there is every reason for believing that the existing law of distribution may differ vastly from the law of permanent distribution required by the kinetic theory of gases.

TABLE 1.

Average number of molecules of gas to every one whose speed is sufficiently great to overcome the attraction of the corresponding body:

	Hydrogen at 0°C (=273° absolute) Oxygen at 4095°C (=4368° absolute.)	Hydrogen at —205°C (=68° absolute.) Oxygen at 819°C (=1092° absolute.)	Hydrogen at —246° (=17° absolute.) Oxygen at 0°C (=273° absolute.)	Hydrogen at —269°C (=4¼° absolute.) Oxygen at —205°C (=68° absolute.)
Moon's surface	3.6	610.0	2.7×10^{12}	6.9×10^{61}
Surface of Mars	3920.	5.0×10^{15}	1.0×10^{66}	1.8×10^{263}
Earth's surface	6.0×10^{19}	3.3×10^{81}	2.3×10^{329}	4.5×10^{1322}
Earth's atmosphere at a height of 80 miles.	2.3×10^{19}	7.6×10^{79}	5.7×10^{322}	1.5×10^{1296}
Sun at same distance as Earth	2.7×10^{307}	6.6×10^{1233}	2.0×10^{4940}	1.7×10^{19767}

TABLE 2.

Relative densities of oxygen and hydrogen in a permanent distribution taking their densities at the Earth's surface as unity:

	H at 0°C (273° abs) O at 4095°C (4368 abs)	H at —205°C (68° abs.) O at 819°C (1092 abs.)	H at —246°C (17° abs.) O at 0°C (273° abs.)	H at —269° C(4¼° abs.) O at —205°C (68° abs.)
Earth's surface	1	1	1	1
Earth's atmosphere at a height of 80 miles	.3859	.02268	2.414×10^{-7}	3.4×10^{-27}
Moon's surface	3.1×10^{-20}	9.4×10^{-79}	37.7×10^{-318}	3.5×10^{-1249}
At Moon's distance from Earth	4.6×10^{-21}	4.6×10^{-82}	4.5×10^{-326}	4.0×10^{-1302}
At Earth's distance from Sun	2.1×10^{-21}	1.9×10^{-83}	1.4×10^{-331}	3.6×10^{-1324}
Interstellar space	2.7×10^{-330}	4.9×10^{-1318}	5.6×10^{-5724}	9.9×10^{-21694}

TABLE 3.

Relative densities in a permanent distribution, taking the average densit of distribution of the gas in interstellar space as unity:

	H at 273° absolute O at 4368° abs.	H at 68° abs. O at 1092 abs.	H at 17° abs. O at 273 abs.	H at 4¼ abs. O at 68° abs.
At Infinity	1.0	1.0	1.0	1.0
At Earth's distance from Sun	7.9×10^{308}	3.9×10^{1235}	2.4×10^{4942}	3.6×10^{19769}
At Moon's distance from Earth	1.7×10^{309}	9.4×10^{1236}	8.0×10^{4947}	4.0×10^{19791}
At Moon's surface	1.2×10^{310}	1.9×10^{1246}	1.4×10^{4961}	4.2×10^{19844}
At Earth's surface	3.7×10^{329}	2.0×10^{1317}	1.8×10^{5273}	1.0×10^{21073}

ON THE LIFE ZONES OF THE ORGAN MOUNTAINS AND ADJACENT REGION IN SOUTHERN NEW MEXICO, WITH NOTES ON THE FAUNA OF THE RANGE.[1]

BY C. H. TYLER TOWNSEND.

THE range known as the Organ Mountains, in southern New Mexico, was determined by the U. S. Geodetic Survey, if I mistake not, to rise to a height of 8,800 feet above sea-level. This altitude has been carefully veried by observations taken by Professor C. T. Hagerty, of the Civil Engineering Department of the New Mexico Agricultural College. The western base of the range is about twelve miles to the eastward of Las Cruces, in Doña Ana County. The range runs nearly north and south for a distance of about twenty miles. It varies in width from about four to eight miles, the north extremity as well as the south one being much narrower. It is intersected a little south of the middle by a wide and detoured pass known as Soledad Cañon. The San Augustine pass divides the range near its north end. About two miles to the north of this pass begin, by common consent, the San Andres Mountains, a lower range which extends on to the northward for about fifty miles. About three miles south of San Augustine pass is a rather high and more difficult drop in the range, known as Bayler pass. The highest peaks of the Organs are north of the centre of the range, and their upper portions are mostly bare and nearly inaccessible. There is a ridge between the southernmost two peaks and those peaks to the north of them. This ridge is probably 8,000 feet or more in elevation, and its highest portion is the point to which the zones given below have been traced. It dips about 200 feet at its northern end.

