Ringgold and Taylor counties. Prairies; frequent.

## GERANIACEÆ.

*Oxalis violacea* L. Union county. Common.

*O. stricta* L. Clarke, Union, Taylor, Fremont and Pottawattamie counties. Fields and woods; common.

*Impatiens pallida* Nutt. Taylor and Fremont counties. Wet woods; frequent.

*I. fulva* Nutt. Fremont county. With the preceding; infrequent.

RUTACEÆ

*Xanthoxylum americana* Mill. Ringgold, Page, Taylor, Fremont, Montgomery, and Pottawattamie counties. Thickets; common.

CELASTRACEÆ.

*Celastrus scandens* L. Ringgold, Taylor, Fremont, and Pottawattamie counties. Woods; frequent.

*Euonymus atropurpureus* Jacq. Page and Pottawattamie counties. Woods; frequent.

RHAMNACEÆ.

*Rhamnus lanceolata* Pursh. Ringgold, Page, Adams, Montgomery, and Pottawattamie counties. Upland thickets; common.

*Ceanothus americanus* L. Ringgold, Taylor, Page, and Montgomery counties. Prairies; infrequent.

*C. ovatus* Desf. Adams, Montgomery, and Pottawattamie counties. Prairies; common.

*C. ovatus pubescens* T. & G. Pottawattamie county. Common.

VITACEÆ.

*Vitis riparia* Mx. Clarke, Adams, Montgomery, Pottawattamie, Ringgold, Page, Taylor, and Fremont counties. Woods and thickets; common.

*V. cinerea* Eng. Page and Fremont counties. Woods; infrequent.

*Cissus ampelopsis* Pers. Fremont county. Common in woods bordering the Missouri river.

*Ampelopsis quinquefolia* Mx. Adams, Montgomery, Pottawattamie, Ringgold, Page, and Fremont counties. Thickets; common.

SAPINDACEÆ.

*Aesculus glabra* Willd. Ringgold, Taylor, and Union counties; rich woods; frequent.

*Acer dasycarpum* Ehrh. Clarke, Adams, Montgomery, Ringgold, and Fremont counties; moist woods and artificial groves; common.

*Negundo aceroides* Moench. Union, Adams, Montgomery, Pottawattamie, Ringgold, Taylor, and Fremont counties; rich woods; common.

## ANACARDIACÆ.

*Rhus glabra* L. Clarke, Union, Adams, Montgomery, Pottawattamie, Ringgold, Taylor, Page, and Fremont counties; thickets; common.

*R. taxicodendron* L. Clarke, Adams, Montgomery, Pottawattamie, Ringgold, Page, and Fremont counties; thickets and waysides; frequent. *R. radicans* L. of the new nomenclature.

## POLYGALACEÆ.

*Polygala senega* L. Ringgold and Taylor counties; prairies; common.

*P. verticillata* L. Decatur and Fremont counties; dry soil; frequent. The variety, *ambigua* Gray, of our preceding papers, belongs here.

## LEGUMINOSÆ.

*Baptisia leucophæa* Nutt. Clarke, Union, Adams, and Ringgold counties. Prairies; frequent.

*B. leucantha* T. & G. Adams, Clarke, Union, Ringgold, Pottawattamie, and Taylor counties. Prairies; common.

*Crotalaria sagittalis* L. Fremont county. A few specimens found. Very common in dry, open, upland woods, Otoe county, Nebraska.

*Trifolium pratense* L. Clarke, Union, Adams, Montgomery, Pottawattamie, Ringgold, and Fremont counties. Waysides; common.

*T. reflexum* L. Union county. One specimen found on river bank.

*T. repens* L. Clarke, Union, and Pottawattamie counties. Waysides; common.

*T. hybridum* L. Adams county. Waste places; infrequent.

*Melilotus officinalis* Willd. Fremont county. Waste places; frequent.

*M. alba* Lam. Clarke, Union, Adams, Pottawattamie, Montgomery, Taylor, and Fremont counties. Waysides; common.

*Medicago sativa* L. Fremont county. Waste places; infrequent.

*Psoralea tenuiflora* Pursh. Union and Ringgold counties. Prairies; frequent.

*P. argophylla* Pursh. Clarke, Union, Adams, Montgomery, Pottawattamie, Taylor, and Page counties. Prairies; common.

*P. esculenta* Pursh. Fremont county. Loess hills, probably frequent.

*Amorpha canescens* Nutt. Clarke, Adams Montgomery, Pottawattamie, Page, Ringgold, Taylor, and Fremont counties. Waysides; common.

*A. fruticosa* L. Clarke, Adams, Montgomery, Pottawattamie, Ringgold, Taylor, and Fremont counties. Sloughs and along streams; common.

*A. microphylla* Pursh. Decatur county. Dry upland woods, infrequent.

*Dalea laxiflora* Pursh. Fremont county. Loess hills, common.

*Petalostemon violaceus* Mx. Ringgold, Taylor, and Fremont counties. Prairies; frequent.

*P. candidus* Mx. Ringgold, Page, and Fremont counties. Prairies; frequent.

*Robinia pseudacacia* L. Taylor and Montgomery counties. Appearing as escapes; frequent.

*Astragalus canadensis* L. Ringgold, Taylor, Page, and Fremont counties. Damp soil; common.

*Oxytropis lamberti* Pursh. Fremont county. Loess hills, common.

*Glycyrrhiza lepidota* Nutt. Union, Taylor, and Montgomery counties. Waysides; common.

*Desmodium acuminatum* DC. Ringgold, Page, and Fremont counties. Rich woods; common.

*D. illinoense* Gray. Ringgold and Page counties. Prairies; frequent.

*D. paniculatum* DC. Decatur and Fremont counties. Woods; infrequent.

*D. canadense* DC. Ringgold and Page counties. Open woods; frequent.

