VICTORIA NATURAL HISTORY SOCIETY

The VICTORIA NATURALIST

Vol. 1, No. 6 December, 1944

HOARY MARMOT or WHISTLER.
(Marmota caligata cascadensis)

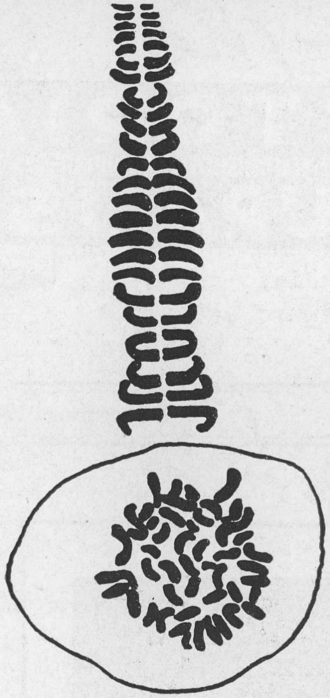

Fig. 1. A drawing of the chromosomes in the nucleus of the body-cell of a human.

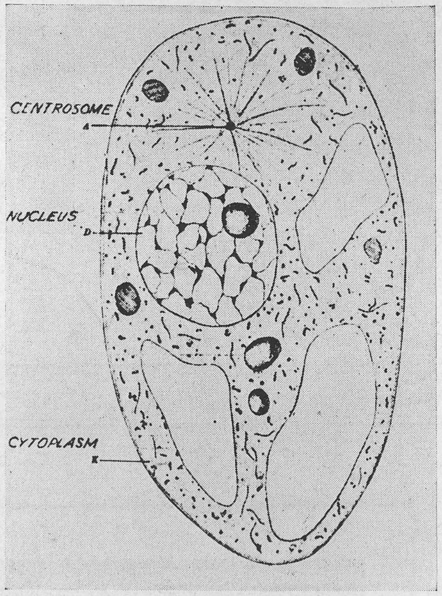

Fig. 2. A typical cell with nucleus, cytoplasm and centrosome.

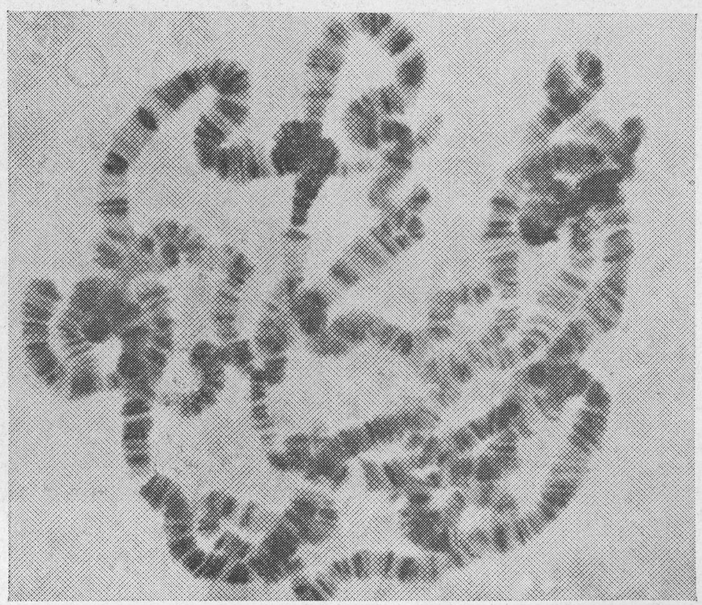

Fig. 3. A photograph showing the genes in chain-like fashion along the chromosomes in the nucleus of a salivary cell of the fly. (Drosophila melanogaster.)

THE VICTORIA NATURALIST

Published by
The Victoria Natural History Society

The regular monthly meeting of the Society was held in the Reading Room of the Provincial library on Tuesday, November 14th. Mrs. B. Woodward acted as Chairman. After the reading of the minutes and correspondence, a very interesting address was given by Mr. W. Downes. A summary of this address follows:-

BENEFICIAL INSECTS AND HOW WE USE THEM:

The speaker opened his address by commenting upon the fact that laymen are prone to regard all insects as noxious, whereas, in point of fact, only about one half of one percent of all species are totally noxious, while the remainder of those usually regarded as harmful are possessed of less conspicuous redeeming qualities.

