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VOL. XX.

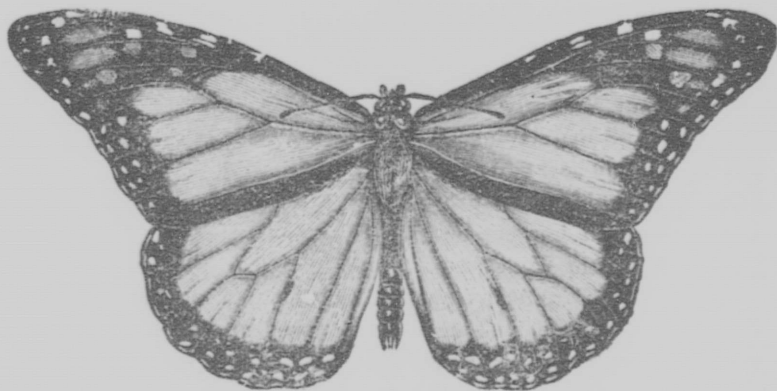
OTTAWA, FEBRUARY, 1907.

No. 11

## A SWARM OF BUTTERFLIES.

By GEORGE H. BRADSHAW, Morden, Man.

About the twentieth of August of this year the writer, in common with many others in this district, had the opportunity of seeing a rather unusual and certainly an interesting sight. Whether interested in such matters or not, one could not help noticing one day countless numbers of a large fiery-rust-colored butterfly—



which I have since learned from Dr. Fletcher was the Milkweed Butterfly, *Anosia plexippus*—that came over-night, or at least seemed to come over-night, for there they were one bright morning hanging on the trees and shrubs, in such numbers and so closely together, that the trees on which they had settled were simply a blaze of red.

Apparently they liked the early morning sun, for they were

gathered on the sunny side of the trees and basked in the warmth of the sun till between eight and nine o'clock, when they suddenly determined to set about their day's work, or whatever they were in quest of, for they began to flit about in all directions and in such numbers that the air seemed full of them. During the afternoon they did not appear so plentiful.

I cannot recall the exact date when they first made their appearance in such large numbers, but it must have been about August 20th, and they remained for probably ten days. To give a better idea of the great number in this swarm, I may say that they appeared in equally large numbers over a distance of twelve miles, to my knowledge, and how much more I cannot say.

They seemed to settle down whenever night overtook them, if in an open field among the grass or grain, and if in a bush they gathered as close together as they could get on tree or shrub. They seemed, I think, to prefer the elm trees to any others, for there appeared to be far more on them than on any other kinds.

There had been odd individuals of these butterflies flying about as early as a month before the coming of the main body and odd ones remained behind for probably a month longer; but the great swarm came suddenly one day and disappeared with equal suddenness.

They seemed a sleek and well conditioned host and looked as though they fared well, but what they lived on I cannot say.

During the early morning one could go out and gather them in any quantity, but as soon as they were on the wing they would lead one a merry chase.

The weather during the time of the swarm was fine, bright and warm, with southerly and westerly winds prevailing.

The district they visited was along the base of the Pembina range of hills.



The above interesting note by Mr. Bradshaw refers to a well known habit of the Milkweed Butterfly (also known as the Monarch). This habit of collecting in large numbers resembles very much the similar habit among birds, when gathering together in large numbers just before migrating. The Milkweed Butterfly is one of the few insects which migrate in large flocks. It is almost certain that none of the insects in these great swarms pass the winter in Canada. Although exceedingly common in many years, all the parents of the vast numbers sometimes seen sailing over clover fields or gathering nectar from various flowers, in late summer and autumn, fly up into Canada from the south. The caterpillars are very restricted in their food plant and are not known to feed upon anything except the various species of *Asclepias* or milkweed. The excellent figure given above of the butterfly and the smaller woodcut representing part of a swarm at rest on a dead branch, have been kindly lent by the Editor of the *CANADIAN ENTOMOLOGIST*, and were used in an article by Mr. J. Alston Moffat in the Annual Report of the Entomological Society of Ontario for 1899, where an occurrence of these handsome butterflies similar to the one now recorded from Manitoba, which was observed near London, Ont., is described.—J. FLETCHER.