*D. dillenii* Darlingt. Fremont county. Woods; frequent.

*Lespedeza violacea* Pers. Ringgold and Page counties. Prairies; frequent.

*L. reticulata* Pers. Dry, upland woods; infrequent.

*L. capitata* Mx. Ringgold, Page, and Fremont counties. Dry soil; common.

*Apios tuberosa* Moench. Ringgold, Taylor, and Fremont counties.

*Strophostyles angulosa*. Ell. Fremont county. Sandy soil; common.

*S. pauciflorus* Watson. Fremont county. Sandy soil; frequent.

*Amphicarpæa monoica* Nutt. Page county. Dry woods; frequent.

*A. pitcheri* T. & G. Page and Pottawattamie counties. Woods; frequent.

*Cercis canadensis* L. Fremont county. Frequent.

*Cassia marylandica* L. Ringgold, Page, and Fremont counties. Rich lowlands; frequent; in some localities forming thickets; found also in Otoe and Cass counties, Nebraska.

*C. chamæcrista* L. Ringgold, Page, Taylor, Fremont, Montgomery, and Pottawattamie counties; waste places; common.

*Gymnocladus canadensis* Lam. Fremont and Pottawattamie counties; low woods; infrequent.

*Gledetschia triacanthos* L. Adams, Ringgold, Taylor, Page, and Fremont counties.

*Desmanthus brachylobus* Benth. Fremont county; foot of loess hills and bottoms of the river; common.

#### ROSACEÆ.

*Prunus americana* Marsh. Clarke, Union, Adams, Taylor, and Pottawattamie counties; thickets; common.

*R. sertina*. Ehrh. Union, Adams, Montgomery, Pottawattamie, Ringgold, Page, Taylor, and Fremont counties; woods; frequent.

*P. virginiana* L. Clarke, Adams, and Pottawattamie counties; low woods; frequent.

*Spiræa salicifolia* L. Taylor and Page counties; waysides; infrequent.

*Rubus occidentalis* L. Clarke, Ringgold, Fremont, and Pottawattamie counties; waysides, thickets; frequent.

*R. villosus* Ait. Union, Ringgold, and Fremont counties; open woods; frequent.

*Geum album* Gmelin. Ringgold, Page, and Pottawattamie counties.

*Potentilla arguta* Pursh. Ringgold county; prairies; common.

*P. norvegica* L. Ringgold county; fields; common.

*Agrimonia eupatoria* L. Ringgold, and Fremont counties; open woods; common.

*A. parviflora* Ait. Page and Ringgold counties; low prairies; frequent.

*Rosa arkansana* Porter. Clarke, Union, Adams, Montgomery, Pottawattamie, Ringgold, Page, and Fremont counties; prairies; common.

*Pyrus coronaria* L. Clarke, Union, Adams, Montgomery, Pottawattamie, Ringgold, Page, and Taylor counties; thickets; common.

*P. malus* L. Union, Page, Adams, Montgomery, Pottawattamie, and Ringgold counties; waysides; frequent; appearing mostly as low shrubs.

*Crataegus coccinea* L. Clarke, Adams, Taylor, and Pottawattamie counties; thickets; common.

*C. crus-galli* L. Clarke and Page counties; woods; frequent.

*Amygdalus persica* L. Ringgold, Taylor, Page, and Fremont counties; waysides; waste places; frequent; an escape from cultivation.

#### SAXIFRAGACEÆ.

*Heuchera hispida* Pursh. Union and Adams counties; prairie; frequent.

*Parnassia caroliniana* Mx. Johnson county; frequent locally.

*Ribes gracile* Mx. Clarke, Union, Adams, Pottawattamie, and Fremont counties; woods; common.

*R. floridum* L'Her. Taylor county; a clump by the wayside.

#### CRASSULACEÆ.

*Penthorum sedoides* L. Ringgold and Taylor counties; damp soils; common.

#### HALORAGACEÆ.

*Myriophyllum scabratum* Mx. Ringgold county; common in a lake near Delphos. In Wabonsie slough, in Fremont county, a deep water form was found that is taken to be this species.

*Callitricha heterophylla* Pursh. Decatur county; a few specimens found in moist localities. This is a rare plant for Iowa, and even a rare genus. The only other species we have is *C. verna* L., of Muscatine county, collected by F. Reppert.

#### LYTHRACEÆ.

*Ammannia coccinea* Rottb. Decatur county; about a dozen specimens found on the margin of a railroad pond near Davis City.

*Lythrum alatum* Pursh. Union, Adams, Montgomery, Ringgold, Page, Taylor, and Fremont counties; moist soil; common.

*Didiplis linearis* Raf. Decatur county; a few specimens on the margin of a railroad pond near Davis City; this species was quite common on mud flats of a lake near Benton, Ringgold county, where it was collected in quantity.

## ONAGRACEÆ.

*Ludwigia polycarpa* Short & Peter. Ringgold and Taylor counties. Shallow lakes; frequent.

*Gaura biennis* L. Fremont county. Fields and waste places; common. By a clerical error *G. coccinea* Nutt. was given for this species in the last Academy report. The localities for southern and northeastern Iowa should be credited to this species.

*G. parviflora* Dougl. Fremont county. Base of loess hills and in bottoms; frequent.

*Oenothera biennis* L. Ringgold and Fremont counties. Fields; common.

*Circea lutetiana* L. Page, Ringgold, Fremont, and Pottawattamie counties.

## CUCURBITACEÆ.

*Echinocystis lobata*. Taylor, Page, and Fremont counties.

## UMBELLIFERÆ.

*Cicuta maculata* L. Ringgold, Taylor, and Fremont counties. Moist places; common.

*Tiedemannia rigida* Coult. & Rose. Ringgold county. Wet sloughs; frequent.

