tive influence of heredity and environment, not in a general, but in a special way. As I have been pointing out for several years, "the heredity *versus* environment" muddle can not be clarified except by making everything into problems of differences.

The study of the lower organisms may give for human heredity, very erroneous conclusions. The lower organisms are much more modified by environment than are the higher. If we are to make the science of eugenics accurate and accumulative, we must in every case, first decide what human differences, because of their importance, are interesting; then keeping the heredity factor constant, we should experimentally alter the environmental; or keeping the environmental the same, experimentally alter the heredity.

There can be no general answer to the time-honored controversy; but there may be a special answer to each separate, pragmatically conceived question. There may or there may not be. We can not tell until we try.[2]

Here it is not a general question whether opportunity has had any influence or not. It is a special one. Have we a right to say that there have been proportionately more great men among kings than among commoners because of the environment of kingship? The answer is that as far as we know at present the differences of environment have had absolutely nothing to do with it.

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OCCURRENCE OF BACTERIAL BLIGHT OF ALFALFA IN THE SALT LAKE VALLEY, UTAH

THE bacterial disease of alfalfa studied by Sackett[1] in Colorado has already done considerable damage in the Salt Lake Valley, Utah. So far as the writer knows, this disease, which is due to *Pseudomonas medicaginis* Sackett, has not been definitely reported from Utah, although Heald[2] states that "what appears to be a similar disease has also been reported from Utah, New Mexico, Nebraska and Kansas." There is sufficient evidence to warrant the statement that the bacterial blight of alfalfa has been prevalent in the Salt Lake Valley for some time, and, no doubt, the poor stands, as well as the many weak plants, are due to this disease. It is certain that this disease has caused more injury than the crown gall disease [*Urophlyctis alfalfæ* (v. Lagerh.) P. Magnus], recently reported by the writer as occurring in the Salt Lake Valley, and is certainly as injurious as the alfalfa weevil (*Phytonomus murinus* Fab.). In the past this disease has been mistaken for smoke injury due to the smelters, and it has also been reported as "alkali burn." That this disease could have escaped notice is singular, because the symptoms are as definite as those of the pear-blight disease.

The water-soaked, semi-transparent, yellowish to olive-green appearance of the stems, together with the presence of small droplets of a thick bacterial ooze and the weakened and partially drooping plants are the unmistakable symptoms of the disease in the incipient stages. Finally the stems become brownish-discolored or blackened, and very brittle. When the stems are attacked the foliage soon becomes chlorotic, finally turning a dirty white in severe cases. The leaves then become dry and brittle. When small pieces of the tissue of the diseased stems or leaves are mounted in water on a slide, enormous masses of the organisms may be seen by the naked eye issuing from the tissues. There is absolutely no difficulty in securing pure cultures.

The presence of the alfalfa weevil in the Salt Lake Valley is a factor in the distribution of this disease. While it is known that stomatal infections may occur, by far the greater number of infections take place through openings in the epidermis produced by insect punctures and severe frost injury. It has been noted that

[2] For a fuller discussion see "Separating Heredity from Environment," *American Breeders Magazine*, Vol. II., No. 3, 1911, and "The Influence of Monarchs," pp. 227–229 and 290–293.

[1] Society American Bacteriologists, Boston meeting, December, 1909. SCIENCE, N. S., XXXI., 553, 1910. Colorado Agricultural Experiment Station Bull. 158, 1910.

[2] Phytopathology, Vol. II., No. 1, page 12.

where the disease is present in a field the greater infection occurs where the alfalfa weevil is also present. This disease is so injurious that fully 80 per cent. of the first cutting may be lost on account of it. However, while the chief damage is usually noted in the first cutting, the plants may be seriously injured in the crowns and roots, thus causing entire plants to be killed.

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May 16, 1914

Further Notes on Tamarisk

Judging from Mr. Carleton's remarks[1] and the writer's experience *Tamarix gallica* is another of those interesting plants that will grow in very dry as well as in exceedingly wet places. This species is extensively planted at Belle Isle, Vermillion Parish, in the broad coastal marsh of Louisiana. The soil here is always saturated with water and is subject to inundation by exceptional tides. The plant is known as salt-water cedar, and its main use is for firewood. Little of that commodity is needed in this austral locality, and sections of the limbs of *Tamarix,* in size from the thickness of a finger to that of the wrist, answer every purpose. The plants are pollarded and closely pruned but quickly produce a new crop of firewood.

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A Factor for the Fourth Chromosome of Drosophila

A new character has recently appeared in *Drosophila* in which the wings are "bent." The factor concerned does not fall within any of the three groups of linked factors so far described. There are four pairs of chromosomes in *Drosophila* (without taking into account possible complications of the *XY* pair). The number of chromosomes now corresponds therefore with the number of independent groups of factors. The correspondence goes even further than number, however, for the sex-linked group is known to be distributed with the *X* chromosome, and all the groups correspond in their size-relations with the chromosomes, there being three large groups and one small, just as in the case of the chromosomes. The factor for "bent" forms the small "group" by itself, and accordingly may be considered to lie in the small chromosome.

Hermann J. Muller

[1] Science, N. S., XXXIX., pp. 692–694, May 8, 1914.

Dickerson[1] on California Eocene

Two brief but valuable papers by Mr. Dickerson call attention to the fact that the apathy with which the Eocene of California has been treated since Gabb's time is less on account of any last word having been said on the subject than the overshadowing economic importance of the later Tertiary horizons of the state.

The use of the name Tejon to embrace all the post-Martinez Eocene of the Pacific coast and the recognition of the section south of Mt. Diablo as a standard for this formation can hardly meet with general approval. It appears that this section is composed exclusively of beds belonging to a formation stratigraphically younger and separated from the horizon at the type section in the Canada de las Uvas near Fort Tejon by several thousand feet of strata as well as a considerable time gap.

The writers[2] have shown that in Oregon and Washington the Eocene may be divided into three faunal divisions, the Chehalis, Olequa, and Arago or Ione formations. The

[1] Dickerson, Roy E., "Fauna of the Eocene at Marysville Buttes, California," Bull. Dept. Geol. Univ. of California, VII., p. 257–298, Pl. XI.–XIV., 1913; "Note on the Faunal Zones of the Tejon Group," *loc. cit.*, VIII., No. 2, p. 17–25, 1914.

[2] Arnold, R., and Hannibal, H., "The Marine Tertiary Stratigraphy of the North Pacific Coast of America," *Proc. Am. Phil. Soc.*, LII., No. 212, p. 559–605, 1913.