The altitude at the western base of the range is about 4,800 feet, or 1,000 feet higher than the site of Las Cruces, situated twelve to fifteen miles west on the edge of the Rio Grande Valley. Thus the above mentioned ridge is, roughly speaking, about 4,000 feet above the surrounding country, or about 3,000 feet above the base of the range.

The various points above mentioned will be better understood by consulting the accompanying diagram of the range. It is only a diagram, no attempt having been made to secure accuracy of detail.

It may be stated that, to the northeast of the range, stretch away the plains of San Augustine; while to the northwest is the vast waterless expanse known as the Jornada del Muerto, or Journey of the Dead, where seventy miles has to be covered between springs. To the eastward of the range is a vast level sandy plain which extends some eighty miles to the Sacramento Mountains, and plains stretch away likewise to the southeast, and for a less distance to the south. For some of the beauties of the Organ Mountains, I would refer the reader to a paper by Mr. Charles H. Ames, in *Appalachia* for 1892. The point reached by Mr. Ames was the lowest part of the ridge above referred to between the peaks, being the dip at its northern end.

Beginning at the east bank of the Rio Grande River, in the bottom of the valley, and going eastward until the highest portion of this ridge between the peaks is reached, the following zones, in the order given below, are encountered. The actual ascent to this ridge, during which most of the data of the higher zones were carefully noted, was made on Nov. 12, 1892. We left the house at Riley's ranch at 9.00 A. M., and reached the highest part of the ridge at about 12.15 P. M., thus making fully 3,000 feet in three and one-quarter hours. Starting back at 12.30 P. M., we reached the house again at 2.55 P. M. It should be stated that there was much snow in the dense brush through which we passed in the higher portions of the range, and that on many occasions we had to proceed in a reclining attitude over long stretches of smooth rock at an angle of about 35°. The house at Riley's ranch is 4,900 feet altitude, and the ridge, as above mentioned, about 8,000 feet.

Tornillo or Cottonwood Zone.

About 3,500 to 3,800 feet.

Characteristic plants.—Prosopis pubescens (tornillo), Populus fremontii var. wislizeni (valley cottonwood), Salix spp. including S. longifolia (willows), Aster spinosus (spring aster), Helianthus annuus (common sunflower), Helianthus ciliaris (dwarf sunflower), Xanthium sp. (cocklebur), Rhus sp. (sumach), Sphæralcea angustifolia, Solidago sp. (golden rod), Baccharis angustifolia (at its climax), mistletoe, grasses, etc.

[1] Read before the New Mexico Society for the Advancement of Science, at Las Cruces, April 6, 1893.

Mesquite Zone.
About 3,800 to 4,800 feet.

Characteristic plants.—Yucca baccata (Spanish bayonet—at its climax), Yucca angustifolia (narrow-leafed yucca), Prosopis juliflora (mesquite), Larrea mexicana (creosote bush), Opuntia lepticaulis (vine cactus), Opuntia arborescens—some (tree cactus), Ephedra nevadense (clapweed), Opuntia spp. (smaller-leafed prickly pears), Opuntia engelmanni—some (prickly pear), Echinocactus wislizeni (barrel cactus), Cereus spp. (bunch cacti), Atriflex canescens (sage bush), Fallugia paradoxa—some along arroyos, Fouquiera splendens (candle wood), Krameria parvifolia, Zizyphus lycioides, Baccharis angustifolia, Parkinsonia sp. (?), Acacia sp. (cat's-claw thorn), Chilopsis saligna (along arroyos, and especially near base of mountains), Perezia nana, certain grasses on plains to north (Jornada del Muerto), etc.

Dasylirion or Scrub Oak Zone.
About 4,800 to 6,800 feet.

