THE PROPOSED BIOLOGICAL STATION IN GREENLAND.

TO THE EDITOR OF SCIENCE: It was my pleasure some time ago to communicate to the readers of SCIENCE that the money for the erection of a biological station in Greenland is donated by a citizen of Denmark. I am now able to add further that it is donated by Herrn Justitsraad P. Holck, of Copenhagen. He has donated 35,000 Kroner (about $10,000) for that purpose, which is the estimated cost, according to Magister M. P. Porsild's plan. It now remains for the Danish government only to appropriate money enough for its running expenses, which, according to Mr. Porsild's plan, will amount to 11,000 Kroner (about $3,000) a year.

To show the great interest which scientists have taken in Magister Porsild's plan I could mention the numerous articles in Danish, Swedish, German and American scientific journals, and the recommendations from leading biologists and polar explorers, as Professor Fridthof Nansen, Sir Clements Markham, Professors Vanhöffen, von Drygalski, Aug. Warming, K. V. Steenstrup and F. Jungersen, Drs. Gunnar Anderson and Georg Brandes, and many others. In the United States it has been highly recommended by Professors E. B. Wilson, C. O. Whitman, J. Loeb, T. H. Morgan and Mr. Pehr Olsson-Seffer, Ph.D.

Sir Clements R. Markham, president of the Royal Geographical Society in London, says: "Your proposal to establish a biological observatory is, in my opinion, deserving of support. I believe that the science of geography would be advanced by it, and would derive important results. * * * I wish you all possible success in your efforts to secure that result ever."

Professor Dr. Vanhöffen, in Petermann's *Geogr. Mittheilungen,* says: "A kind of biological station was established in Greenland in the time of Holbölls and Rinks, the former remained there eighteen years, the latter twenty years. They were the central figures in the exploration and investigation of Greenland. Especially Mr. Rinks knew the people of Greenland well and we have as a result his classical work, 'Grönland, geografisch und statistisch beschrieben.'" After a longer description of Mr. Porsild's plan, he states: "It is a very extensive plan that the leader of the future arctic biological station has; but, without doubt, great results are to be expected from such a station."

The north polar explorer Professor Fridthoff Nansen says: "A biological station in Greenland will be of immense value for scientific research. Especially the investigation of its fauna and flora can not help to give results of utmost importance to biological science."

As soon as the Danish government has decided to appropriate money for the support of the station I shall publish an article and describe the proposed function and the opportunities offered to investigators in the first arctic biological station.

At present we can only express our sincerest thanks, high respect and gratitude to men of science in foreign countries who have shown their interest in this Danish scientific undertaking, which we hope will add greatly to the universal advance of biological, geological and geographical science.

M. E. HENRIKSEN.

COLUMBIA UNIVERSITY,
December 1, 1905.

SPECIAL ARTICLES.

THE ASSUMED PURITY OF THE GERM CELLS IN MENDELIAN RESULTS.

CUÉNOT has recently published[1] in the fourth note of his important series of experiments with mice, certain results with yellow mice that are of fundamental importance as bearing on the question of the assumed Mendelian purity of the germ-cells. His results and his interpretation of them are briefly as follows:

Wishing to obtain 'pure' yellow mice, he crossed yellow mice known to be heterozygotes (*i. e.*, containing recessive gray or black in this case). According to the Mendelian formula he should have obtained the following results:

$$CYCG \times CYCG = 1\underset{\text{Yellow}}{CYCY} + 2\underset{\text{Yellow}}{CYCG} + 1\underset{\text{Gray}}{CGCG}.$$

[1] 'Les Race Pures et Leur Combinaisons chez les Souris,' *Arch. de Zool. Exp. et Gén.*, 1905, Vol. III., Notes et Revue, page cxxiii.