One of the most useful of insect functions is the pollination of plants, and in this connection it is interesting to note that the general revolutionary tendancy has been for the plants to adapt themselves to the insects, rather than the reverse. Many insects, particularly beetles, are of enormous value as scavengers, and have a very important part in the reduction of organic matter on the forest floor. In many countries, and from earliest times, insects have been used as food, and travellers who have tried them have reported that some dishes prepared from them are truly delicious.

One of the most apparent uses for insects is as predators or parasites upon harmful species. This can not be accomplished as simply as might at first appear, as many factors have to be taken into consideration. The delicate biological balance of Nature must not be upset, and there must be reasonable assurance that an introduced parasite will continue to adhere to its normal diet in the new surroundings, and not itself become a pest. In Canada and the United States there must be international agreement, since insects ignore the forty-ninth parallel. Furthermore, care must be taken that the new parasites are introduced as pure cultures, since the presence of secondary parasites upon them may nullify their effect.

Canada is fortunate in having, at Belleville, Ont., the best laboratory on the continent for the study and breeding of parasitic insects. Here, proposed new introductions are given careful study and relieved of their hyperparasites, while conditions necessary for their survival are investigated. If found suitable for introduction they are then bred in large numbers, and shipped to the point of release.

One of the earliest uses of parasites was made in California, where it was found that a serious infestation of Fluted Scale could be controlled by the introduction of Ladybirds. In the Hawaian Islands, large commercial plantations have been protected by the introduction of some 90 species of parasite.

In Canada, parasites have been used to combat the depredations of Larch, Spruce and Wheat-stem Sawflies, Earwigs, Whitefly, Holly-leaf Miners, and European Cornborers. While most parasites are used in the control of other insect pests, there have been cases where man has used them against his enemies in the vegetable kingdom. Of these, the most outstanding success has been in the case of the Prickly Pear cactus in Australia. Here, the complete ruin of thousands of acres of pasture was arrested by the combined use of a beetle, a fungus-bearing caterpiller, and a mite.

Following the address, slides were shown, illustrating parasitic wasps, lacewings, syrphus flies, and predatory ladybird larvae and stink-bugs. The concluding item was a film illustrating the work of the Belleville laboratory, with particular reference to the control of the European Corn-borer.

L. Lolin Curtis.

The Vancouver Island Marmot

One of the least known mammals on Vancouver Island is the marmot. This is no doubt due to the fact that marmots are found only at or above timberline and then only at scattered points. Hikers, prospectors and timber-cruisers may occasionally see these animals but the general public seldom has an opportunity.

Marmots were first noted on Vancouver Island in 1910 when Dr. H. S. Swarth of the University of California discovered them high in the mountains south of Alberni. They have since been found in several other localities including Mount Washington in the Forbidden Plateau, the vicinity of Jordan Meadows and the head of Shaw Creek flowing into Cowichan Lake. They probably occur in many other parts of the Island wherever conditions are suitable for their existence.

The favourite haunt of the marmot is in areas of rock slides where tumbled masses of large boulders form shelters under which to burrow. In some places they frequent open country usually on a slope with a southern exposure and where an occasional rock provides both a vantage point upon which to sit and at the same time a roof for the underground burrow. In these surroundings they may be occasionally seen but more often they are heard only, their shrill warning whistle being the only sign of their presence to the approaching human. A vigilant observer may see these mountain dwellers by carefully stalking an area where they are known to occur but only a long and patient wait will award the watcher with an opportunity to see these wary mammals once they have retreated into the burrow in alarm.

The marmots of Vancouver Island are noticeably darker in general coloration than those on the mainland and for this and other reasons they are considered to represent a separate species, Marmota vancouverensis.

The colour of the fresh pelage is very dark brown above and below with a white spot on the forehead and a white streak down the mid-line of the belly; in adults a few grizzled hairs may be around the shoulders. A large male may measure more than two feet in total length.