#### THE FULVOUS TREE-DUCK IN BRITISH COLUMBIA.

In the *Canadian Naturalist and Geologist*, Vol. VI, 1861, p. 334, there is what must stand as a good record of the fulvous tree-duck in British Columbia. In an article entitled "Recollections of the Swans and Geese of Hudson Bay" Mr. George Barnston says: "Two small species of southwest habitat, the *Dendrocygna autumnalis* and *D. fulva* never come north, as far as I know. It has never been seen the first, but have shot one out of a pair of the latter on the banks of the Columbia above Okanagan. This I daresay is usually its limit to the north, and I believe it has never been seen to the eastward of the great stony ridge. Neither of these elegant little geese ever visit Hudson Bay." This record is of additional interest in view of the recent occurrence of this species in British Columbia as given in the December number of this journal.

Toronto, Ont.

JAMES H. FLEMING.

NOTES ON THE SKELETON OF A WHITE WHALE OR  
BELUGA, RECENTLY DISCOVERED IN PLEIS-  
TOCENE DEPOSITS AT PAKEN-  
HAM, ONTARIO.

By J. F. WHITEAVES.

In August, 1849, portions of the skeleton of a small cetacean were discovered in stratified clay of pleistocene age "on the line of the Rutland & Burlington Railroad in the Township of Charlotte" (Vermont) "about twelve miles south of Burlington, and a little more than one mile eastward of Lake Champlain." These remains were described and figured by the late Professor Zadock Thompson, in the American Journal of Science and Arts for March, 1850, under the provisional name *Delphinus Vermontanus*, which he changed to *Beluga Vermontana*, in 1853, in an Appendix to the "History of Vermont." But it is now quite clear that they belong to the genus *Delphinapterus*, Lacepede, of which *Beluga*, Rafinesque, is a synonym.

More or less complete skeletons of this small whale have since been found in marine deposits of pleistocene age, at Montreal in 1858; at Riviere du Loup (en bas) in 1864 or 1865 (detached bones only); at Cornwall, Ont., in 1870; and on the Jacquet River, N. B., in 1874. By far the most perfect of these is the fine specimen from Cornwall in the museum of the Geological Survey of Canada. It is a nearly perfect skeleton of an adult individual, which, as now mounted, is a little more than twelve feet in length, though a few of the vertebræ are missing. These Canadian specimens, and especially the Cornwall one, have led to the conclusion that Thompson's *Beluga Vermontana* is probably identical, both specifically and generically, with the common White Whale or Beluga (*Delphinapterus leucas*) now so abundant, in a living state, in the lower St. Lawrence and North Atlantic. In his latest list of the fossils of the pleistocene of eastern Canada (Canadian Ice Age, 1893, p. 268) Sir J. W. Dawson says: "there seems no good reason to believe that the *B. Vermontana* of Thompson, from the pleistocene of Vermont, is distinct from *B. catodon*," Gray, which, it may be added, is another well known synonym of



*D. leucas*. Beddard, in his "Book of Whales," published in 1900, says that "both Sir W. Flower and Mr. True concur in allowing but one species of White Whale" (*D. leucas*), and it certainly seems most likely that the names *Delphinus Vermontanus* and *Beluga Vermontana* will have to be added to its already rather lengthy synonymy.

On the 5th of September, 1906, a skeleton, which is obviously that of a very young individual of this same White Whale or Beluga, was found by Mr. Patrick Cannon, while digging a well on his farm, on lot 21 of the 11th concession of Pakenham, Lanark Co., Ont. The Rev. J. R. H. Warren, of the village of Pakenham, informs the writer that this skeleton was embedded in blue clay, fourteen feet below the surface, and that only a portion of it was dug out. In digging the well, he adds, some depth of blue clay was first bored through, then a mixture of clay and shells, in which the skeleton was found, was struck, and the excavation ended in more blue clay. The well has since been incased or lined with stone, and now contains a considerable depth of water, so that it may be somewhat difficult to dig out the remainder of the skeleton.