*Heracleum lanatum* Mx. Union and Pottawattamie counties. Rich woods; common.

*Pastinaca sativa* L. Decatur, Clarke, Union, Adams, Ringgold, Taylor, Page, Fremont, and Johnson counties. Waste places; common.

*Pimpinella integerrima*. Union county. Woods; frequent.

*Polytaenia nuttallii* DC. Ringgold and Montgomery counties; prairies; a few specimens found.

*Cryptotaenia canadensis* DC. Union, Ringgold, and Pottawattamie counties; woods; common.

*Sium cicutæfolium* Gmelin. Ringgold county; wet soil; frequent.

*Zizia aurea* Koch. Johnson and Page counties; low grounds; common.

*Osmorrhiza brevistylis* DC. Fremont county; woods; frequent.

*O. longistylis* DC. Fremont county; woods; frequent.

*Eryngium yuccæfolium* Mx. Montgomery, Pottawattamie, Ringgold, Taylor, and Page counties; prairies; common.

*Sanicula marylandica* L. Ringgold and Pottawattamie counties; woods; common.

CORNACEÆ.

*Cornus asperifolia* Mx. Taylor, Fremont, Montgomery, and Pottawattamie counties; thickets; common.

*C. sericea* L. Adams county; low places; common.

*C. paniculata* L'Her. Ringgold and Pottawattamie counties.

*C. alternifolia* L. Johnson county; one shrub, from which several specimens were collected, is known.

CAPRIFOLIACEÆ.

*Sambucus canadensis* L. Clarke, Union, Adams, Montgomery, Pottawattamie, Ringgold, Taylor, Page, and Fremont counties. Low grounds; common.

*Viburnum pubescens* Pursh. Decatur county. Upland thickets; frequent locally.

*V. lentago* L. Union and Decatur counties. Low ground, along streams; frequent.

*V. prunifolium* L. Johnson county. Low grounds; infrequent.

*V. dentatum* L. Johnson county. Wooded ravines; infrequent.

*Triosteum perfoliatum* L. Union, Adams, Pottawattamie, Ringgold, and Page counties. Woods; common.

*Symphoricarpos vulgaris* Mx. Clarke, Union, Adams, Montgomery, Pottawattamie, Lucas, Monroe, Ringgold, Taylor, Page, and Fremont counties. Upland woods and prairies; common.

*S. occidentalis* Hook. Fremont and Pottawattamie counties. Base of loess hills; common.

*Lonicera sullivantii* Gray. Fremont county. Woods; a few collected.

RUBIACEÆ.

*Houstonia angustifolia* Mx. Taylor and Fremont counties. Prairies and loess hills; common.

*Galium concinnum* T. & G. Union and Page counties. Woods; common.

*G. circeazans* Mx. Fremont and Pottawattamie counties. Woods; common.

COMPOSITÆ.

*Vernonia noveboracensis latifolia* Gray. Ringgold county. Pastures; common.

*Eupatorium purpureum* L. Ringgold, Page, and Pottawattamie counties. Woods; common.

*Liatris punctata* Hook. Fremont county. Loess hills; common.

*L. scariosa* Willd. Ringgold and Fremont counties. Prairies; common.

*L. pycnostachya* Mx. Ringgold, Taylor, and Page counties. Prairies; common.

*L. squarrosa* Willd. Taylor and Page counties. Prairies; common.

*Grindelia squarrosa* Dunal. Fremont county. Waste places; frequent.

*Solidago rigida* L. Fremont county. Woods; frequent.

*S. ulmifolia* Muhl. Taylor county. Woods; frequent.

*S. missouriensis* Ait. Ringgold, Page, Fremont, Decatur, and Johnson counties. Upland woods; frequent.

*S. serotina* Ait. Taylor county. Low places; common.

*Boltonia asteroides* L'Her. Ringgold and Taylor counties. Wet soil; frequent.

*Aster sericeus* Vent. Ringgold, Taylor, Page, Fremont, Montgomery, and Pottawattamie counties. Prairies; common.

*A. multiflorus* Ait. Ringgold and Taylor counties. Waysides; frequent.

*A. laevis* L. Johnson county.

*Erigeron strigosus* Muhl. Clarke county. Fields; common.

*E. divaricatus* Mx. Ringgold and Fremont counties. Pastures; common.

*E. canadensis* L. Page and Fremont counties. Waste places; common.

*E. annuus* Pers. Union and Pottawattamie counties. Waste places; common.

*Silphium perfoliatum* L. Ringgold, Taylor, Page, Fremont, Montgomery, and Pottawattamie counties. Low places; frequent.

*S. integrifolium* Mx. Ringgold, Taylor, Page, Fremont, Montgomery, and Pottawattamie counties. Prairies; common.

*S. laciniatum* L. Clarke, Union, Adams, Fremont, Montgomery, and Pottawattamie counties. Prairies; common.

*Parthenium integrifolium* L. Ringgold county. Prairies; common.

*Iva xanthiifolia* Nutt. Fremont county. River bottoms; common.

*Ambrosia artemisiifolia* L. Clarke, Union, Adams, Montgomery, Pottawattamie, Ringgold, Taylor, Page, and Fremont counties. Waste places; common.

*A. trifida* L. Clarke, Union, Adams, Montgomery, Pottawattamie, Ringgold, Taylor, Page, and Fremont counties. Waste places; common.

*A. psilostachya* DC. Fremont county. Waste places; common.

*Xanthium canadense* Mill. Ringgold, Fremont, and Pottawattamie counties. Waste places; common.

*Heliopsis laevis* Pers. Decatur and Fremont counties. Upland woods; infrequent.

*H. scabra* Dunal. Taylor, Page, Fremont, and Montgomery counties. Prairies; common.