Marmots have two types of call, a bird-like chirping sound repeated at intervals of a few seconds and a shrill whistle used only occasionally and usually as an alarm. The latter call which has given rise to the name "whistler" commonly used in referring to these animals, may be heard over long distances. In tone, pitch and intensity it is similar to the sound produced by blowing over the open end of an empty .22 long cartridge.

The food of these rodents consists chiefly of vegetation growing in the immediate vicinity of the colony. The blueberry (Vaccinium) appears to be one of their favourite plants. They are not adverse to trying a bit of meat, such as provided by a dead comrade, if the opportunity presents itself, but they are usually considered to be strict vegetarians. Sufficient fat is accumulated during the short summer season to enable them to hibernate for a period which may be as long as September to the following May or June.

G. Clifford Carl,
Provincial Museum.

THE APPLE SAWFLY

Sawflies are members of the order of insects called Hymenoptera which includes also the ants, bees, wasps, and the multitude of parasitic four-winged flies which are such invaluable agents in controlling the number of many destructive insects. The sawflies, however, are plant feeders and in the larval stage resemble the caterpillars of moths and butterflies. Some of them are serious pests and one of the worst

of these is the apple sawfly. It is a native of Europe and appeared for the first time on this continent several years ago, being reported almost simultaneously from New York state and Victoria, B. C. where it is now common.

The larva of the apple sawfly bores into young apples and feeds within the fruit causing it to drop to the ground when it is about an inch or so in diameter. Such fallen fruit will be found to have one, or occasionally two, fairly large holes in the side from which the larva has emerged and the interior will be found to be extensively eaten and full of black or brown decaying matter.

The loss caused by the apple sawfly is often serious. The fly seems to have a preference for the better flavored dessert varieties such as Gravenstein, Belleflower, Wealthy, Duchess and King and may destroy as much as 75 per cent of the fruit. The fly is a small black insect about half an inch in length with orange markings on the head and tip of the abdomen. It emerges from cocoons formed in the soil beneath the trees when the first apples come into bloom and lays its eggs in the blossoms. With its saw-like ovipositor it pierces the side of the calyx below the petals and deposits an egg at the base of the calyx cup. The egg hatches in about ten days and the young larva at first feeds on the skin of the newly-formed fruit on which it creates a characteristic linear scar. When the little apples are large enough it bores into them, excavating the interior. The larva matures in about a month and forms a tough silken cocoon at the depth of four to six inches in the soil.

Fortunately the control of this destructive pest is not difficult. One application of a spray should be given consisting of light petroleum oil emulsion at a strength of two percent in water with nicotine sulphate added at the rate of one ounce to four gallons of spray. Arsenate of lead should be added at the rate of eight tablespoons to four gallons of spray to control caterpillars and other foliage eaters. The spray must be applied just after the blossoms have fallen and should be directed at the calyces as the object is to destroy the sawfly eggs lying within. Besides controlling sawfly this combination spray controls other pests and thereby effects a great improvement in the condition of the trees.

W. Downes,
Convener.

HEREDITY UNDER THE MICROSCOPE

Life for an individual begins at fertilization, but the beginning of the individual is the end of a complicated chain of events in the cell that have gone forward with miraculous precision. Many of these processes can be seen by the aid of a microscope - or rather what is seen is the end result, for the cells are no longer alive and functioning when prepared for microscopic examination.

MECHANISM OF INHERITANCE------ A TYPICAL CELL

Plants and animals are made up of millions of cells (Fig.2) too small to be seen except by means of a microscope. Cells differ in size and appearance according to their location and function, but the general make-up is the same, each cell having a nucleus and cytoplasm. In a study of inheritance the part of the cell in which we are particularly interested is the nucleus, for it carries the material which determines the character of the plant and animal, and which is passed on to the offspring to determine its characteristics. In every cell the nucleus contains a certain number of darkly staining bodies called chromosomes, which are the vehicle by which the characteristics of one generation are handed on to the next.

HOW THE CELLS OF PLANTS AND ANIMALS MULTIPLY

Every living cell arises from a pre-existing cell.