The bones that have been exhumed so far, from this excavation, with samples of the mixture of clay and shells in which they were found, have been kindly lent to the writer by Mr. Cannon. The former consist of a nearly perfect skull (with only a few of the teeth missing) and one of the tympanic bones, with most of the cervical vertebræ and three of the dorsals with some of their epiphyses. Or, as interpreted more definitely by Mr. L. M. Lambe, of the skull, the left tympanic, the atlas, axis, third, fourth and fifth cervical vertebræ, and the second, third and fourth dorsal, with some of their epiphyses.

Apart from their obvious immaturity, this Pakenham skull, and the vertebræ immediately adjoining thereto, seem to be essentially similar to the corresponding parts of the skeleton of the Beluga from the Cornwall pleistocene, and of that of a recent specimen of the White Whale, from Metis, in the Museum of the Survey.

The discovery of this skeleton at Pakenham is of special

interest, as no remains of Cetacea of the genus *Delphinapterus* had previously been found in the pleistocene deposits of the Ottawa valley.

Samples of the clay, with shells, in which this skeleton was found, contain numerous specimens of *Macoma Balthica* (L.). This little tellinid is the *Venus fragilis* of O. Fabricius (1780); the *Psammobia fusca* of Say (1827), and *Sanguinolaria fusca* of Conrad (1831); and the *Telina Groenlandica* of Beck (1839). It is extremely abundant in the pleistocene sands and clays at many localities in the St. Lawrence and Ottawa valleys. It is also common, living, in very shallow, brackish or salt water in the estuary and Gulf of the St. Lawrence, and elsewhere on the Atlantic coast of Canada. It is said to be the most abundant shell in the clay in which the original type of *Beluga Vermontana* was found in Vermont, the other species found with it being *Mya arenaria*, *Saxicava rugosa*, and *Mytilus edulis*.

Ottawa, Jan. 15th, 1907.

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A friend of mine out hare-shooting on Jan. 28th, about fifteen miles from Montreal found a partridge with its feet and the end of its tail feathers frozen into the ice crust. It was under a thick hawthorn bush (a lot of dead leaves on the bush, but not a sign of a berry or any other food around), and though in a weak condition was able to flap its wings, in fact that was what drew my friend's attention to it. He had kicked at the bush and heard a noise but seeing no hare run out he looked under the leaves and found this bird, which he liberated. It ran a short distance and then flew away. All naturalists are familiar with the fact that partridge often dive into deep snow and sleep there but how often are they known to roost on the ground (or snow) as this bird was doing?

GEO. A. DUNLOP.

Montreal, Jan. 29th, 1907.

## SOME NOTES ON WINTER BIRDS.

By C. W. G. EFRIG.

By our Canadian winter birds are meant certain birds of several different families, which in their coming and going show marked inexplicable anomalies or eccentricities, so to speak. To them belong primarily birds like the pine grosbeak, the Bohemian waxwing, the evening grosbeak, and secondarily birds like the hawk, snowy and Richardson's owls, the Canada jay, and to some extent the redpoll, pine siskin, snowflake and goshawk. These birds are not real migrants, *i. e.*, birds that come and go to and from their breeding places at nearly the same time each season, and in the same general direction and to the same general destination, so that their winter habitat is well known; nor are these Canadian winter birds real permanent residents at their breeding localities. They indulge in, what seems to us to be more or less of an aimless wandering about the country, most of them not going much farther south than our southern boundary, if that far, at all. What induces them to wander over the country in this way, showing up here in numbers one winter and then not coming again for several seasons? Is it the low temperature prevailing in their northern habitat? No, because other seasons, severer than the present one here, they remain in their higher latitudes. That also does away with the idea that some people have, that these birds have a certain premonition of an impending serious winter, a certain vague premonitory-barometric sense, allowing them to diagnose the weather in advance, and escape coming hardships! Is it on account of a failure in their food supply? Although this is undoubtedly a better reason than the first, it does not explain all. They indulge in such wanderings when their food supply is not short in their homes to the north. When the Canada jay came here two winters ago, and went in great numbers as far south as Toronto—a thing that had not occurred for about fifty years—their usual food supply, the kitchens of the lumber camps, the offal from the farm-houses, were there as usual. Neither can it be assumed that when the snowy owls make their phenomenal periodical incursions into southern territory in such vast numbers, that