*Echinacea angustifolia* DC. Clarke, Adams, Montgomery, Pottawattamie, Ringgold, and Fremont counties. Prairies; frequent.

*Rudbeckia triloba* L. Ringgold county. Woods; common.

*R. laciniata* L. Ringgold county. Low woods; common.

*R. subtomentosa* Pursh. Johnson county. Prairies; frequent.

*Lepachys pinnata* T. & G. Ringgold, Taylor, Page, and Fremont counties. Prairies; common.

*Helianthus annuus* L. Union, Pottawattamie, Ringgold, Page, and Fremont counties. Waste places; frequent.

*H. rigidus* Desf. Ringgold, Taylor, Page, and Fremont counties. Prairies; frequent.

*H. grosse-serratus* Mart. Fremont county. Low places; common.

*H. hirsutus* Raf. Ringgold county. Woods; common.

*Actinomeris squarrosa* Nutt. Ringgold, Page, and Fremont counties. Low woods; frequent.

*Coreopsis palmata* Nutt. Clarke, Union, Adams, Montgomery, Pottawattamie, and Page counties. Prairies; common.

*C. tripteris* L. Ringgold and Taylor counties.

*Helenium autumnale* L. Taylor and Fremont counties.

*Dysodia chrysanthemoides* Lag. Union, Ringgold, Taylor, Page, and Fremont counties. Waste places; common.

*Anthemis cotula* DC. Clarke, Union, Adams, Montgomery, Pottawattamie, Ringgold, Taylor, and Fremont counties. Waste places; common.

*Achillea millefolium* L. Clarke, Union, Montgomery, Pottawattamie, Decatur, and Ringgold counties. Fields and upland woods; common; pink, flowered forms are frequently found in Decatur county, in upland woods.

*Artemisia ludoviciana* Nutt. Union, Adams, Montgomery, Pottawattamie, Ringgold, Taylor, Page, and Fremont counties. Waysides and fields; common.

*A. annua* L. Decatur county. Waste places; common in one locality.

*Cacalia atriplicifolia* L. Union, Pottawattamie, Ringgold, Taylor, and Fremont counties. Prairies; frequent.

*C. tuberosa* Nutt. Union, Adams, Pottawattamie, Ringgold, and Taylor counties. Prairies; common.

*Arctium lappa* L. Clarke, Adams, Pottawattamie, Ringgold, Taylor, and Fremont counties. Waste places; common.

*Hieracium longipilum* Torr. Taylor county. Prairies; frequent.

*H. scabrum* Mx. Ringgold county. Woods; frequent.

*Prenanthes aspera* Mx. Ringgold county. Waysides; frequent.

*Lygodesmia juncea* Don. Fremont county. Loess hills; common; this species is spreading eastward and is becoming frequent in the cultivated fields.

*Taraxacum officinale* Neber. Clarke, Union, Adams, Montgomery, and Ringgold counties. Fields and waste places; common.

*Lactuca integrifolia* Bigel. Decatur, Ringgold, and Taylor counties. Fields and waysides; frequent.

*L. scariola* L. Decatur, Taylor, Page, and Fremont counties. Waste places; frequent.

*L. canadensis* L. Ringgold county. Waysides; frequent.

*L. floridana* Gaertn. Johnson, Van Buren, and Decatur counties. Fields; frequent.

*L. pulchella* Bigel. Montgomery, Pottawattamie, and Fremont counties. Waste places; common.

#### LOBELIACEÆ.

*Lobelia siphilitica* L. Taylor, Page, and Fremont counties. Moist places; frequent.

*L. spicata* Lam. Union and Adams counties. Fields; common.

#### CAMPANULACEÆ.

*Specularia perfoliata* A. DC. Union county. Rare.

*Campanula americana* L. Taylor, Page, and Fremont counties. Rich woods; common.

PRIMULACEÆ.

- Steironema ciliatum* Raf. Fremont county. Woods; frequent.  
*S. lanceolatum* Gray. Ringgold county. Frequent in a swampy locality.

APOCYNACEÆ.

- Apocynum androsaemifolium* L. Union county. Waysides and fields; frequent.  
*A. cannabinum* L. Clarke, Montgomery, Pottawattamie, Ringgold, and Taylor counties. Fields and waste places; frequent.

ASCLEPIADACEÆ.

- Asclepias tuberosa* L. Clarke, Union, Montgomery, Ringgold, Taylor, and Page counties. Fields; common.  
*A. incarnata* L. Ringgold, Page, and Fremont counties. Wet soil; frequent.  
*A. cornuti* Decaisne. Clarke, Adams, Pottawattamie, Ringgold, and Taylor counties. Fields; common; the authority for this species was wrongly given as DC. in the last report.  
*A. sullivantii* Englm. Taylor and Page counties. Bottoms; frequent.  
*A. obtusifolia* Mx. Union, Adams, and Montgomery counties. Waysides; frequent.  
*A. meadii* Torr. Adams county. Prairie; infrequent.  
*A. purpurascens* L. Union and Ringgold counties. Infrequent.  
*A. verticillata* L. Ringgold, Taylor, Page, Fremont, and Pottawattamie counties. Fields and open woods; common.  
*Acerates longifolia* Ell. Ringgold and Taylor counties. Prairies; common.  
*A viridiflora* Ell. Clarke county. Prairies; frequent.

GENTIANACEÆ.

- Gentiana andrewsii* Griseb. Decatur county. Prairies; infrequent.  
*G. alba* Muhl. Taylor county. Prairie woods; infrequent.

POLEMONIACEÆ.

- Phlox pilosa* L. Union, Adams, Montgomery, and Pottawattamie counties. Prairies; common.  
*P. divaricata* L. Pottawattamie county. Rich woods; common.

## HYDROPHYLLACEÆ.

*Ellisia nyctelea* L. Union county. Damp localities; common.