A plant or animal begins life as a fertilized egg which is the product of two reproductive cells--(one from the male (sperms) and fertilizing cells of pollen) and one from the female (eggs) which unite and become one. With the growth of the body, or the beginning of life, this fertilized egg, one cell, divides and becomes two; the resultant cells become four, the four eight, and so on, until every one of the millions of cells in plants or animals is produced. When the cells divide, each chromosome in a nucleus is very carefully divided in half longitudinally, so that the nucleus of each daughter-cell has exactly the same equipment of chromosomes as the mother-nucleus (Fig.5). The exactness of division in itself suggests that the chromosomes, the bodies in the nucleus, are the bearers of heredity characters, since none of the other cell constituents seem to be so accurately divided at division of the body-cells.

Within the reproductive organs of both male and female a different kind of cell division takes place to form the reproductive or germ cell. The reproductive cells are the egg or ovule, produced by the female, and the sperm or pollen, produced by the male. The reproductive cells increase like the body-cells; that is, one cell divides and becomes two, and two four, and so on, but the behaviour of the chromosomes is different.

At the time the reproductive cell divides it becomes evident that the chromosomes exist in pairs (Fig.1); thus there is always an even number of chromosomes in every body-cell of an organism. The two components of each pair of chromosomes are always identical in shape and size. (This is strictly true for all the chromosomes except for sex). When cell division takes place no splitting of the individual chromosome takes place; instead, the chromosomes are distributed to the daughter-cells in such a way that the chromosomes of each pair in the mother-cell pass one to one daughter-cell, and the other to the other daughter-cell (Fig.4). Since this procedure reduces the chromosome number for the daughter-cells to half the number present in the mother-cell, this particular cell division is called the reduction division. These reduced daughter-cells give rise to reproductive cells (sperms and eggs). It is important to remember that this reduction of the chromosomes for the reproductive cells is not indiscriminate, but always involves a separation of the two components of each chromosome pair. When two reproductive cells unite and fertilize, there is of course a return to the normal number of chromosomes of the body-cells. Naturally, therefore, one-half of the inheritance comes from one parent and one-half from the other.

CHROMOSOMES

Chromosomes are the material basis of heredity, the vehicle by which the characteristics of one generation are handed on to the next (Fig.1). They can be seen in the nucleus by looking through the powerful microscope. The chromosomes have characteristic shapes; they may be straight or curved, stout or slender, and in these details may vary from species to species. Each kind of living thing has its characteristic chromosome outfit, and takes the most minute and elaborate precaution to preserve the constancy of that outfit at every cell division. Looking very closely through the powerful microscope we can see that every body-cell has a double set of these vitally important chromosomes. For example, in the female fruit-fly (Drosophila melanogaster) each nucleus contains a pair of little blobby chromosomes, two pairs of longer V-shaped chromosomes, and a pair of stout straight rods.

When the reproductive cells, sperm and egg-cells, are formed, this double set as described above is separated into two single sets. Thus each egg or germ cell of the fruit-fly has one very little blobby chromosome, two longer V-shaped chromosomes, and one of the stout rods. When the sperm and egg-cells unite

in fertilization their nuclei join, and thus a double set is founded again. The progeny receives a set, or one of each pair, of its chromosomes from each of its parents.

-----GENES -----

Mendel, in order to explain the results we obtained by crossing red and white four-o'clock flowers, assumed that somewhere in the plants' constitution there were hereditary units concerned with this or that specific character. In this particular case there must be units which have to do with the control of Flower colour, and these units he supposed were self-perpetuative and did not mix with one another. Today we call these units by the technical name of genes. (Fig.3). All the countless breeding experiments that have been done since Mendel's work was rediscovered have confirmed his original idea, and in addition have established a new fact--namely, that these gene-units are carried in the chromosomes. Like an atom, a gene is something that has never been seen or felt. It is inferred. More than a century ago scientific men were forced to believe in the existence of atoms by the chemical behaviour of different substances when they combined and separated. Today scientific men have been forced to believe in the existence of genes by the reproductive behaviour of plants and animals in breeding experiments. "Gene" can be defined as that something in the chromosomes, whatever its nature may be, which is essential to or determines the development of a particular character and is responsible for transmission from parent to offspring. It has been found that each chromosome ordinarily carries a large number of these genes. Moreover, a given gene occupies a definite place in a definite chromosome.

