The *Journal of Economic Entomology* under the editorship of Dr. E. Porter Felt, of Albany, N. Y., and under the business management of Professor E. D. Sanderson, of Durham, N. H., has been a power for the development of economic entomology. It has not only published the records of the meetings of Chicago in 1907, and at Baltimore in 1908, but it has secured for economic workers throughout the country, records of progress throughout the season, and it has made possible the early publication of results that were of sufficient importance to warrant the attention of other workers along similar lines. It would be easy to criticize adversely individual publications in this journal, and to find fault with details of management, but in that it would share only the fate of other periodicals that depend upon individuals for their contents. The *Journal of Economic Entomology* has not only justified itself during the nearly two years of its existence; but, in the opinion of one of its opponents, has done excellent work in the advancement of the science whose records it publishes. JOHN B. SMITH

RUTGERS COLLEGE,
NEW BRUNSWICK, N. J.

SPECIAL ARTICLES

ON THE PLANT GEOGRAPHY OF THE CHIRICAHUA MOUNTAINS

THE CHIRICAHUA MOUNTAINS[1] of southeastern Arizona extend almost due north and south for some 50 miles from Fort Bowie to a point near College Peak, and within 15 miles of the Mexican Boundary, with a maximum width at Paradise of 18 miles. On their west lies the broad and level Sulphur Springs Valley at about 5,000 feet altitude, on their east the trough-like San Simon Valley drops to nearly 3,500 feet. The highest part of the range extends from Paradise to Rucker Canyon, consists of five or six more or less elongated forest-covered peaks whose axes lie in a north-east-southwest direction, and rises in Cave Peak to an altitude of about 9,700 feet above sea-level.

As one might expect, the tree growth is quite similar to that recently given by Mearns[2] for several mountain ranges near the international boundary of this region. Of the 54 species (including a few shrubs) mentioned as occurring about 12 or 15 mountain masses of his "Elevated Central Tract," 48 are found in the Chiricahuas alone. He enumerates 137 arborescent species along the boundary from Texas to the Pacific Coast. In the Chiricahuas were found, exclusive of succulents and Liliaceæ, a total of 124 species of trees and shrubs. These consist of 111 angiosperms and 13 gymnosperms, all the latter being trees except *Ephedra* sp., and all evergreen. Of the angiosperms, 35 are trees and 76 are shrubs, making a total for the mountains of 47 trees and 77 shrubs. Ten of the latter are suffrutescent composites, probably all more or less evergreen, at least when sufficient moisture is available. Of the remaining shrubby species, 39 are deciduous and 16 evergreen, while 12 in this respect are unknown to the writer. Thus the total of known evergreens is 47, that of deciduous species, 65. Other species will be found, but they will probably not materially alter these proportions.

This does not, however, give the key to a true, general picture of the floral geography. This must rather base upon the number, size and distribution of the individuals composing the more prevalent species. From this viewpoint, leaving out of consideration the winter-dead ground-cover of perennial and annual grasses and herbs, the evergreen character is altogether dominant. The Lower Sonoran zone, characterized by its cacti and thorny shrubs, often drouth-deciduous, touches the mountains only at their eastern base and both ends. The Upper Sonoran completely encircles them in a broad belt of evergreen brush land, with the oaks as leading species, corresponding to one of the types of Schimper's Immergrünes Hartlaubgehölze. This extends well into the Transition zone, and here mingles with the

[1] In 1906 and 1907, ten months were given to the exploration of this range, some 1,600 miles covered within its bounds, and about 1,050 species of plants collected. Undoubtedly many other higher plants may be found.

[2] "Mammals of the Mex. Bound. of the U. S.," Part I., Bull. 56, U. S. Nat. Mus., 1907.

outposts of the tall coniferous forest, which through the Canadian and Hudsonian zones envelops all the remainder of the range with a mantle of needle-leaf evergreen differing only in its much deeper hue from the light green of the largely sclerophyllous broadleaf brush-woods of the lower slopes.

The larger species most characteristic of the several zones are as follows: Lower Sonoran or Desert Zone—*Acacia constricta* Benth., A. *greggii* A. Gray, *Prosopis velutina* Wooton.[3] Upper Sonoran or Oak Zone—*Quercus oblongifolia* Torr., *Q. emoryi* Torr., *Q. toumeyi* Sarg., *Juniperus monosperma* Engelm., *Prosopis glandulosa* Torr.[3] Transition or Pine Zone—*Pinus chihuahuana* Engelm., *P. mayriana* Sudw., *P. cembroides* Zucc., *Quercus hypoleuca* Engelm., *Q. reticulata* H. B. K. Canadian or Fir Zone—*Abies concolor* (Gord.) Parry, *Pinus arizonica* Engelm. Hudsonian or Spruce Zone—*Picea Engelmannii* (Parry) Engelm.