## BORRAGINACEÆ.

*Echinosperrum virginicum* Lehm. Page county.

*Lithospermum latifolium* Mx. Pottawattamie county.

*Onosmodium carolinianum* DC. Union, Adams, Montgomery, and Fremont counties. Pastures; common.

## CONVOLVULACEÆ.

*Convolvulus sepium* L. Union, Adams, Montgomery, Pottawattamie, Ringgold, Taylor, Page, and Fremont counties. Waysides; borders of fields; common.

*C. arvensis* L. Decatur, Taylor, and Fremont counties. Waste places; frequent.

*Cuscuta glomerata* Choisy. Taylor county. Low places; frequent.

## SOLANACEÆ.

*Solanum nigrum* L. Ringgold, Page, and Fremont counties.

*S. carolinense* L. Taylor and Fremont counties. Waste places; frequent.

*S. rostratum* Dunal. Page and Fremont counties. Waste places; fields; becoming frequent.

*Physalis angulata* L. Fremont county. A few found.

*P. philadelphica* Lam. Page and Fremont counties. Fields; frequent.

*P. lanceolata* Mx. Adams and Pottawattamie counties. Open woods; waysides; frequent.

*Lycium vulgare* Dunal. Page county. Waste places; infrequent.

*Nicandra physaloides* Gaertn. Fremont county. In fields; infrequent.

*Datura stramonium* L. Ringgold, Taylor, Page, Fremont, and Montgomery counties. Waste places; common.

*D. tatula* L. Ringgold county. Waste places; common.

## SCROPHULARIACEÆ.

*Verbascum thapsus* L. Clarke, Montgomery, Pottawattamie, Ringgold, Taylor, Page, and Fremont counties. Fields; waste places; common.

*Linaria vulgaris* Mill. Clarke and Page counties. Waste places; frequent.

*Scrophularia nodosa marylandica* Gray. Ringgold and Taylor counties. Open woods; frequent.

*Pentstemon grandiflorus* Nutt. Fremont county. Loess hills; frequent.

*Mimulus ringens* L. Ringgold county. Wet places; frequent; white flowered forms were found.

*M. alatus* Ait. Decatur county. Wet banks; infrequent.

*Gratiola virginiana* L. Ringgold county. Rich woods; frequent.

*Ilysanthes riparia* Raf. Ringgold county. Wet banks common.

*Veronica virginica* L. Ringgold and Taylor counties. Prairies and woods; common.

*Seymeria macrophylla* Nutt. Decatur and Page counties. Upland woods; common.

LENTIBULARIACEÆ.

*Utricularia vulgaris* L. Fremont county. Frequent in Wabonsie slough.

PEDALIACEÆ.

*Martynia proboscidea* Glox. Taylor county. Waysides; infrequent.

ACANTHACEÆ.

*Ruellia ciliosa* Pursh. Clarke, Ringgold, Taylor, and Page counties. Waysides; common.

VERBENACEÆ.

*Verbena urticifolia* L. Ringgold and Taylor counties. Fields and waste places; common.

*V. hastata* L. Clarke, Union, Pottawattamie, Ringgold, and Page counties.

*V. stricta* Vent. Ringgold and Fremont counties.

*V. bracteosa* Mx. Union, Fremont, and Pottawattamie counties. Fields and waste places; common.

*Lippia lanceolata* Mx. Fremont county. Wet places; frequent.

*Phryma leptostachya* L. Page and Fremont counties. Rich woods; frequent.

LABIATÆ.

*Teucrium canadense* L. Page and Ringgold counties. Low grounds; frequent.

*Mentha viridis* L. Taylor county. Waysides; infrequent.

*Lycopus sinuatus* Ell. Fremont county. Low places; frequent.

*Pycnanthemum lanceolatum* Pursh. Ringgold county. Waysides; frequent.

*P. linifolium* Pursh. Ringgold county. Prairies; frequent.

*Hedeoma pulegioides* Pers. Page and Fremont counties. Woods; common.

*H. hispida* Pursh. Decatur county. Dry, upland woods; common.

*Monarda fistulosa* L. Ringgold, Taylor, Page, and Fremont counties. Woods; common.

*M. punctata* L. Jefferson county.

*Lophanthus scrophulariaefolius* Benth. Fremont county. Woods; frequent.

*L. nepetoides* Benth. Ringgold, Page, and Fremont counties. Woods; frequent.

*Salvia lunceolata* Willd. Decatur, Page, and Fremont counties. Waysides; frequent.

*Nepeta cataria* L. Ringgold, Page, Fremont, and Pottawattamie counties. Waste places; common.

*N. glechoma* Benth. Clarke and Page counties. Waste places; frequent.

*Scutellaria versicolor* Nutt. Decatur county. Rich woods; frequent.

*S. parvula* Mx. Ringgold county. Prairies; frequent.

*Brunella vulgaris* L. Union, Pottawattamie, Ringgold, Page, and Fremont counties. Open woods; common.

*Physostegia virginiana* Benth. Fremont county. Wet, low soil; infrequent.

*Leonurus cardiaca* L. Decatur and Fremont counties. Waste places; frequent.

*Marrubium vulgare* L. Fremont county. Waysides; scarce.

*Stachys palustris* L. Union and Montgomery counties. Wet soil; common.

*S. aspera* Mx. Ringgold county. Low places; frequent.

#### PHYTOLACCACEÆ.

*Phytolacca decandra* L. Fremont county. Waysides; infrequent.

#### PLANTAGINACEÆ.

*Plantago rugelii* Dec. Ringgold county. Low woods; common.

*P. aristata* Mx. Ringgold, Montgomery, and Pottawattamie counties. Wayside and waste places; frequent.

NYCTAGINACEÆ.

*Oxybaphus nyctagineus* Sweet. Union county. Waste places; frequent.