MENDEL'S FIRST LAW

EXPLANATION OF FOUR-O'CLOCK CROSS

It will be remembered that when we crossed red and white four-o'clocks all the offspring were pink, and when we inbred these pinks--that is, crossed a pink with a pink--we obtained a second generation showing three distinct types in the proportion of one red to two pinks to one white.

We explain our results in the following way: Since every cell of the plant (except for the actual reproductive cells) contains a double chromosome outfit it must contain two of these colour-producing genes. In the original red four-o'clock parent from which we started, these genes were red-producing; in the white plant they were different and turned the flowers white. When the cross was made, the pink plants of the first generation received one of their chromosome outfits from each of their parents. Hence it follows that their cells contain one colour-controlling gene of each kind, one red-producer and one white-producer. So that the resulting flowers are a compromise between red and white; that is, pink. Next, when the pink plant produces reproductive cells, the result was a little more complicated.

It may be recalled that when a body-cell divides to produce reproductive cells, the nature of the division is such as to distribute into different daughter-cells the components of each pair of the chromosomes. For a pink plant; one of the chromosome pair with the red gene on it goes to one reproductive cell and the other with the white gene on goes to another. About 50 percent of the pollen and ovules will therefore carry the chromosome with the gene for red flower and the remainder will carry the chromosome with the gene for white flower. So that when pink plants are self-fertilized or crossed with each other, four kinds of fertilization ensue as far as colour-gene are concerned.

They are as follows and are illustrated in Fig.1 Oct.issue

(1) A red-carrying pollen grain might fertilize a white-carrying egg; result, a red-flowered plant.

(2) A red-carrying pollen-grain might fertilize a white-carrying egg; result, a pink-flowered plant, a hybrid.

(3) A white-carrying pollen-grain might fertilize a red-carrying egg; result, a pink-flowered plant, a hybrid.

(4) A white-carrying pollen grain might fertilize a white-carrying egg; result, a white-flowered plant.

As we have seen, all these possibilities have happened. The second generation was mixed and contained red, pink, and white flowering plants.

The cross between the red and white four-o'clocks and the inbreeding of the pink of the first generation illustrates Mendel's first law of the independence and mutual aloofness of the genes. When a red-producer and a white producer exist together in one plant, the visible result is a blend of red and white. But this is only the resultant of two independent and antagonistic influences; the genes themselves neither blend nor contaminate one another. When the production of germ-cells brings the time for parting, each goes its solitary way, bearing no trace of having been associated for months or years with the other within the microscopic chambers of the cells. Moreover, it evidently makes no difference whether we use a red-flowered plant as our original male parent and a white for female, or vice versa. In both cases the progeny will be pink. All that matters is the kind of genes carried in the chromosomes from the male and female.

W. R. Foster,
PROVINCIAL DEPARTMENT
of AGRICULTURE,
VICTORIA.

NOTICE OF MEETINGS

CORRECTION

The Ornithology Group Meeting on
"Songs of British Columbia Birds" ------- Mr.J.O. Clay
is on Tuesday 5th December; not the 4th as stated in
last month's issue.

MONTHLY MEETING

Tuesday Dec.12th Provincial Library Reading Room.

Speaker: G. HARDY

-on--

"FROM SEA SHORE TO MOUNTAIN TOP
IN FLOWER LAND."

GROUP MEETINGS --

Dec.19th: Geology ------------------ Mr. W. Mathews
"The Geology of the Lower Mainland."
Biology Lab.,Victoria College, Joan Cres.

Dec.26th: Ornithology --------------- Mr.J.O. Clay
An outdoor meeting for the purpose of taking a Christmas census of the birds that winter in Beacon Hill Park and the foreshore in the immediate vicinity.

Meet at the Band Stand, Beacon Hill Park
at 2 p.m.

It is suggested by the Committee that those members unable to attend, might forward to the Secretary a list of birds seen in their district on that date, in order that a list for the district can be tabulated.