their usual food supply, *i. e.*, small mammals and birds, have in those seasons been swept off the face of the earth or at least of their habitat—so, what is the reason for their wandering? No one seems to know. Ernest Thompson Seton in one of his books says that the little chickadees on certain days in the year get "crazy" spells, during which they act very queer, as though they had lost their "birdsense." And the same has been observed of other birds, *e. g.*, the capercaillie and the blackcock in Germany, etc. Perhaps some of this queer, eccentric feeling on the part of these birds is responsible for some of their wanderings too!

Neither does the appearance of some of these birds at Ottawa this winter make the matter any clearer. A hawk owl (*Surnia ulula caparoch*) which breeds in Newfoundland, Labrador and the Hudson Bay country, was shot here on Oct. 9 last, and another seen at that time. Mr. Henry the taxidermist had two more. Usually they come later, if at all. At that time it was very mild here.

A very unusual migration of the American goshawk (*Accipiter atricapillus*) took place last October and beginning of November. While a few birds are seen here most winters, they are nearly always in the immature plumage, and rather rare at that, but at this time a regular migration of them took place, mostly composed of adult birds in the finest plumage. That is certainly remarkable. On Oct. 18 a fine large female was shot by a farmer near East Templeton in the act of carrying away a good-sized plymouth rock rooster. On Nov. 3, a boy shot a nice male near the rifle range, which had just put himself on the outside of a ruffed grouse (partridge.) Mr. E. G. White noticed a pair together near Pembroke, one also in the act of devouring a grouse. The taxidermist got several more from this vicinity, and all save one in the finest blue plumage. At Kingston this flight was still more noticeable. Mr. E. Beaupré of that city writes me, that he never saw so many goshawks together as this year, *i. e.*, fall of 1906. There were regular flights of them passing over the city. He saw them almost every day in October, but during the first week in November they were most abundant. He saw seven flying at one time. One he approached quite closely while tearing up a hairy woodpecker.

Another tried to make a meal of a wooden decoy duck. Many were brought to local taxidermists.

The pretty pine grosbeak (*Pinicola enucleator leucurus*) is repeating his performance of three winters ago and is paying us a visit in numbers. They put in an earlier appearance than usual. The first ones were seen Nov. 3rd near the rifle range and on Nov. 5th one was found dead on the Experimental Farm. At the same time and before, they were extremely abundant near Pembroke, and from then until now they have remained with us, right in the city. They frequent the many mountain ash trees upon which they gorge themselves on the berries. They do not, however, eat the pulp so much as the seed. The old males are of a gorgeous rose-red, the female and young are ashy gray, with greenish yellow on the crown and rump; the wings are crossed by a white bar. The females and young greatly predominate in numbers. They are, as a rule, very unsuspecting of man, and allow a very close approach, and this unsuspectingness is often their undoing at the hands of boys, who should be restrained. On Jan. 21st, I noticed a flock of ten on a mountain ash tree near the corner of Bank and Queen sts. Some of these would fly down on the sidewalk and street to eat the fallen berries and would hardly move away for the passers-by. They should be protected, and, if necessary, fed to keep them here. Other articles of food of which they are fond are sumac berries and the buds and tips of twigs of evergreen trees. Broken nuts and suet will attract most birds to the house in winter.

The snowflake (*Plectrophenax nivalis*) also put in an early appearance. The first were seen Oct. 27th on Kettle Island. Great flocks of them were common for several weeks around the city, when they just as suddenly disappeared.