Characteristic plants.—Dasylirion wheeleri (sotol), Quercus undulata var. wrightii (scrub oak), Opuntia arborescens (tree cactus—at its climax), Yucca baccata (Spanish bayonet), Accacia sp. (cat's-claw thorn), Opuntia engelmanni (prickly pear or tuna—at its climax), Agave heteracantha (century plant), Agave parryi (Parry's century plant), Unguadia speciosa (Mexican buckeye), Celtis occidentalis (hackberry), Fraxinus sp. (ash), Robinia neomexicana (New Mexico locust), Fallugia paradoxa, etc.

Juniper or Cedar Zone.
About 6,800 to 7,500 feet.

Characteristic plants.—Juniperus sp. (cedar), Cercocarpus parvifolius (mountain mahogany), Garrya wrightii, etc.

Pine Zone.
About 7,500 to 8,800 feet.

Characteristic plants.—Pinus edulis probably (piñon), Pseudotsuga douglassii (Douglas spruce), Quercus undulata var. gambellii (a scrub oak on top of ridge, 8,000 feet), Pinus ponderosa (Californian pine), etc.

The above are the more important forms of vegetation met with in going up past the Modoc mine to the top of the ridge (slope with western exposure); in going up a long side cañon which opens into Soledad on the north at a point about a mile east of Mr. Isaac's place (mostly south exposure); and also as noticed in general in the whole range, on the western slopes, from Soledad to the south end. As before said, the zones were more particularly noted in the ascent to the ridge above the Modoc mine, Nov. 12, 1892, as this is about the highest accessible point in the range.

On Nov. 26, 1892, an ascent was made to the top of the ridge of the northeast portion of the range. The results of this trip are detailed separately below. Going up this slope, which has a north-northeast exposure, the following seventeen characteristic species of vegetation were noticed. The real ascent was begun at a point about four or five miles a little east of south of San Augustine. Exactly a year before this, I made an ascent nearly to the top of the higher portion of the same ridge about two miles farther to the westward, on which many of the same plants were also noted.

Plants found on going up northeast slope of Organ Mountains, Nov 26, 1892.—The vertical distance was divided into approximate fifths, which are spoken of as first to fifth belts. This vertical distance from the level at San Augustine to the top of the ridge is probably about 2,000 feet, the ridge being, apparently, about 7,000 feet elevation at its eastern end. The lower range of the hardier species, as shown below, is due to the north or northeast exposure.