*O. hirsutus* Sweet. Taylor county. Waysides; infrequent.

*O. angustifolius* Sweet. Page, Taylor, and Fremont counties. Prairies; infrequent.

*O. albidus* Choisy. Union county. Waysides; infrequent; the same as *Allionia albida* Walt.

ILLECEBRACEÆ.

*Anychia capilalcea* DC. Ringgold, Page, Fremont, and Pottawattamie counties. Woods; frequent.

AMARANTACEÆ.

*Amarantus retroflexus* L. Page and Fremont counties. Waste places; common.

*A. albus* L. Page county. Waste places.

*A. blitoides* Watson. Fremont county. Waste places.

CHENOPODIACEÆ.

*Chenopodium hybridum* L. Ringgold and Fremont counties. Waste places; frequent.

*Cycloloma platyphyllum* Moq. Fremont county. Sandy soil; frequent.

*Atriplex patulum hastatum* Gray. Taylor county. Waste places; infrequent.

POLYGONACEÆ.

*Rumex crispus* L. Clarke county. Waste places; frequent.

*R. acetosella* L. Pottawattamie county. Waste places; frequent.

*Polygonum virginianum* L. Ringgold and Page counties. Rich woods; common.

*P. aviculare* L. Ringgold, Fremont, and Pottawattamie counties. Waste places; common.

*P. erectum* L. Clarke and Union counties. Waste places; common.

*P. convolvulus* L. Decatur county. Waste places; frequent.

*P. muhlenbergii* Watson. Ringgold and Fremont counties. Wet places; frequent.

*Fagopyrum esculentum* Moench. Page and Pottawattamie counties. Waste places; frequent.

*F. tataricum* (L.) Gaertn. Decatur county. Waste places; one specimen found.

## ARISTOLOCHIACEÆ.

*Asarum reflexum ambiguum* Bicknell. Decatur, Appanoose, Ringgold and Page counties. Rich woods; common.

*A. acuminatum* (Ashe) Bicknell. Johnson county. Rich woods; frequent. This and the preceding species have heretofore been confused with *asarum canadense* L.

## SANTALACEÆ.

*Commandra umbellata* Nutt. Page county.

## EUPHORBIACEÆ.

*Euphorbia serpens* H. B. K. Fremont county.

*E. maculata* L. Ringgold and Fremont counties. Waste places; common.

*E. preslii* Guss. Ringgold, Page, and Fremont counties. Waste places; common.

*E. marginata* Pursh. Fremont county. Fields and waste places; common.

*E. corollata* L. Ringgold, Taylor, Page, Fremont, and Pottawattamie counties. Fields; common.

*E. heterophylla* L. Decatur county. Bluffs; infrequent.

*E. cyparissias* L. Decatur and Pottawattamie counties. Waste places; infrequent.

*Acalypha virginica* L. Page and Fremont counties. Fields and waste places; common.

## URTICACEÆ.

*Ulmus fulva* Mx. Union, Pottawattamie, Ringgold, Taylor, Page, and Fremont counties. Woods; frequent.

*U. racemosa* Thomas. Decatur county. An infrequent tree along Grand river.

*U. americana* L. Union, Adams, Montgomery, Pottawattamie, Ringgold, Taylor, Page, and Fremont counties. Low woods; common.

*Celtis occidentalis* L. Union, Montgomery, Pottawattamie, Ringgold, Page, and Fremont counties. Low woods; frequent.

*Cannabis sativa* L. Clarke, Union, Adams, Montgomery, Pottawattamie, Ringgold, Taylor, Page, and Fremont counties. Waste places; common.

*Humulus lupulus* L. Union, Adams, Montgomery, Pottawattamie, Ringgold, Taylor and Fremont counties. Thickets; common.

*Morus rubra* L. Fremont county. Low woods; frequent.

*Urtica gracilis* Ait. Clarke, Montgomery, Pottawattamie, Page, and Fremont counties. Low grounds; common.

*La portea canadensis* Gaud. Ringgold and Fremont counties. Moist woods; common.

*Pilea pumila* Gray. Ringgold and Page counties. Damp woods; frequent.

*Parietaria pennsylvanica* Muhl. Decatur, Union, Page, and Pottawattamie counties. Low woods; frequent.

PLATANACEÆ.

*Platanus occidentalis*. Page and Fremont counties. Bottoms; frequent.

JUGLANDACEÆ.

*Juglans nigra* L. Union, Montgomery, Pottawattamie, Ringgold, Page, Taylor, and Fremont counties. Rich woods; common.

*Carya alba* Nutt. Taylor, Page, Pottawattamie, and Fremont counties. Upland woods; common.

*C. amara* Nutt. Ringgold, Taylor, Page, Fremont, Montgomery, and Pottawattamie counties. Rich woods; common.

CUPULIFERÆ.

*Betula nigra* L. Ringgold county.

*Corylus americana* Walt. Clarke, Adams, Montgomery, Pottawattamie, Ringgold, and Page counties. Thickets; common.

*Ostrya virginica* Willd. Union and Fremont counties. Bluffs; frequent.

*Quercus alba* L. Union and Ringgold counties. Woods; common.

*Q. macrocarpa* Mx. Union, Adams, Montgomery, Pottawattamie, Ringgold, Taylor, Page, and Fremont counties. Woods; common.

*Q. bicolor* Willd. Ringgold county. Low woods; frequent.

*Q. muhlenbergii* Englm. Union, Adams, Montgomery, Ringgold, and Fremont counties. Upland woods; frequent.

*Q. rubra* L. Union, Montgomery, Pottawattamie, Ringgold, Taylor, Page, and Fremont counties. Woods; frequent.

*Q. coccinea* Wang. Ringgold, Fremont, and Pottawattamie counties. Upland woods; common.