A single specimen of the beautiful Bohemian waxwing or chatterer (*Ampelis garrulus*) found its way into the city on Dec. 2. It took up its stand in a little mountain ash tree on Russell Avenue, right over the sidewalk, and if passers-by became too numerous would shift its headquarters to another tree of the same kind across the street. Here it remained, all alone, save the pesky sparrows, for six days. At first it would almost allow itself to be

touched, later on it became a little shyer. It would utter a soft musical twitter, much like the "beady" song of its congener, the cedarbird.

The snowy owl (*Nyctea nyctea*) seems again to have given Ottawa a wide berth, whereas further south many are reported. I have seen one only, which had been shot about Nov. 15th near Farrelton.

Of the rare great grey owl (*Scotiaptex cinereum*) another inhabitant of the fur countries of the far north, I have seen and heard of four so far this winter, all of which found their way into the hands of Henry the taxidermist.

At the same place I found a specimen of the rare Richardson's owl (*Cryptoglaux tengmalimi richardsoni*) which had been shot here on Nov. 16th.

The beautiful evening grosbeak (*Coccothraustes vespertinus*) has not put in an appearance so far, much as his presence is desired. He is one of the most irregular birds in his movements. He may come at any time in winter, beginning or end, and stay for a day or a month at a place, and then not be seen there again for years, or perhaps come for several years in succession.

Neither has the comical Canada jay (*Perisoreus canadensis*), the clown amongst our northern birds, deigned us worthy of his visit this winter. Instead he prefers to steal meat from the shantykitchens in our northern words. Redpolls (*Acanthis linaria*) and pine siskins (*Pinus spinus*) may be seen in favorable localities all winter. They come and go without pretense to any regularity.

Who can solve the riddle of the coming and going of these birds?

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#### THIS YEAR'S AWARD OF THE LYELL MEDAL.

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The many friends of Dr. J. F. Whiteaves, palæontologist and zoologist to the Geological Survey of Canada and one of its assistant directors, will be pleased to learn that he has been awarded the "Lyell Medal" by the Geological Society of London. The presentation of this medal is made at a most appropriate time, as Dr. Whiteaves has just completed the fiftieth year of his scientific work.

Born at Oxford, England, in 1835 his first paper, entitled "On the Land and Fresh-water Mollusca inhabiting the neighbourhood of Oxford" appeared in 1857 in the Proceedings of the Ashmolean Society, and was followed by others, printed in a number of scientific journals, on palæontological and zoological subjects, whilst yet in England.

Dr. Whiteaves visited Canada for the first time in 1861; returning to this country in 1862 he resided in Montreal and in the following year was appointed recording secretary of the Natural History Society of Montreal and curator of its Museum, in which position he remained for twelve years, publishing during this interval valuable palæontological papers, as well as reports on the results of deep-sea dredging operations conducted by him in the Gulf of St. Lawrence.

In 1875 Dr. Whiteaves first became connected with the Geological Survey, and in the following year succeeded the late Mr. E. Billings as Palæontologist to the Survey. With the acceptance of this position Dr. Whiteaves had opened to him an enlarged field for work of which he has taken full advantage as his long list of papers and official reports published during the last thirty-two years fully testifies. His reports, both palæontological and zoological, have gained for him a world-wide reputation and have placed him in the front rank of eminent men of science whilst they have brought Canada more than ever forward in the scientific world. His writings are noted for their accuracy and for the succinct and terse language used in all descriptions. His recently issued Part IV of Volume III of "Palæozoic Fossils" reveals a descriptive power perhaps surpassing that of any of his previous publications, an augury it is hoped of many more years of industry and zealous work to be performed, work rendered increasingly valuable with the accumulation of data and a rich, ever widening experience.

Sir William Dawson and Professor Frank Adams the only other recipients of the "Lyell Medal" in this country. Professor John Morris was the first to receive it in 1876 and in the list of awards of later dates are the names of Dr. Joseph Leidy, Professor Henry A. Nicholson, Professor Rupert Jones, Dr. A.