The letter C in this formula stands for any color (in contrast to white, $A =$ albinism); G indicates gray, and Y yellow-bearing gametes. The formula shows that 25 per cent. should be pure yellow, 50 per cent. yellow-grays (*i. e.*, dominant recessives), and 25 pure grays. To his surprise he got no pure yellow mice, CY, but only impure yellows (*i. e.*, yellow dominants, $CYCG$). Quantitatively there were 72.7 per cent. yellows, $CYCG$, and 27.3 per cent. 'pure' grays.

Why were no pure yellows obtained? In other combinations yellow seemed to follow the same rule as the other colors, gray, black or brown, but neither the pure yellow CY, nor the albino with yellow alone recessive, AY, nor the yellow heterozygote $CYAY$ could be obtained.

Cuénot explains these curious results by means of the assumption that the gametes (eggs or sperm) having the formula CY or AY never unite to give the forms $CYCY$, $AYAY$, $CYAY$. In other words, yellow-bearing spermatozoa never unite with eggs bearing the yellow color alone. If this conclusion could be established with certainty it would have a fundamental bearing on all questions connected with Mendelian phenomena. It is, therefore, of the utmost importance to know whether Cuénot's interpretation is the only one that can be given to his results.

It seems to me, in the first place, highly improbable that such a trivial difference as the color of the hair could absolutely prevent the conjugation of the gametes carrying these colors, especially when we recall that the same gametes must carry thousands of other unit-characters that are identical.

It seems also more *probable* that the results mean, that the color, yellow, was never disassociated from one of the other colors, gray, or black, or brown; and that the results are due to this and not to the disjunction of yellow and its failure to combine with yellow again. On this basis, moreover, all the facts can be explained according to the Mendelian formula. Incidentally the whole question of what is meant by the '*purity*' of the germ cells is here raised. Let me now try to show how these claims can be justified.

Cuénot obtained his yellow mice by crossing an albino of unknown ancestry with colored mice. His yellow mice must, therefore, have contained gray (or black). Now the theory of 'pure' germ-cells *assumes*, in order to explain the Mendelian ratio, that the germ-cells of $CYCG$ separate into two sorts, CY and CG. I *assume*, on the contrary, that the mixed characters do not separate again, but alternately dominate and remain latent giving $CY(CG)$ and $(CY)CG$. Two mice of this kind paired will give:

$$\begin{array}{cc} CY(CG) & (CY)CG \\ CY(CG) & (CY)CG \end{array}$$

$$\underset{\text{Yellow}}{1\,CY(CG)} + \underset{\text{Yellow}}{2\,CY(CG)\;(CY)CG} + \underset{\text{Gray}}{1\;(CY)CG.}$$

Thus there will be three yellows to one gray. There are, moreover, two classes of yellows, but while the first group $CY(CG)$ will breed true, the other group $CY(CG)(CY)CG$ will split in each successive generation according to the Mendelian formula. There is an implication in this point of view of importance for the conception of germ-purity. The gray in the latent condition in $CY(CG)$ is different from the gray in the recessive condition in $CY(CG)(CY)CG$, for the former remains in the latent condition to CY in inbreeding, while the latter, the free CG, becomes dominant in half of the germ cells. Thus the germ cells of $CY(CG)$ are all $CY(CG)$, but half the germ cells of $CY(CG)(CY)CG$ are yellow, $CY(CG)$, and half gray, $(CY)CG$. The same rule applies to the 'pure' grays $(CY)CG$ in which the latent (CY) always remains latent in inbreeding. Crossing with other races may, however, bring the yellow from its latent position to dominance or to recessiveness again.

Cuénot's yellow mice were, on my view, either $CY(CG)$ or $CY(CG)(CY)CG$. The former if inbred should give usually yellow mice, but if crossed with mice of other colors, or united with $CY(CG)(CY)CG$, would give some grays. Cuénot's somewhat ambiguous statement on the top of page cxxix may accord with this view, although it may have a different meaning. He obtained no pure yellows, $CYCY$, because, on my view, his yellow mice were contaminated at the start.

