1593 and followed by three Dutch editions between 1600 and 1607, by nine French editions between 1602 and 1607, by four German before 1627, and by several other English editions. In this, following the conclusion that the Pope is Antichrist, the end of the world is set to fall between 1688 and 1700. This type of arithmetical mysticism in the study of "Revelations" appealed to many other mathematicians of the sixteenth and seventeenth centuries, some of whom were not so wise as to set the end of the world sufficiently distant to be safe.

From the time of the earliest known trigonometrical tables of Hipparchus and Ptolemy, probably based upon Babylonian documents, down through the ages there has been a continued interest in such mathematical tables. The Babylonians, the Greeks, the Hindus, the Arabs, the Europeans of the Middle Ages, and many of the nations of the present day have contributed energetic workers to this field. No one can deny to Napier the just claim to having made the greatest contribution for the final construction of tables sufficient for computation purposes of the most diverse types.

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A NEW TRIANGULATION SIGNAL LAMP

State, county and city surveyors must look to the national government for the exact geographical positions upon which to base their respective surveys. The duty to establish and furnish these positions devolves upon the United States Coast and Geodetic Survey.

The geodesist determines astronomically with the greatest possible exactness the longitude and latitude of selected principal points, suitably distributed over the whole country. The geographical positions of the many places between these principal points required are ascertained most accurately and economically by means of what is called triangulation. A rough, preliminary or reconnaisance survey reveals those points which are intervisable and most desirable as to distance and other characteristics, to form the corners of connected triangles. From the measured length of one side of a suitably selected one of these triangles and the angles of all the interconnected ones, the exact latitude and longitude of each point is computed.

Though the general principle employed in the measurement of these angles is the same as that applied in the survey of a railroad, a farm, etc., the great distance between the points, varying between ten and a hundred miles or over, requires not only the use of specially large and refined instruments, but also a special means of making the point visible to the observer. This latter is now done, in day time, by reflecting sunlight to the observer from a mirror placed accurately over the point, and at night by means of a specially constructed acetylene lamp.

It is apparent that distances of the magnitude mentioned can be penetrated by either means only under favorable weather conditions, and that many days during a season are lost even when the atmosphere is only slightly clouded by smoke, fog, etc. As the expense to maintain the party, which amounts to from $50 to $60 per day, goes on whether observations are made or not, it was thought that advances in illuminating devices made since the lamp now used was adopted might be utilized to increase considerably the intensity of the light directed to the observer, and thereby increase the number of observing nights.

Experiments made with calcium light produced by the oxy-acetylene flame showed this form of illumination to be impracticable by reason of cost and bulkiness of the apparatus necessary.

The storage cell was studied with the view of using electricity as a source of light. Its cost and weight and the difficulties connected with its maintenance were found to be too great. The electric generators with the necessary prime motor were carefully studied, tried experimentally and found to be too heavy for transporting to difficult stations, and doubtful as to continued and unfailing service.

The result of a series of tests of dry cells, which are readily divisible into loads suitable for climbing difficult ascents, however, warranted the design and construction of a new

type of lamp, the use of which, undoubtedly, will increase the present number of observing nights per month by at least twenty-five per cent.

The main part, an ordinary automobile head light, is suitably mounted for directing in the horizontal and vertical; the lamp is provided with an ammeter, a small rheostat and a switch. The whole, packed in a strong case, weighs twenty-three and one half pounds.

In order to obtain most nearly the maximum intensity of the light, it was necessary that the lamp bulb be provided with a filament concentrated to a degree not found in those on the market. One of the lamp manufacturers was induced to make the necessary designs and experimental tests, and submitted a number for trial.

At the present time all the lights of the stations surrounding the observer's station are kept burning continuously from sunset to the closing of the observations for the night. The use of the dry cell was found practicable and not too costly on the assumption that the proposed lamp was to be kept burning throughout the night. The trial of the newly designed lamp by comparison with the present acetylene lamp, however, proved the former so much superior, that it was decided to have the lights shown only on signal, flashed with one of the new lamps by the observer, for the few minutes each time it is observed upon. This reduces very materially the consumption of current and battery cost.

The lamp, after being provided with two additional bulbs, one for medium and one for short distances, was tested by the Bureau of Standards, with the following results:

Apparent candle power, at a distance of 100 ft. Lamp with specially concentrated filament, gas filled, 6 volts, 2.5 amp.	250,000
Automobile lamp, 6 volts, 1.8 amp.	50,000
Flash light lamp, 2.7 volts, .34 amp.	6,000

The candle power of the acetylene lamp now used in the triangulation carried on by the survey, measured under the same conditions, is 1,500.

E. G. FISCHER
U. S. COAST AND GEODETIC SURVEY

SPECIAL ARTICLES

LINKED MENDELIAN CHARACTERS IN A NEW SPECIES OF DROSOPHILA

IN my cultures of a new species of *Drosophila,* tentatively called "species *B*,"[1] several mutants have recently appeared. They have not all been tested fully with respect to their linkage relations, but enough has been learned to suggest some interesting possibilities when considered in connection with the results of Morgan and others on *Drosophila ampelophila.* Three linkage groups have already been obtained in my material, and five characters remain to be studied. Of the linkage groups one is sex-linked and contains four characters, the others are non-sex-linked and are composed, respectively, of one and two characters.

So far as the evidence goes, it indicates a mode of inheritance in this fly entirely comparable with that in *D. ampelophila,* although I have as yet been unable to determine whether or not there is "crossing over" in the male, because the only linked factors thoroughly studied (aside from the sex-linked group) are completely linked and give no crossing over in either sex.

The most interesting feature of the results, as they stand at present, is the apparent correspondence between certain mutant characters in this species and in *D. ampelophila.* Four of the characters I have obtained show this correspondence. One of them ("confluent") has already been recorded.[1] It is a dominant, non-sex-linked character, and has a lethal effect when flies are homozygous for it. Its counterpart in *ampelophila* is an almost exact duplicate in appearance, and apparently has the same peculiarities in genetic behavior. There seems to be little doubt that these characters are actually alike in the two species. The other three are "black," "yellow" and "forked." Black has only been studied enough to tell that it is not sex-linked; and since there are two or three factors in *ampelophila* that give a melanistic effect, there is some doubt as to which, if any, is really comparable to the one I have found. But with respect to yellow and forked the case is different, for they not only correspond exactly in appearance, but

[1] Metz and Metz, "Mutations in Two Species of *Drosophila*," *Amer. Nat.*, 1915.