Smith Woodward and more than a score of other distinguished geologists and palæontologists who have been similarly honoured.

We extend to Dr. Whiteaves our hearty and sincere congratulations on having received this well-merited recognition of the value of his scientific work from such a high source as the governing body of the Geological Society of London as a "mark of honorary distinction" under the consideration that he has "deserved well of the Science."

L. M. L.

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SOIRÉES.

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The opening soirée of the Ottawa Field Naturalists' Club, held on the evening of December 6th in the Assembly Hall of the Normal School could hardly have been more successful. The attendance was large and the programme one of the best ever provided by the Club.

The president, Mr. W. J. Wilson, presented an able paper dealing with the aims of the Club, the nature and scope of its work, and the advantages afforded to its members. His address was printed in the last issue of the NATURALIST.

Dr. Jas. Fletcher read a paper prepared by Dr. J. Chester Bradley of the University of California on "An Entomological Excursion to the Selkirk Mountains." Illustrating the paper was an exceptionally fine set of lantern slides. The views differed from the ordinary photograph taken by tourists; for besides bringing out scenic effects such as the characteristic skyline of the Selkirks, their glaciers, waterfalls, rivers and lakes, they show in the foreground features of especial interest to the naturalist. These included the characteristic plants of the different zones, from the lower valleys with their gigantic trees and dense undergrowth to the stunted firs of the tree limit and the alpine meadows of the higher slopes. There were some particularly fine views of these meadows showing their great extent and the remarkable size and profusion of the flowers. Dr. Fletcher made the views doubly interesting by observations and incidents drawn from his own experience in the Selkirks.



Rev. C. G. Eifrig gave a practical demonstration about the study of birds, using colour as a means of identification suitable for beginners. Mr. Eifrig made use of mounted specimens, a field glass, and popular books on birds as a person might actually do in the field. He drew attention to the number of illustrated books which make the study of birds more interesting and much easier than it was some years ago, and referred to Ottawa as a city particularly favored by the birds. Among the books recommended by Rev. Mr. Eifrig were :

Bird Life, by Chapman; Bird Neighbors, by Blanchan; Birds of Ontario, by McIlwraith; Bird Guide, by Reed.

As is customary at the opening soirée there were exhibits of specimens illustrating the branches of natural history in which the Club's members are specially interested. A fine collection of living turtles, a young alligator and several batrachians exhibited by Mr. Andrew Halkett attracted much attention. Mr. Eifrig had brought from his private museum many sheets of beautifully prepared botanical specimens and birds; Mr. W. T. Macoun exhibited specimens of plants and Messrs. Fletcher, Gibson, Young and Baldwin insects of great beauty and variety. Geology was represented by fossils and specimens of ore from Cobalt shown by Messrs. Ami and Collins. A very fine series of colored plates of Canadian weeds and the seeds of these plants in bottles were exhibited by Mr. Miller and a collection of photographs of scenery on the Lièvre by M. Lemieux.

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SUB-EXCURSION TO THE BEAVER MEADOW, HULL,  
FEBRUARY 2ND, 1907.

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It has not in the past been customary for the Ottawa Field Naturalists' Club to hold winter excursions, but this year it was thought best to give them a trial and the first one, which took place on Saturday, February 2nd, proved quite a success, although the number which attended was not large, doubtless owing to the threatening state of the weather, the day being very mild and promising rain. The party met at the toll-gate on the Aylmer Road at 3 o'clock, and the route taken was up the Beaver Meadow

