well-known ellipsoidal axis and the solar velocity increasing as we go from the stars of small and 'contrary' proper motion to those of medium and large proper motion.

Such variations of the position of the apex although apparently connected with distance or other conditions, would seem to point ultimately to some form of rotary or spiral motion among the stars themselves.

The details of the investigation, which is based upon Campbell's well-known catalogs of about 1300 radial velocities, will be published in the *Astrophysical Journal.*

CHANNELED GRATING SPECTRA, OBTAINED IN SUCCESSIVE DIFFRACTIONS

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The great variety of channelled spectra obtained, when white light is successively diffracted by two gratings, are referrable to the fringes of the diffraction of homogeneous light, observed *outside* the principal focal plane, on a spectrometer. In other words, if light of a given pure color (sodium, mercury) is used, a single grating suffices. Each line of the spectrum is resolved into well defined groups of fringes, if it is observed either in front of or behind the principal focal plane. The arrangement of fringes varies in marked degree with the distance of the plane observed, from the latter. If reflecting gratings are used, there is no other possible source of interferences; but reflecting and transmitting gratings show the phenomenon equally well.

After finding how easily the Fresnellian interferences of two virtual slits could be reproduced in the telescope and observed on either side of (before or behind) the plane of the sharp slit images, it seemed reasonable to suppose that the diffraction of a slit could also be produced and exhibited in this way; but the availability of this anticipation is attended with much greater difficulty. The image of a very distant slit does indeed show separated diffraction fringes on either side of the principal focal plane in the observing telescope. But they move right and left with the eye, in the same direction and in this respect do not at once recall the phenomena under consideration. Usually the blurred image, out of focus, is stringy, without definite structure.

To obtain sharp stationary fringes from an image of the slit, this image must be produced by the diffraction of a grating, having a dis-

persing power above a certain minimum. Thus in a grating of less than 7,000 lines to the inch, the undeviated slit image and the image of the first order are not clearly resolved, unless the slit is very fine. In the second and higher orders, however, the resolution is very pronounced and the fringes stationary.

The resolution of fringes is equally manifest in front of, or behind the principal focal plane, so that if a weak convex lens is added to the objective of the telescope, the succession of fringes is found with an outgoing ocular; if a weak concave lens is added to the objective, with an ingoing ocular, starting in each case near the principal focus. As the fringes increase in size they in turn subdivide, as if each fringe were a new slit image, capable of undergoing secondary diffraction. Beyond these secondary fringes no further resolution was detected.

Returning to the work with two successive gratings and white light, the channelled spectra obtained are too complicated for concise description. A very interesting result, however, is the passage of the fringes across the stationary sodium line, when the grating is moved, fore and aft, in a direction normal to its plane. The region of the D line is thus alternately dark and bright. The direction of these rays remains unaltered while the illumined strip is shifted horizontally across the ruled space of the second grating. It is sometimes difficult to see the D line in the focal plane of the fringes. When homogeneous light is used this fiducial mark is necessarily absent and the cross hairs of the ocular must be supposed to replace it. The shift of the fringes is then equally obvious and sometimes (sodium light) different groups seem to travel in opposite directions while the grating moves in one direction. In case of homogeneous light and two gratings, moreover, the fringes seem to be of minimum size in the conjugate focal plane of the gratings. They increase in size and in turn split up, in focal planes before and behind this.

An insight into these occurrences was finally obtained in observation with homogeneous light, on the spectrometer, by shifting the grating (transmitting) in its own plane, right and left. The fringes in such a case move *bodily* across the field of the telescope, new groups entering on one side for those which leave on the other. These fringes, even if quite distinct, are differently arranged in the coarse and fine series and are frequently accompanied by dark or bright bands. If the ocular is drawn out and set outward from the principal focal plane (at which the slit image is quite sharp) into a different position, the fringes move in a direction opposite to the grating. If the ocular is set inward from the principal focal plane, they move in the same direction as the grating.

This would not be unexpected; but secondary fringes, or something else in the field, seem to remain stationary. Successive fields may be quite different as to arrangement of fine and coarse lines, but all plane gratings exhibit the same phenomena. Thus it is obvious that the fringes of the present paper result from a residual irregularity in the rulings of the grating. Micrometrically, the successive strips of a slit image, however fine, are of unequal intensity. Between these there is diffraction as may be tested by examining the clear glass at the edge of the ruled space.

It is obvious that in the otherwise indistinguishable images of a slit in homogeneous light, however sharp or however narrow, in its own focal plane the nature of its origin still persists and may be detected by observations outside of the principal focal plane. A fine slit is in all cases presupposed and all the phenomena vanish for a wide slit. On the other hand the width of the pencils of parallel rays may be far greater than is necessary to show the strong Fraunhofer lines.

A fuller report of this work has been presented to the Carnegie Institution of Washington, D. C.

THE EFFECT OF PARENTAL ALCOHOLISM (AND CERTAIN OTHER DRUG INTOXICATIONS) UPON THE PROGENY IN THE DOMESTIC FOWL

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The investigation here reported deals with the general problem of the origin and causation of new, heritable variations. That this is one of the most fundamental problems of genetics admits of no doubt. The method by which this general problem is attacked in the present investigation is that of exposing systematically the germ-cells of an animal to something unusual or abnormal in the surrounding conditions, and then analyzing, so far as may be, not only the new heritable variations themselves (provided any such appear), but also the factors which underlie their causation.

The specific problems with which this investigation deals are these:

1. Does the continued administration of ethyl alcohol (or similar narcotic poisons) to the domestic fowl induce precise and specific changes in the germinal material, such as to lead to new, heritable, somatic variations?