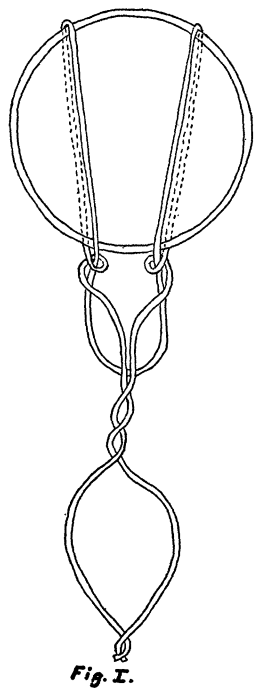

Fig. I.

stick can be pushed up through both loops. With the mirror placed thus, one is able to see the contents of many nests which are out of reach and which could not be looked into without the aid of a ladder or support of some kind. It is especially valuable to observe contents of nests which are located in bushes or small saplings six to ten feet from the ground. It also may save the observer a useless climb into a larger tree.

By bending the wire in the same general plane as the mirror, it can be conveniently carried in the pocket or handbag.

Sticks of varying lengths are always available in the woods and the writer has made use of a broom on several occasions where the nests were located in trees near a house.

This device is also quite valuable when there are a number of people in the party, a bird class, for instance, as it gives all a chance to see the eggs, young or empty nest practically at the same time, and thus disturb the nest for but a short time.

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SPECIAL ARTICLES

THE RELATION OF EXERCISE TO RICKETS IN WHITE RATS[1]

IT has been observed by Paton, Findlay and Watson in their experiments on dogs that those kept in the country and freely exercised in the open air, although they had actually a smaller amount of milk fat than those kept in the laboratory, remained free of rickets, while those kept in the laboratory became rachitic. This supported their belief that diet alone was not the sole factor in producing rickets—that exercise and sunlight were both instrumental in the prevention of rickets. It was on the basis of such observations that this experiment was started to determine, if possible, whether exercise (as well as sunlight) tends to prevent rickets.

Litter No. 123 (from a mother kept away from ultraviolet light and fed a diet low in antirachitic vitamine), consisting of eight albino rats (four females and four males), were placed on a diet March 14 which in previous experiments had proved to be rickets-producing, with the exception of one rat. This rat was given a diet containing "red dog" flour high in phosphorus, thus serving as a control since such a diet would normally not produce rickets.

The apparatus consisted of a series of individual wire-netting tread-mills of the squirrel cage form, the end pieces of which have a diameter of about 16 inches and are mounted on a two-tier rack. Each cage is equipped with a counter so that the number of revolutions made by the animal is registered. Each cage is equipped with a receptacle for food or water.

Diet No. 341, low in phosphorus, and containing relatively much calcium, was made according to the following formula:

NaCl	2 per cent.
Plaster of Paris	2 " "
Lactalbumin	8 " "
Yeast	1 " "
Flour (high patent)	87 " "

The phosphorus content was determined to be about 138 mg per 100 gms of food. This diet is also lacking in antirachitic vitamine and vitamine A. During the last week, one gram alfalfa meal daily was given each rat to cure xerophthalmia which had developed. Rat VIII was fed on the same diet with the substitution of red dog flour as a control.

Each animal was kept well supplied with the diet and distilled water; weighings were taken every week, and note was made of abnormalities, such as sore eyes. Rats Nos. I, II and III were given the greatest amount of exercise for two hours between the hours of 5 and 7 P.M. Rats Nos. IV, V and VI received one hour of the same exercise. Rats VII and VIII received no special exercise at all. At the end of a week, rats Nos. I, II and III were exercised from 8 P.M. to 7:30 A.M. (except Sunday), and an average of 1,000 revolutions per night was quite constantly maintained. This would equal a distance of

[1] From the Laboratory of Physiological Chemistry, University of Minnesota.

a little less than a mile per night. For the rats receiving the least exercise (IV, V and VI) periods in the revolving cages were given on alternate nights. This method was in accordance with the work of Slonaker who found that the period of activity for the albino rat was during the night between 8 P.M. and 3 or 4 A.M. and the period of rest during the day. The experiment was continued over a period of six weeks beginning March 14 and ending April 25. At this time the animals were X-rayed and autopsied.