and back through the woods. To a naturalist there are many things of interest to be found in the woods in winter, and many objects attracted the attention of the party. The leaves being off the trees in winter, the birds' nests are more easily found now than they are in the summer, and may be taken without compunction, although some young ladies who were passing made the remark that it was "a shame to rob the poor birds' nests," thinking, perhaps, as we are afraid too many do, that the birds use the same nest two years in succession. It is true that some birds do this, but very few of those which are seen about Ottawa. Nests of what were taken to be the least flycatcher, Maryland yellow throat, and one of the vireos were among those seen. A few chickadees were the only birds observed during the afternoon. The beauty and usefulness of the climbing bitter-sweet—*Celastrus scandens*—was impressed on the members of the club by the fine appearance of the scarlet berries which were seen in great abundance and still in good condition. This is one of the best climbers to plant about a house, as the foliage is seldom injured by insects during the summer, and is of an attractive shade of green and the highly colored fruit, which remains on the plants all winter, makes the home look quite cheerful. The red, white and black ash were all observed among many other trees, these three being easily distinguished by the color of the wood and the buds. An apple tree was found growing wild among the forest trees. Chance apple seedlings are not so common in this part of Ontario as they are further south and west.

The eggs of the tent caterpillar were found on the choke cherry, a favorite food of this insect. The finding of these eggs there and elsewhere this winter shows that the tent caterpillar is again on the increase.

After a very enjoyable outing, which was a welcome change to those who have to be in offices all week, the party reached Hull about 5.30 p.m.

W. T. M.

## NATURE STUDY, No. XLI.

## MANUAL TRAINING II. THE MACHINIST'S ART.

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Perhaps the most interesting of all trades or mechanical arts, as some prefer the term, is that of the machinist.

There is a fascination about the cutting and shaping of iron, steel and brass that is irresistible. The stubborn nature of the materials, the permanence of the product, the accuracy and effort called forth and above all the perfection and adaptability of the machines and tools required, all provide elements for the perpetual joy of the worker.

Take for example the modern turning lathe. It is the embodiment of concrete mathematics. It can add, subtract, multiply and divide with unalterable accuracy. It can duplicate angles to the smallest fraction of a degree and can turn work to less than the thousandth part of an inch. The turning lathe has been called the King of Tools. It is the great central figure of our mechanical development. Without it, that greatest of all human productions, that potent civilizer, that real missionary, the steam-engine, were impossible. The triumph of steam is the locomotive, which has solved more problems and brought more blessings than all the philosophies, all the inventions and perhaps all the religions of the preceding ages.

The steam-engine was the stimulus of the 19th century and the most potent physical factor of the Victorian era. Under its broadening influence art, science and literature blossomed and bore good fruit and man outgrew the narrow confines of tribe and nation, grasped his far off brother by the hand and promises in the near future to become a citizen of the world.

Let us now consider briefly how an amateur would set about the production of a steam-engine.

First there is to be chosen the type, which may be stationary, marine or locomotive, simple or compound, trunk, reciprocating or turbine. Next comes the general design, which shows the engine in its finished state with its description and dimensions. Then each separate part must have a drawing in detail, giving accurate measurements of each, with directions regarding material and fin-

ish, so that when the individual parts are finished they will fit accurately together and form one harmonious whole. When these drawings are completed, patterns must be made for the parts to be cast in iron or brass.

In making the patterns the amateur must have some knowledge of the moulder's trade in order to make the proper allowance for drawing the patterns out of the sand, for the contraction of the metals in cooling and for coring the hollow parts. The shapes of hollow parts cannot be made in ordinary sand, which would not stand up; but core boxes must be constructed in which are made the hard baked sand cores which are knocked out of the holes after the casting is done. The steel forgings are made directly from the drawings and do not as a rule call for patterns. To do this the amateur must be somewhat of a blacksmith.

After the castings and forgings, comes the machining of the parts, which falls to the lathe, sharper, or drill, as required. In addition to this there is a certain amount of bench work such as scraping, filing, tapping for screws and general fitting. It will be seen that in these manipulations the amateur has been in part a draughtsman, pattern-maker, moulder, blacksmith and machinist, and if he complete the engine and run it he will learn some of the duties of a fireman and an engineer. He will have acquired an increased respect for each of these arts and for the men who practice them well.