Other prominent species are *Quercus arizonica* Sarg. and *Juniperus pachyphlœa* Torr., which are practically coextensive throughout the Upper Sonoran and Transition zones. In like manner, *Pinus strobiformis* Engelm. links and extends over the Canadian and Hudsonian zones, becoming increasingly abundant toward the summits, while *Pseudotsuga taxifolia* (Lam.) Britton is present here and downward, reaching the remarkably low altitude of 6,500 feet on residual north slopes in several instances.

If three maps were to be drawn of this mountain range, to show the three chief features of its floral geography, the first would give the several altitudinal zones, both in succession and relative limits somewhat as outlined by Merriam for San Francisco Peak in northern Arizona.[4] The chief differences between the two mountain masses are: (1) The absence of the two uppermost zones of Merriam from the Chiricahuas, due to insufficient elevation. (2) The absence in the San Francisco Mountains of the evergreen oaks, whereas in the Chiricahuas the pinyon of the former is to a great extent replaced by oak, and should be designated the oak zone or oak-pinyon zone.

TABLE OF ALTITUDES

Zones of San Francisco Mts. (Merriam)

Desert Area	4,000–6,000 feet
Pinyon Zone	6,000–7,000 feet
Pine Zone	7,000–8,200 feet
Balsam Fir Zone	8,200–9,200 feet
Spruce Zone	9,200–10,500 feet
Timber-Line Zone	10,500–11,500 feet
Alpine Zone	Above 11,500 feet

Zones of Chiricahua Mts.

Desert Area	Below 4,500 feet
Oak Zone	4,500–6,000 feet
Pine Zone	6,000–7,900 feet
Fir Zone	7,900–8,900 feet
Spruce Zone	Above 8,900 feet

The San Francisco altitudes represent mean elevations of the limits of the several zones. The lower limits of the Chiricahua zones are approximate averages of the lowest points of extension on residual slopes of the species or groups of species for which the respective zones are named.[5] The upper limits, as given, merely coincide with the lower limits of the next higher zones. This will partly account for the lower elevation of the Chiricahua zones, while in part it may be due to lower base level (smaller land mass)[6] despite the counteractive effect of lower latitude. The zones in reality overlap, but on paper we have thus at least their true lower limits. Their upper limits fall into other zones or else are not reached. For example, the four or five larger pines extend from a limit of 6,000 feet to the ultimate summits of the range, on sunny aspects covering both the fir and the spruce zones completely. In order to admit the latter two, the former must be restricted. Similarly the oak zone, equivalent to the lower portion of the total oak area and devoid

[3] Often considered varieties of *Prosopis juliflora* (Sw.) DC.

[4] North American Fauna No. 3, U. S. Dept. Agr., pp. 7–17, 1890.

[5] These altitudes were obtained by aneroid loaned by the Desert Laboratory of the Carnegie Institution, frequently checked by the new bench marks of the U. S. Geological Survey.

[6] See Lowell, *Century Magazine*, March, 1908.

of the larger pines, remains not always below 6,000 feet, nor the desert area below 4,500, but, under favorable (or unfavorable!)[7] conditions they may raise long tongues into the upper zones. Thus near Paradise certain points carry the former to a height of 8,700, the latter to 6,250 feet, mainly dependent upon aspect (slope exposure) modified by gradient,[8] and secondarily upon character of the rock and soil and other conditions. Also, in fixing the lower limits at their first appearance on residual slopes, we avoid the mere fringes of species that normally belong to higher zones, but follow the canyons and watercourses down and often far out into desert and grassy plain.

The second map, showing the vegetation as governed by aspect, would have the appearance of a veritable crazy-quilt in its patchwork of many small areas of different color. By far the larger part of the montane area is composed of slopes facing either north, east, south or west, or in intermediate directions. Given the same altitude, locality, rock and soil, each aspect supports a plant society differing in some degree from those of other aspects. The difference may consist in kind, number or relative proportion of species, or merely in number, relative abundance, size and thrift of individuals, usually two or more of these combined. In view of many other influences that may be at work, such as seepage, exposure to local atmospheric currents, number and size of boulders present, physical constitution and relative abundance of rock and soil, presence of animals or insects, the greatest caution is constantly necessary in attributing the differences to the proper controlling cause. However, it may be stated that, given otherwise similar conditions, the more directly one slope faces southward, and the other northward, the greater is the difference between their plant societies.

