of her progeny because it is the expression of a phenotype and Mr. Buchanan Smith allows that rarely is the cow's genotype capable of assessment because of the small numbers of her progeny. This is a state of affairs in no way improved upon by any increase in the number of daughter-dam pairs, and as in discerning inheritance it is essential to distinguish transmitting ability from actual production, it is difficult to see why two small correlations to phenotypes far removed can be expected to reveal anything. Actually the correlations amongst genotypes in Mr. Madsen's data should more reasonably be expected to yield a clue, as the X-chromosome which the bulls receive comes as often from the maternal grandsire as from the maternal granddam, though never from the paternal grandsire. Mr. Madsen finds that to the latter parent $r = 0.202$, while to the maternal grandsire $r = 0.194$, which would indicate that the presence or absence of the X-chromosome makes no difference.

The method of direct correlation employed leaves much to be desired. To a daughter's inheritance the sire and dam each contribute and yet in the daughter-dam correlations the sire's part is completely left out of account. This omission is not made good by an increase in the number of daughter-dam pairs studied.

(3) and (4) That the suggestion of inaccuracy in the calculation of the odds as one in ten is unfortunate is shown by Dr. J. Wishart in a letter contributed below.

I agree with Mr. Buchanan Smith that Mr. Madsen's investigation is particularly exhaustive and it is the very thoroughness with which he has prosecuted it which makes the likelihood of significant sex-linkage even more uncertain.

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¹ NATURE, 129, 688, May 7, 1932.

² NATURE, 129, 437, March 19, 1932.

³ NATURE, 129, 165, Jan. 30, 1932.

⁴ Smith, A. D. Buchanan, and Robison, O. J., "The Inheritance of Milk Yield". Conference Papers, Internat. Dairy Cong., Copenhagen, 1st section, pp. 127-140; 1931.

THE standard errors of the correlation coefficients 0.026 from 721 pairs and 0.112 from 715 pairs are almost exactly equal, at 0.037. Thus the difference 0.086 is 1.64 times its standard error, and treating this as a normal deviate it appears that a difference of this size, or greater, would occur in random samples from equally correlated populations just once in ten times on the average. Mr. Edwards used the more exact z -transformation of R. A. Fisher, but the small size of the correlations and the large numbers on which they are based, lead to exactly the same result by both methods. The observed coefficients are thus compatible with the hypothesis that the correlations with paternal and maternal granddam are equal. The best value for the joint correlation afforded by the data is 0.07, so that the relationship at best is very slight.

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Light and Sexual Periodicity

IN the North Greenland (Peary) Expedition, evidence of sexual periodicity in the Eskimos was observed by Cook.¹ Thus, with the onset of the sunless winter, sexual desire fails and menstruation during the long period of darkness is absent. But with the dawn of spring a phase of sexual excitement or pro-oestrus ensues, menstruation returns, and the majority

of the children are born nine months after the return of the 'sun'. The girls marry at fourteen or fifteen years of age, but the menstrual flow does not begin until they are nineteen or twenty years old. Children are 'suckled' for four to six years, and on the average one child is born every four years. Stieve and others, too, have noted that in the long polar night Eskimo women neither menstruate nor conceive. If this hiatus in the sexual cycle be due to absence of light, it must be of 'sunlight', for moonlight is present in the polar night. Light and heat rays seem essential for maintenance of the sexual cycle.

This annual recurrence of a 'menopause' suggests a species of 'hibernation' localised to the hypophysio-gonadal system, and that it should be so restricted and not generalised is presumably due to the fact that they—unlike warm-blooded hibernants—have no 'fat gland' to draw upon during the long winter sleep. Hence the need of fat consumption, and body temperature stabilisation forbids such marked slowing down of tissue metabolism, pulse, and respiration—with consequent induction of sleep, oliguria, and poikilothermia—as occurs in true hibernants which pass the winter in a state of retarded animation.

This assumption of localised hibernation of the hypophysio-gonadal system recalls the many similarities obtaining between generalised hibernation and pituitary (anterior hypophysis) dysfunction. In hyper-pituitarism (acromegaly) sexual desire is increased, but in hypo-pituitarism abolished—males become impotent, and in females menstruation ceases. This correlated variation of pituitary (hypophyseal) with gonadal functional activity indicates that the sexual cycle is controlled by the hypophysis and any interruption in sexual rhythm—apart from local causes—referable thereto. Hence, may not the recurring seasonal loss of sexual desire, with impotence in males and absence of menstruation in females, be due to seasonal suppression of the functional activity of the hypophysis (hypo-pituitarism) with its correlated cessation of gonadal activity—the same referable to lack of the stimulus 'sunlight'?

Alike in Eskimos and hibernants, for example, bear and sloth, the 'awakening' in spring—almost certainly due to resumption of hypophyseal activity—signals the onset of the 'mating' or 'rutting' season. Further resemblances between hibernation and hypo-pituitarism are that in both states the basal metabolic rate and body temperature are lowered. Again, in both sexes in hypo-pituitarism 'adiposity' ensues, which possibly acts vicariously as a substitute for the 'fat gland' of hibernants. With these changes, too, are associated lethargy, slow pulse, and a moderate degree of somnolence. The parallel, then, between states of hibernation and hypo-pituitarism is suggestively close—the differences being quantitative rather than qualitative.

It has been suggested that the sexual periodicity in Eskimos is a racial peculiarity. But Cook—in alluding to the suppression of sexual desire and menstruation with "great muscular debility" in Eskimos—observes, "Our own party suffered in the same way". Their participation would seem to rule out any question of its being a racial peculiarity, indicating rather that all persons, when living in the arctic zone, react in like fashion to long-continued absence of 'sunlight'. As to the pathway of light transmission, that of vision first presents itself, and possibly light mediated through the hypophysis in this way influences the sex organs.

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¹ F. Cook, *New York Journal of Gynecology and Obstetrics*, 1894.