The result is exactly the same as when a so-called 'pure' Mendelian gray mouse is obtained through a cross. The 'pure' dominant is contaminated in the same sense as the 'pure' recessive and in the same way. For example, a gray mouse crossed with a black will give a mouse $CGCB$ whose germ cells will be, on my view, $CG(CB)$ and $(CG)CB$. Such mice inbred will give

$$1\,CG(CB) + 2\,CG(CB)\;(CG)CB + 1\;(CG)CB.$$

The so-called 'pure' dominant, $CG(CB)$, is really only a dominant gray with black in the latent condition. This form is strictly comparable to the yellow mice that Cuénot tested for purity, and could not be expected to give by inbreeding a form with perfectly pure germ cells, $CGCG$. To obtain such a pure gray mouse, $CGCG$, a wild form, never crossed with black, must be sought; for, once crossed always contaminated.

The preceding results given for these special cases are strictly in accordance with what is now becoming recognized in regard to the usual condition of albino mice. It has been shown that these carry gray, or black, or some other color *latent*. Thus a white mouse is $A(G)$ or $A(B)$ or $A(Y)$. Suppose one of these white mice, with the formula $A(G)$, is crossed with a pure gray mouse, with the formula CG:

$$A(G) \times CG = A(G)CG.$$

The offspring are all gray, because free gray dominates free white. Suppose now we inbreed these $A(G)CG$ mice. Their germ cells will be, on my point of view, of two sorts, viz., $A(G)(CG)$ and $(A(G))CG$. The resulting offspring give

$$\underset{\text{White}}{1\,A(G)\,(CG)} + \underset{\text{Gray}}{2\,A(G)\,(CG)\,(A(G))\,CG} + \underset{\text{Gray}}{1\,(A(G))\,CG}.$$

Since albino is white, while C stands for the color with which it is associated, we may simplify the form of the equation by omitting the C's and putting the G's together, thus:

$$1\,A(G) + 2\,A(G)\,(A(G))\,G + 1(A(G))\,G.$$

Thus our formula gives the Mendelian results, but it also brings to light the different relation of latent (G) and free G. If individuals of the middle group above be inbred, they again give the Mendelian ratio 1:2:1; because the free A and the free G alternately dominate and become latent, so that the germ cells are $A(G)$ and $(A)G$.

It is needless to go over the well-known Mendelian combinations of other sorts, back crossing, etc., since they also work out according to our formula.

The important point is not that there is offered here a new set of Mendelian formulæ, but a new conception regarding dominance and recessiveness, which I believe to be better in accord with the conditions found to exist in extracted recessives. Furthermore, this idea brings into question the assumption of the so-called purity of the germ cells, by means of which modern writers are explaining the Mendelian results. Purity only means dominance over latency. Dominance over recessiveness follows a different rule, viz., the rule of alternation or of contrasted gametes.

T. H. MORGAN.

RECENT CHANGE OF LEVEL IN ALASKA.[1]

ABOUT the middle of September, 1899, the coast of Alaska, in the St. Elias-Fairweather region, was visited by a series of vigorous earthquake shocks, one effect of which was to greatly modify the front of the Muir glacier, and to fill Muir Inlet with ice dislodged from the glacier. The shocks were also felt with marked intensity at Yakutat, and a company of prospectors, camped near the Hubbard glacier in Disenchantment Bay, report a series of severe shocks and accompanying water waves.

[1] The observations outlined in this paper were made in the summer of 1905 in connection with a general geological survey of the Yakutat Bay region by a United States Geological Survey party under the direction of the senior author. A grant of money obtained through the assistance of the American Geographical Society made it possible to add the junior author to the party as special assistant in physiographic and glacial geology. Acknowledgments are due to B. S. Butler, the other member of the party, for assistance in this work. Published by permission of the Director of the U. S. Geological Survey.