*Q. imbricaria* Mx. Clarke, Union, and Ringgold counties. Upland woods and thickets; common.

*Q. marylandica* Muench. Decatur county. Uplands; a frequent shrub associated with *Q. nigra* L.

## SALICACEÆ.

*Salix nigra* Marsh. Decatur, Page, and Fremont counties. Along streams; common.

*S. longifolia* Muhl. Ringgold, Taylor, Page, and Fremont counties. Rich soil; frequent.

*S. humilis* Marsh. Taylor county. Dry uplands; frequent.

*S. amygdaloides* Anders. Page and Fremont counties. Rich low lands; common.

*S. cordata* Muhl. Page and Fremont counties. Low lands; common.

*S. alba vitellina* Koch. Decatur county. Becoming frequent.

*Populus tremuloides* Mx. Union and Ringgold counties. Thickets; frequent.

*P. monilifera* Ait. Clarke, Union, Adams, Montgomery, Ringgold, Taylor, Fremont, Lucas, and Monroe counties. Low lands; frequent.

## CONIFERÆ.

*Juniperus virginiana* L. Decatur county. A small shrub found in upland woods.

## ORCHIDACEÆ.

*Spiranthes cernua* Richard. Johnson county, several specimens found in moist places; Decatur county, a single specimen found in prairie upland.

*S. gracilis* Bigelow. Decatur county. About forty specimens found in upland prairie grass.

*Cypripedium parviflorum* Salisb. Decatur county. Rich woods; associated with *C. pubescens* Willd., but much less frequent.

*C. pubescens* Willd. Ringgold county. Rich uplands; frequent.

*C. spectabi'e* Swartz. Jefferson county. Swampy soil; rare. Specimens were transplanted with with good results.

## IRIDACEÆ.

*Iris versicolor* L. Union, Ringgold, and Page counties. Swamps; ponds; frequent.

*Belamcanda chinensis* Adans. Ringgold, Taylor, and Page counties. Waysides; waste places; becoming frequent.

DIOSCOREACEÆ.

*Dioscorea villosa* L. Union and Ringgold counties. Thickets; frequent.

LILIACEÆ.

*Smilax herbacea* L. Union county. Thickets; rich soil; frequent.

*S. hispida* Muhl. Adams, Ringgold, and Fremont counties. Woods; frequent.

*Allium canadense* Kalm. Union county. Fields and woods; frequent.

*Yucca angustifolia* Pursh. Fremont county. Loess hills; common.

*Polygonatum giganteum* Dietrich. Ringgold, Page, and Pottawattamie counties. Woods; frequent.

*Asparagus officinalis*. Page, Fremont, and Montgomery counties. Waste places; frequent.

*Smilacina racemosa* Desf. Union county. Woods; frequent.

*Erythronium mesochoreum* Knerr. Decatur county. High prairies; common; blooming before *E. albidum* Nutt., and the specimens all flowering ones; the leaves very narrow; found also in Harrison county, Missouri.

*Lilium philadelphicum* L. Union and Adams counties. Prairies; common.

*L. canadense* L. Montgomery county. Prairies; frequent.

*L. tigrinum* Ker. Fremont county. An escape into waste places.

*Trillium nivale* Riddell. Decatur county. Rocky woods; frequent locally.

*Melanthium virginicum* L. Union and Adams counties. Damp prairies; frequent.

*Zygadenus elegans* Pursh. Decatur county. Rich woods; frequent locally.

PONTEDERIACEÆ.

*Pontederia cordata* L. Ringgold county. Margins of ponds; frequent.

COMMELINACEÆ.

*Tradescantia virginica* L. Clarke, Union, and Ringgold counties. Prairies and fields; common.

JUNCACEÆ.

*Juncus tenuis* Willd. Union and Pottawattamie counties. Grassy places; common.

*J. torreyi* Coville. Fremont county. Damp soil; frequent.

#### TYPHACEÆ.

*Typha latifolia* L. Union, Adams, Page, and Fremont counties. Margins of ponds; frequent.

*Sparganium eurycarpum* Englm. Ringgold county. Ponds; frequent.

*S. androcladum* (Englm.) Morong. Ringgold county. Ponds; frequent.

#### ARACEÆ.

*Arisæma triphyllum* Tor. Pottawattamie county. Rich woods; common.

*A. dracontium* Schoot. Union, Page, and Pottawattamie counties. Rich woods; frequent.

#### LEMNACEÆ.

*Spirodela polyrrhiza* Schleid. Fremont county. Ponds and sloughs; common.

*Lemna trisulca* L. Fremont county. Ponds and sloughs; frequent.

*L. minor* L. Decatur, Taylor, and Page counties. Ponds and streams; frequent.

#### ALISMACEÆ.

*Alisma plantago* L. Ringgold county. Moist places; frequent.

*Sagittaria variabilis* Engl. Ringgold and Taylor counties. Ponds; common.

*S. graminea* Mx. Fremont county. Common in mud flats or shallow water.

#### NAIADACEÆ.

*Potamogeton fluitans* Roth. Common in Wabonsie slough.

#### CYPERACEÆ.

*Cyperus speciosus* Vahl. Ringgold county.

*C. esculentus* L. Montgomery and Fremont counties.

*Eleocharis ovata* R. Br. Ringgold county.

*E. acicularis* R. Br. Fremont county. Margins of ponds; common.

*Scirpus lacustris* L. Fremont county. Ponds; common.

*S. fluviatilis* Gray. Decatur county. Frequent in one locality.

*S. atrovirens* Muhl. Montgomery county.

*Carex lupulina* Muhl. Page county.

*C. vulpinoidea* Mx. Union, Adams, and Montgomery counties. Moist soil; common.

*C. rosea* Schkur. Pottawattamie county.

*C. cephalophora* Muhl. Pottawattamie county.

*C. cristatella* Britton. Adams county.