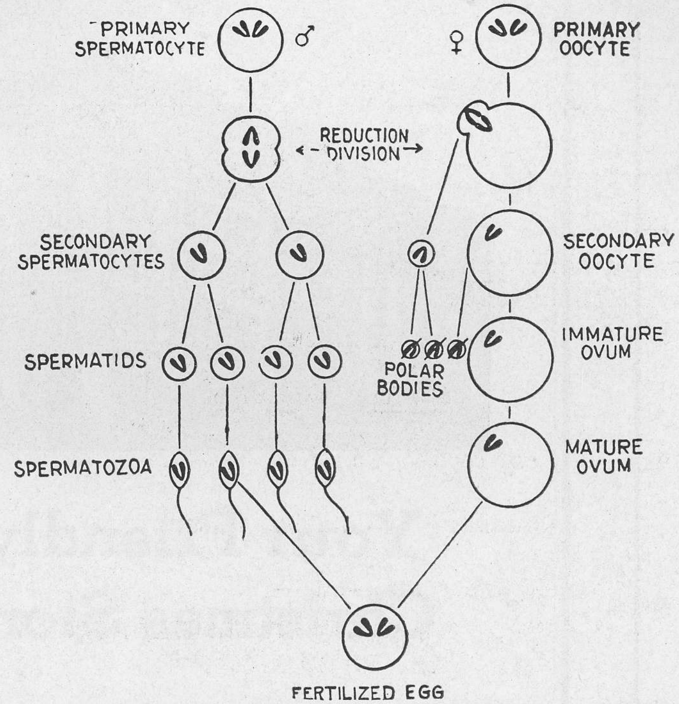

Fig. 4. The diagram shows the reduction division; one of each pair of chromosomes goes to the reproductive cells, spermatozoa, and ovum. When the reproductive cells unite to form the fertilized egg, there is a return to the normal number of chromosomes of the body-cell.

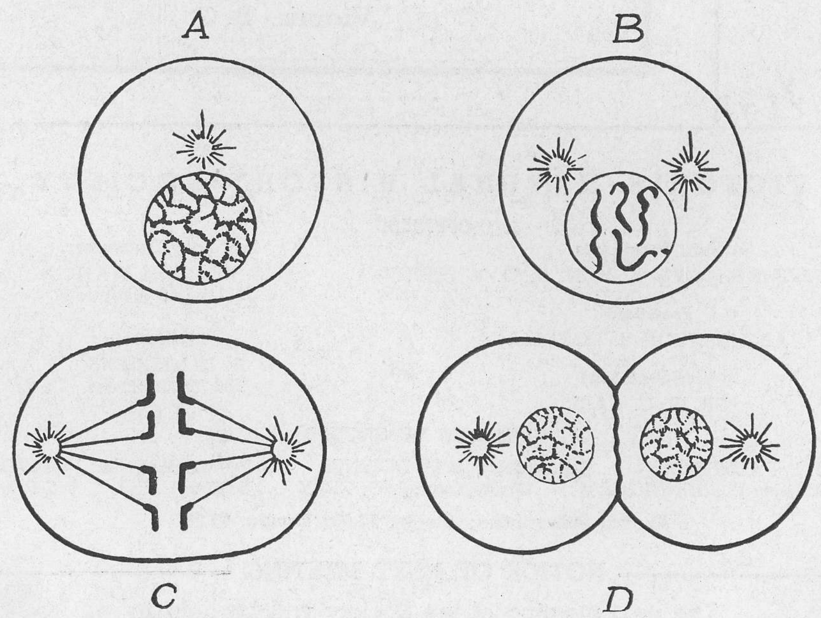

Fig. 5. The diagram shows how the body-cells increase in number (growth). A. Resting stage. B. The cell with four chromosomes in the nucleus. C. Separation of the daughter chromosomes formed by the longitudinal splitting and beginnings of the division of the body-cell. D. Cell division practically complete.

To

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Victoria, B. C.

VICTORIA NATURAL HISTORY SOCIETY

Annual Subscription: Single, $2.00; Family, $3.00

NOTICE OF NEXT MEETING

The next meeting of the Society will be held in
READING ROOM OF PROVINCIAL LIBRARY, PARLIAMENT BUILDINGS
at 8 p.m. on Tuesday the 12th December, 1944

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