One of the chief benefits of the mechanical hobby to the individual is the training of the faculty of accuracy.

To work to definite measurements, to be able to perceive the relations of things in the material world, is just that kind of education which this age and in fact all preceding ages have lacked.

The perception of relations between things in the concrete is the only basis on which to train the mind to compare ideas in the abstract. The lack of this basis is responsible for much of the loose thinking of the present day.

If our truly heroic efforts in the line of education are to have any real results, we must begin upon a sound basis, and we may well rejoice at the adoption of manual training in our schools, for that is the very element best fitted to bring about the desired result.

I have often been struck, in many conversations with machinists and engineers of the better class, by their terse and pointed methods of reasoning. If upon such a basis there could be erected the superstructure of a liberal education, the results should be ideal. Manual training should furnish this basis and go beyond it by awakening the incentive towards the getting of further knowledge.

To awaken this incentive is the highest fruit of an educational system, for in the last analysis we find that each individual must educate himself and herself or forever remain a mere repository of useless knowledge.

The old methods of education were merely encyclopedic. The new method should make of each fact a living and working truth.

#### ARTISTIC AND SCIENTIFIC HOBBIES.

As an example of an artistic hobby, Amateur Photography stands out pre-eminently. It has many valid claims to our attention. It develops the artistic sense, trains the judgment, acquaints one with some of the laws of chemistry and optics and above all brings its votaries into close communion with the beauties of nature. It has an amusing side, I was almost going to say a pathetic side, as well. The considerations of light, time and position, as well as the often totally irresponsible action of developers and other items, keeps one continually interested and incidentally adds to one's knowledge in many directions.

It most certainly offers continual exercise in training one's patience and self control; but who will say, who has conquered the A,B,C, and obtained a few successes, that the result is not worth the trouble. Like all really valuable hobbies, it is difficult to attain proficiency therein, and there are ever widening and alluring fields opening up ahead.

My first camera, back about 1887, was a black box with a pin-hole through a piece of ferrotype plate stuck in the front. This did for a few weeks. Then I read up the article on Photography in an encyclopedia and made a sliding box camera with an old opera glass lens. Its productions in the architectural line were more wonderful than the leaning tower of Pisa.

Then a real lens costing about \$3.50 was purchased and a more ambitious attempt was made—bellows, shutter and all.

In the three years following 1887 I made six cameras of varying efficiency. Then I bought a No. 5 folding Kodak for films but soon gave up films and took to plates again. At present I use a 4 x 5 Premo. B., for plates, which serves my very ordinary attainments and requirements in this line very well. One contracts the habit of having a camera at hand, especially on the water or in camp, and does not feel fully equipped without it. It adds not a little to the pleasure of living to have these pictorial records, to say nothing of their value in substantiating our stories of what we catch and shoot.

Regarding scientific hobbies I shall be brief.

Previous to that time when governments recognized the true value of purely scientific work, nearly all investigation was carried on along the lines of the hobby.

Astronomy, microscopy, scientific farming, histology and many other lines of investigation were developed in the spare time of earnest men who either could afford the leisure or earned their bread by other means. It was long before the world learned that purely scientific research had any commercial value.

Even now, amongst the ignorant can be heard sneers at the men of theory and not a few farmers laugh at scientific farming—as a scythe might have one day laughed at a reaping machine.

To-day, however, things of this nature are getting on to a different plane—we have government astronomers, government histologists, geologists, botanists, entomologists, horticulturists, a fish commissioner and a host of others. In our Geological Survey and our Experimental Farms we have the spirit of the hobby made flesh; and not only do we derive certain theoretical benefits from the same, but the advantages can be measured in those big round dollars which to so many people represent the standard of utility.

Were it possible to unscrew the skull cap of any of these men in the Geological Survey or on the Experimental Farms there would be found a live healthy hobby, a hobby in the real sense of work for work's sake:—an altruistic hobby, for they work early and late, and their contributions to the welfare of the nation are large, out of all proportion to the reward which they receive for their services.

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