The floral difference between two small contiguous slopes of equal gradient and similar limestone soil at 5,500 feet near Paradise,[9] directly facing each other, one north, the other south, may serve as a simple example of the influence of aspect: The north slope supports a dense, shrubby growth of *Ceanothus greggii* A. Gray, interspersed with *Cercocarpus breviflorus* A. Gray, *Viguiera helianthoides* H. B. K., and numerous smaller plants, from which grasses are practically absent. The south slope is entirely devoid of trees and shrubs, dotted with *Croton corymbulosus* Engelm. and covered with grasses, among which no less than three species of *Triodia* are prominent.

These slopes for the greater part are rather sharply bounded by adjoining and opposing slopes and canyon bottoms. But, unlike the more or less insensible transition between one altitudinal zone and another, the tension lines between adjoining plant societies follow these topographic boundaries, such as crests of ridges, angles of V-shaped gullies, or sides of canyon bottoms, and usually their degree of definiteness is in direct proportion to the sharpness by which such boundaries are marked.

The third map would divide the mountains, without regard either to altitude or to aspect, into more or less irregular areas both large and small, their number dependent upon the degree of intensity employed, based upon the geologic origin and character of the rock and soil. The following main divisions may be made:

I. Transported Soils.
II. Residual Soils derived from
  1. Limestone.
  2. Recent eruptives.
  3. Other rocks.

The small total area of transported soils is confined to outwash slopes, canyon bottoms, and small mountain parks. They support floral elements either quite peculiar to themselves, or else derived from two or more residual societies. For the present are made only the three divisions of residual soils that show the greatest differences between their plant societies as indicated by their trees and shrubs. Each division or group of societies is found to be peculiar to a class of rocks and residual soils of its own. Further, the so-called tension lines between these societies or groups of

[7] Spalding, *Plant World*, XI., p. 213, 1908.

[8] See Merriam, N. A. Fauna No. 3, p. 27, Pl. II.

[9] Designated as Slopes I and III in exsiccati distributed.

such are usually marked with great definiteness and bear no relation to aspect. Moreover, these sharp boundary lines coincide throughout with the more plainly marked surface contacts and boundaries of such geologic formations. Cases occur in which, if two quadrats of 1,000 square feet each were laid off, each on a separate formation,[10] but adjoining one another on one side and on the contact line, not a single woody species would be common to both quadrats, although several such might be found on either.[11-12] The first class of areas is composed of limestone, the second and smallest in total extent of basalt, and the third and by far the largest, of older igneous and metamorphic rocks, predominant among which are andesite, rhyolite, granite and quartzite.[13]

The second division is practically confined to certain volcanic outbursts in the eastern and southern parts of the range, but certain spots also occur on its west side. The comparatively recent origin of these is shown by the fact that on the rim of a former crater were found volcanic bombs in a state of excellent preservation and fragments of lava that still bore plainly the marks of former plasticity. Grasses and herbs cover these hills, but they are characterized by the almost complete absence of tree and shrub growth. The adjacent hills of andesite and rhyolite bear with the same aspect and general altitude of 5,000 feet the usual evergreen oaks and junipers. Whether comparative age of the formation is a factor or not, the cause plainly lies in the substratum.

The first division is distinguished from the great composite third mainly by species of smaller stature and leaf surface, *i. e.*, more distinctly zerophytic chaparral character. The following collection of woody species, growing on a steep, westerly, limestone slope near Hands' Cabin at approximately 7,000 feet, may serve as a type for calcareous societies of similar situation. The species are ranked in order of abundance: 1. *Ceanothus greggii* A. Gray. 2. *Cercocarpus breviflorus* A. Gray. 3. *Rhus virens* Lindh. 4. *Garrya wrightii* Torr. 5. *Pinus cembroides* Zucc. 6. *Juniperus pachyphlœa* Torr. Below is a society of trees and shrubs typical of a habitat similar to that above in all chief particulars except rock and resultant topography and soil, which is andesitic: *Quercus arizonica* Sarg., *Q. hypoleuca* Engelm., *Q. reticulata* H. B. K., *Pinus chihuahuana* Engelm., *P. mayriana* Sudw., *Ceanothus fendleri* A. Gray, *Gymnosperma corymbosa* DC., *Juniperus pachyphlœa* Torr.

A number of fern species occur upon the limestone, very few upon the andesite, but the latter often supports a better grass cover. *Dasylirion Wheeleri* Wats., though present elsewhere, is highly characteristic of limestone, *Nolina erumpens* Wats. and *Yucca macrocarpa* (Torr.) Coville are seen at their best on non-calcareous soil. The seven species of evergreen oak are almost absolutely absent from pure limestone soil. The only oak (*Quercus pungens* Liebm.) on limestone is not evergreen, and this is never found on other rocks of the region covered.