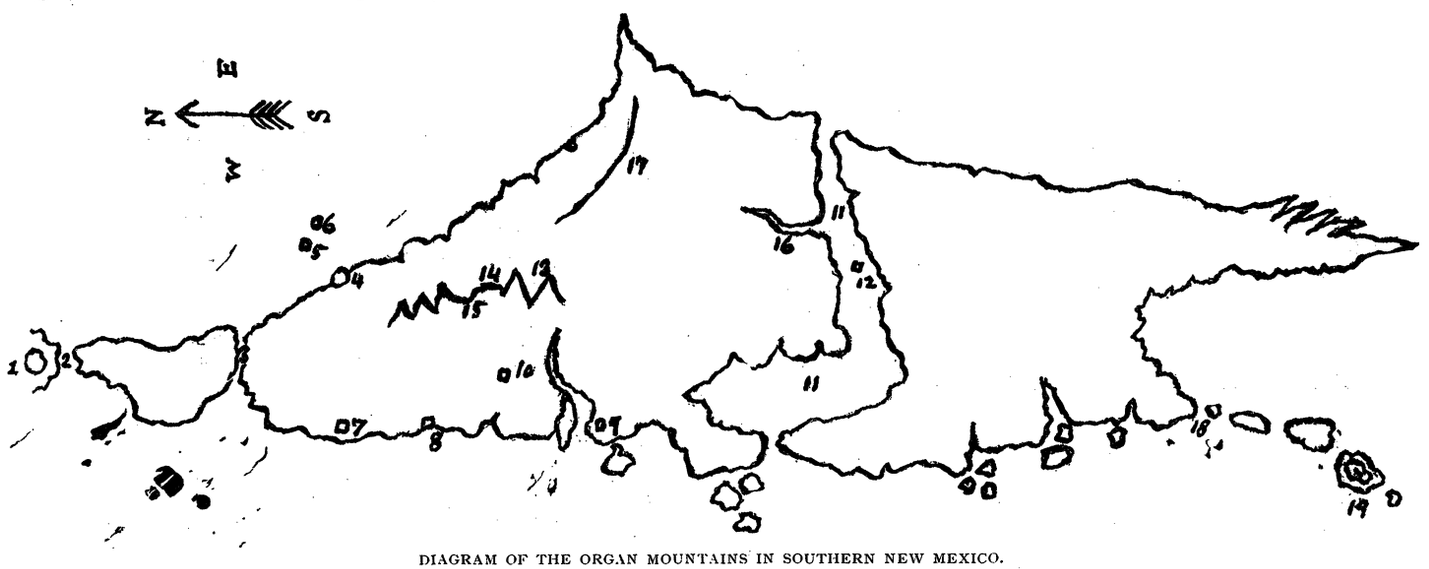

DIAGRAM OF THE ORGAN MOUNTAINS IN SOUTHERN NEW MEXICO.

1. Organ peak.
2. Organ pass.
3. Bayler pass.
3. Sugar loaf.
5. Old San Augustine hotel.
6. Davies Leibsky ranch.
7. Stephenson-Bennett mine.
8. Riley's well.
9. Riley's ranch.
10. Modoc mine.
11. Soledad canon.
12. Isaac's ranch.
13. Highest peaks (8,800 ft.).
14. Highest part of ridge betw. peaks.
15. Dip of ridge at north end.
16. Side canon opening into Soledad.
17. Ridge of northeast part of range.
18. South and wagon pass.
19. Bishop's Cap.

1. Cat's-claw thorn (Acacia sp.).—Extending from near base of mesa-like prolongation of north end of range through first belt.

2. Mulberry (Morus parvifolia).—Upper portion of cat's-claw thorn area or first belt.

3. Mexican buckeye (Unguadia speciosa).—Second belt.

4. Wild grape (Vitis sp.).—Second belt.

5. Wild cherry (Cerasus sp.?).—Second belt.

6. Maple (Acer sp.).—Second belt.

7. Small bunch cacti (Cereus 2 spp.).—Third belt.

8. Ash (Fraxinus pistacifolia).—Third belt.

9. Hackberry (Celtis occidentalis).—Third belt.

10. Willow (Salix sp.).—Third belt.

11. Cottonwood (Populus sp. much resembling P. fremontii).—Third belt.

12. Scrub oak (Quercus undulata var. wrightii). Third and fourth belts. Often hung with mistletoe.

13. Piñon (Pinus edulis?).—Large trees on lower ex-

tent of fourth belt. (Perhaps P. ponderosa as well).

14. Jimson weed (Stramonium sp.)—Fourth belt.

15. Mountain mahogany (Cercocarpus parvifolius).—Fourth and fifth belts.

16. Oak (Quercus undulata var. gambellii).—Fifth belt, below but near top of ridge.

17. Thornless chaparral (Fallugia paradoxa).—At top of ridge, fifth belt, forming a thick chaparral on north slope.

It should be mentioned, as a possible explanation of the higher altitude at which the scrub oak, hackberry, etc., were found on this slope than on the western slope, that in the ascent the course of a stream was followed about to the third belt.

Notes on the fauna of the Organ Mountains.—Mammalian fauna: The range contains a wide and varied extent of country, particularly between its northern widened portion and Soledad cañon. Of the larger mammals, there were formerly, as reported by hunters, elk, mountain goat, mountain sheep, and bear. These are not known to exist there at present, but Mr. G. R. Beasley, of Soledad cañon, is reported to have killed a full-grown male mountain sheep two years ago in the Organs. There are said to be some bears at the present time in the more inaccessible portions of the range, but this is not positively known.

There are known to exist at the present time: Deer (probably the black-tailed, Cariacus macrotis); mountain lion (Felis concolor); wild cats (Lynx sp.); red and silver foxes (Vulpes spp.); skunks (Mephitis sp.); squirrels (Sciurus sp.); chipmunks (Tamias gracilis and other spp.); weasels (Putorius sp.); civet cats (Bassaris sp.); and raccoons (Procyon sp.). Bats and mice also occur. Antelope, rabbits, badgers, prairie dogs, coyotes, are found at the base or in the lower portions.

Avian fauna: Californian quail, tonto quail (Ortyx spp.), eagles, hawks, buzzards, owls, jays, woodpeckers, doves, mocking birds, orioles, whippoorwills, wrens, swallows, humming birds, and others have been noted in the range. Unfortunately specimens were not collected, so that no specific determinations can be given. Wild turkey are said to occur, but I have seen none. They were common in the range formerly.