GRAMINEÆ.

*Spartina cynosuroides* Willd. Ringgold, Page, Taylor, and Fremont counties. Wet soil; common.

*Panicum sanguinale* L. Page and Fremont counties. Fields and waste places; common.

*P. virgatum* L. Taylor county. Low prairies; frequent.

*P. glabrum* Gaud. Decatur county.

*P. lanuginosum* Ell. Union county. Waysides; frequent.

*P. macrocarpon* Le Conte. Union county. Woods; frequent.

*P. crus-galli* L. Ringgold, Page, and Fremont counties. Waste places; common.

*Setaria glauca* Beauv. Ringgold, Page, and Fremont counties. Waste places; common.

*S. viridis* Beauv. Page, Pottawattamie, and Fremont counties. With the preceding.

*S. italica* Kunth. Page county. Waysides; frequent.

*Cenchrus tribuloides* L. Fremont county. Sandy shores; common.

*Zizania aquatica* L. Ringgold and Page counties. Ponds; infrequent:

*Tripsacum dactyloides* L. Adams, Ringgold, and Taylor counties. Wet places; frequent.

*Andropogon scoparius* Mx. Decatur county. Uplands and woods; frequent.

*Crysopegon nutans* Benth. Taylor county. Prairies; frequent.

*Phalaris canariensis* L. Decatur county. Waste places; streets; infrequent.

*Aristida oligantha* Mx. Taylor county. Dry soil; frequent.

*Stipa spartea* Trin. Union, Adams, and Montgomery counties. Prairies; frequent.

*Muhlenbergia mexicana* Trin. Decatur county. Low places; common.

*M. sobolifera* (Muhl.) Frin. Decatur and Fremont counties. Infrequent.

*Phleum pratense* L. Clarke, Union, Adams, Montgomery, Pottawattamie, Ringgold, Taylor, Page, and Fremont counties. Fields and waysides; common.

*Alopecurus geniculatus* L. Ringgold county. Wet places; frequent.

*Bouteloua hirsuta* Lag. Fremont county. Loess hills; common.

*B. racemosa* Lag. Ringgold, Taylor, Page, and Fremont counties. Waysides; frequent

*Eragrostis major* Host. Ringgold, Page, and Fremont counties. Waste places; common.

*E. purshii* Schrader. Fremont county.

*Melica nutica* Walt. Union county. Woods; infrequent.

*Dactylis glomerata* L. Page county.

*Glyceria nervata* Trin. Union and Adams county. Low prairies; common.

*Bromus secalinus* L. Adams county. Fields; frequent.

*Bromus ciliatus purgans* Gray. Pottawattamie county.

*Agropyrum spicatum* R. & S. Montgomery and Taylor counties. Prairies; infrequent.

*Hordeum jubatum* L. Clarke, Union, Adams, and Montgomery counties. Waste places; common.

*H. pusillum* Nutt. Adams, Montgomery, and Pottawattamie counties. Waste places; waysides; becoming frequent.

*Elymus striatus* Willd. Decatur, Pottawattamie, Page, and Fremont counties. Woods; frequent.

*E. virginicus* L. Ringgold county.

*E. canadensis* L. Ringgold, Taylor, and Fremont counties. Waysides; frequent.

*Asprella hystrix* Willd. Decatur, Ringgold, Page, and Pottawattamie counties. Woods; frequent.

#### EQUISETACEÆ.

*Equisetum arvense* L. Union and Fremont counties. Moist soil; common.

*E. lævigatum* Braun. Adams, Union, Montgomery, and Pottawattamie counties. Uplands; waysides; frequent.

#### FILICES.

*Adiantum pedatum* L. Ringgold, Page, and Fremont counties. Rich woods; common.

*Cystopteris fragilis* Bernh. Union, Page, Pottawattamie, and Fremont counties. Rich woods; common.

*Onoclea struthiopteris* Hoffm. Decatur county. Rich woods; infrequent.

OPHIOGLOSSACEÆ.

*Botrychium virginianum* Swartz. Pottawattamie county. Rich woods; frequent.

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**EXTENSION OF COMPLEX ALGEBRA TO THREE-FOLD SPACE.**

BY T. PROCTOR HALL.

Taking rectangular coördinates in a plane, let  $x, y,$  be unit vectors along the axes of  $X, Y,$  respectively; and let  $A$  be any unit vector from  $O$  in the plane, making an angle  $a$  with  $X.$

Let  $i$  be a rotor such that  $i^n$  rotates any vector,  $A,$  through  $n. 90^\circ$  in the positive direction. Then

$$\begin{aligned} i x &= y. \\ i^2 A &= -A \\ \therefore i^2 &= -1. \end{aligned}$$

Equating vectors from  $O:$

$$\begin{aligned} A &= x \cos a + y \sin a. \\ &= (\cos a + i \sin a) x. \\ &= e^{i a} x, \text{ (by expansion in series).} \end{aligned}$$

A vector ( $A$ ) is here considered to be composed of three distinct components or factors; a unit direction ( $x$ ), a length (which, for the sake of simplicity, is here considered unity), and a rotor ( $\cos a + i \sin a,$  or  $e^{i a}$ ) which has rotated the vector from unit position ( $x$ ) to any other position ( $A$ ) in the plane.

The product of two vectors is

$$\begin{aligned} A_1 A_2 &= (\cos a_1 + i \sin a_1) (\cos a_2 + i \sin a_2) x. x \\ &= [\cos (a_1 + a_2) + i \sin (a_1 + a_2)] x. \\ &= e^{i (a_1 + a_2)} x. \end{aligned}$$

Since  $x$  is unity in every one of its capacities,  $x x = x,$  as given above.

The unit vector,  $x,$  is a factor of every term of this algebra, and may be dropped, leaving an algebra of rotors only, which