In a notable recent paper,[14] Fernald brings out similar great contrasts between the alpine floras of northeastern America, and their direct relation to the rock and soil on which they grow. As is abundantly the case in the Chiricahuas, he finds plants that are very definitely limited to certain residual soils on slopes and table-lands, freely commingling on the mixed elements of transported soils at the foot of slopes and along the watercourses.

The ultimate causes of these distributional phenomena, apart from those controlled by altitude and aspect, thus plainly lie in the substratum. How much is due to historic determinants, and how much to physicochem-

[10] The term "formation" is here used only with reference to rock and soil.

[11] In Europe, these definite floral boundaries have long been known to occur, and their immediate cause has been recognized. See Warming, "Pflanzengeog.," sec. ed., p. 78.

[12] MacDougal, *Plant World*, XI., p. 270, 1908.

[13] Not included in above divisions, were also found smaller bodies of volcanic tuff, and still more infrequently, sandstone and shale. For the age of some Chiricahua formations see E. T. Dumble, "Notes on Geology of S.E. Arizona," *Trans. Am. Inst. Min. Eng.*, Feb., 1901.

[14] Cont. Gray Herb., Harv. Univ., N. S., XXXV., 1907.

ical factors at present operative, is not easily established, but observation points strongly toward the latter as controlling forces.

J. C. Blumer

Tucson, Arizona

DIKES IN THE HAMILTON SHALE NEAR CLINTONVILLE, ONONDAGA COUNTY, NEW YORK

The presence of a few igneous intrusions in the almost undisturbed Paleozoic strata of central New York has long been known to geologists. Their extreme rarity, however, has always invested them with a peculiar interest.

Excluding the Manheim Dike near Little Falls, which lies about seventy-five miles east of Syracuse and which cuts Ordovician strata, we find that these igneous rocks may be grouped geographically into (1) those occurring in the vicinity of Ithaca and Ludlowville and (2) those occurring in the vicinity of Syracuse. In both regions the intrusions are peridotite and are mostly true dikes cutting in the first case such Upper Devonian formations as the Genesee shale and the Portage and Ithaca shales and sandstones, and in the second case cutting the Salina beds of Silurian age.

As far as the writer has been able to learn, the geologically intermediate Hamilton shale has, until now, yielded no dikes and the recent discovery of two in this formation at a locality about twelve miles southwest of Syracuse and about forty miles northeasterly from Ithaca is believed to be a matter of interest.

The dikes in question are exposed on the south wall of the Clintonville Ravine at a point approximately fifty feet above the level of the Marietta road. The more western is a fine-grained porphyritic rock resembling peridotite. What appear to be serpentine grains, produced by the alteration of olivine, protrude from the weathered surface and have the appearance of small pebbles. Another conspicuous feature is furnished by large scales of a bronzy mica. This dike has a uniform width of from seven to eight inches and is displayed for about twelve feet on the south bank of the ravine. On the north side it is obscured by talus. Its plane is vertical, while its direction is north and south, agreeing in this latter respect with the Ithaca dikes. Wherever examined it presents a very uniform texture, is apparently free from fragments of the sedimentary rocks through which it passed, and has produced little contact metamorphism.

The second dike discovered by the writer lies about two feet and four inches to the east of the first and was not observed until the wall at this point had been cleaned. It has a width of about eight inches. Like the first dike, it is vertical and north and south in direction. It differs, however, from the first dike in being much weathered in places and in containing many shale fragments some of which have a long diameter of three inches or more.

Burnett Smith

Department of Geology,
Syracuse University

GUINEA PIG GRAFT-HYBRIDS

In May, 1907, I published results demonstrating, (1) that iso-engrafted ovaries in fowls subsequently exhibit a reproductive function; and (2) that such resulting offspring give evidence of a "soma" or "foster mother" influence.[1] The same year, Professor Wilhelm Magnus, of the University of Christiania, obtained similar results on a rabbit.[2]

The purpose of this note is to record results obtained on a guinea pig. November 6, 1908, the ovaries of a young guinea pig were removed and in the former site of the right ovary, the left ovary from a sister guinea pig was engrafted. The guinea pig was bred and in the latter part of July or the early part of August, 1909, gave birth to two young.[3] As all the animals were mongrels it is obvious that no conclusion regarding foster mother influence is possible.

In Science,[4] September 3, 1909, Professor Castle reports the birth of two guinea pigs from a spayed white mother carrying en-

[1] Proceedings of the society, *American Journal of Physiology*, Vol. XIX., pp. xvi–xvii, July, 1907.

[2] *Norsk magazin for laegevidenskaben*, No. 9, 1907.

[3] November 12, the operated animal gave premature birth to two more young.

[4] N. S., Vol. XXX., No. 766, pp. 312–313.