Reptilian fauna: Rattlesnakes (Crotalus sp.), several species of harmless snakes, and several species of small lizards have been observed. The rattlers are more frequent on the plains at the base of the range. Frogs are also said to occur.

Fish fauna: There are no fishes that I know of, as the mountain streams are small and swift, and often dry, for a long season. In the Sacramento and White Mountains, about sixty to eighty miles north and northeast, there is fine trout fishing in the streams.

Insect fauna: Many species of insects abound, a large number being peculiar to the range in this region, i. e., not found on the mesa and in the valley to the westward. These, in most cases, feed on such plants and trees as are likewise peculiar to the range. The following are those species which feed on some of the principal plants, so far as I have observed them, arranged under the heads of the plants:

Sotol (Dasylirion wheeleri).

1. Thrincopyge alacris—larvæ bore flower stalks.
2. Hesperobænus n. sp.—adults eat newly forming flowers.
3. Thrincopyge ambiens—larvæ bore flower stalks.
4. Acmæodera culta—larvæ bore in flower stalks.
5. Moth—larvæ bore flower stalks.
6. Lecanodiaspis yuccæ—scale on leaves. Also on Yucca baccata.
7. Small weevil—bores in flower stalks.

Scrub oak (Quercus undulata var. wrightii.)

1. Andricus sp.?—makes a woolly, reddish gall on leaves.
2. Another gall-fly—makes a fleshy leaf gall.
3. Synergus sp. and Decatoma sp.—the first makes a large apple-like and very hard woody gall on twigs, in which the second is apparently an inquiline.
4. Geometrid moth—larva feeds on foliage.
5. Several species of Lepidoptera—larvæ feed on foliage.

Hackberry (Celtis occidentalis).

1. Pachypsylla venusta—forms a leaf-stalk or petiole gall.
2. Pachypsylla celtidis-pubescens—forms a small circular gall on leaves.
3. Cecidomyiid—makes small round gall on leaf-stems.

Many carnivorous bugs and beetles abound in the range. Butterflies are more numerous than in the valley. There are bees, wasps and ants; dragon flies, many locusts, larvæ of gnats in the streams, including buffalo gnats (Simulium occidentale); and flies of many families, especially those of parasitic and creophilous or coprophagous habits. A single specimen of a peculiar large blister beetle (Megetra vittata) has been found in the mountains and nowhere else in this immediate region, but many were found higher up in western New Mexico. Tarantulas (Lycosa sp.), centipedes (Scolopendra), viñagrones or whip-scorpions (Thelyphonus), and true scorpions also occur.

Molluscan fauna: Quite a number of specimens of a snail have been found in several parts of the mountains about half way up the range. Prof. T. D. A. Cockerell, to whom I gave some of the shells for determination, writes me that they are undoubtedly a variety of Patula strigosa Gould.

In conclusion, it should be stated that the determinations of the plants mentioned in this paper were made largely by the Botanical Division of the U. S. Dept. of Agriculture, and by Mr. Walter H. Evans, now of that Department also. A few were made by Prof. E. O. Wooton, botanist of the N. Mex. Agr. College.

POTTERY ON PUGET SOUND.

BY JAMES WICKERSHAM, TACOMA, WASHINGTON.

THAT the reader may not be misled by the above headline, I hasten to say that there never was any aboriginal pottery made either on the Columbia River, Puget Sound or in the regions northward to Alaska. Baskets of such strength, firmness and texture were made, however, that the absence of pottery was not a hardship upon the Indians, for they carried water in baskets, and even boiled food in them by the use of hot rocks constantly dropped in the water. But what lesson, if any, can the ethnologist learn from the absence of pottery on this northwest coast?

Let us first look at the character of the civilization existing here prior to the advent of the white man and compare it with that of other localities—say San Francisco Bay, but a few hundred miles farther south on the same shore. The Indians of Oregon, Washington, British Columbia and Alaska made and constantly used the finest canoes in the world, capable of holding fifty or sixty men. They fearlessly pursued the whale on the Pacific Ocean, far out of sight of land; and fastening their harpoons to the monster by the use of inflated bladders, they caused him to float; and after his death he was towed by a line of great canoes to the shore; where, landing the huge carcass,