At autopsy the following findings were obtained:

THOSE RECEIVING MOST EXERCISES

Rat I Costochondral junctions enlarged decidedly in middle four ribs, larger on right than left.

Rat II Costochondral junctions decidedly enlarged lower half of both sides.

Rat III Costochondral joints noticeably, but not as markedly enlarged as I and II; more so on the right lower six ribs.

THOSE RECEIVING NO EXERCISE

Rat IV Costochondral junctions very slightly enlarged, more distinct on left lower five.

Rat V Costochondral joints slightly enlarged.

THOSE RECEIVING NO EXERCISE

Rat VII Showed slight nodules on right lower six costochondral junctions; smaller on left side.

Rat VIII Died April 2, no rickets.

X-ray plate showed mild rickets in all rats except VIII.

TABULATED RESULTS

		Body Weight in Grams					
Rat. No.	Date	3/14	3/21	3/29	4/4	4/11	4/18
I		27	32	35	37.5	42	46.5
II		25.5	32	36	41	42	47
III		26	32	35	41	44	45
IV		23	30	37	42	43.5	40
V		22	27	31	32	35	37
VI		23.5	28	30	30	30	30
VII		26	32	35	40.5	44	42
VIII		21	38	42	Died 4/2		

Conclusion: Exercise does not prevent rickets.

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COINCIDENCE BETWEEN THE RANGES OF FORMS OF WESTERN YELLOW PINE, BARK BEETLES AND MISTLETOE

IN 1924 the writer[1] called attention to some hitherto obscure differences between the Pacific Coast and Rocky Mountain forms of western yellow pine. Following the publication of this paper Dr. F. C. Craighead, entomologist in charge, Forest Insect Investigations, U. S. Department of Agriculture, has called the writer's attention to the striking manner in which the ranges of two species of yellow pine bark beetles correspond to the ranges of the two forms of western yellow pine. The range of the mountain pine beetle (*Dendroctonus monticola* Hopk.) corresponds very closely to that of the Pacific Coast form of western yellow pine (*Pinus ponderosa* Laws.), while the Black Hills beetle (*Dendroctonus ponderosa* Hopk.) ranges over the same territory as the Rocky Mountain form of yellow pine (*Pinus ponderosa scopulorum* Engelm.) These two species of *Dendroctonus* do not overlap, which still further substantiates the writer's contentions as to the differences in the characteristics of the two forms of western yellow pine. Dr. Craighead states that although the adults of these two species of bark beetles are somewhat difficult to separate, their habits and general bionomics are strikingly different.

A comparison of the ranges of two species of western yellow pine mistletoes with the ranges of the two forms of yellow pine also reveals a striking coincidence. Hedgcock[2] records *Razoumofskya campylopoda* (Engelm.) Piper as occurring very commonly on *Pinus ponderosa* in the Pacific Coast region and *R. cryptopoda* (Engelm.) Coville, the eastern form, as "very common on the western yellow pines, *Pinus ponderosa* and *Pinus ponderosa scopulorum*, in the states in the region of the Great Basin and Rocky Mountains from eastern Washington to [Arizona and] New Mexico." Thus it is seen that, with the exception of a slight overlapping in the northwest, each of these species of mistletoe attacks a particular form of the western yellow pine.

These two parallel cases tend strongly to strengthen the belief that biologic forms change readily in response to the environment. The environmental conditions which characterize the habitats of these two forms of western yellow pine and the associated bark beetles and mistletoes are sufficiently diverse to result in climatic variants of these species. Many so-called species of plants and animals differ from each other because of their differing reactions to the same or to widely diverse environmental conditions.

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[1] Korstian, C. F., "A silvical comparison of the Pacific Coast and Rocky Mountain forms of western yellow pine," *American Journal of Botany*, 11: 318–324. 1924.

[2] Hedgcock, George G., "Notes on some diseases of trees in our national forests. V." *Phytopathology*, 5: 175–181. 1915.