to lose their certificates if guilty of carelessness; and the fact of their proper education will equally lessen the liability to error.

Art. V.—On the Golden Eyes, or Garrots in Nova Scotia.

By J. Bernard Gilpin, A. B., M. D., M. R. C. S.

(Read March 11, 1878.)

Sub-genus Bucephala, Baird.

Bucephala	clangula,	*Coues.*
Bucephala	americana,	*Baird.*
Anas	clangula,	*Linn.*
Fuligula	clangula,	*Bon.*
Clangula	vulgaris,	*Richardson.*

The Common Golden Eye.

Bucephala	islandicus,	*Baird.*
Anas	islandicus,	*Gmelin.*
Clangula	barovii,	*Richardson.*

Barrow's Golden Eye.

Bucephala	albeola,	*Baird.*
Anas	albeola,	*Linn.*
Fuligula	albeola,	*Richardson.*

Spirit Duck.

Thus we find that the genus Anas, formed by Linnæus to include these species, has been since sub-divided into Fuligula, Clangula, and Bucephala, and that the specific Clangula, also given to the common Golden Eye by Linnæus, has been justly restored to it by Coues, though disallowed by Richardson and Baird. In the Barrow's Golden Eye, Baird has justly restored Gmelin's first specific Islandicus, though Richardson had named it after his friend, the Secretary of the Admiralty.

There are many circumstances making Digby Basin a chosen resort during fall and winter, for many species of migratory sea birds. Its easy access from the rough tides of the Bay of Fundy, its sheltered basins and broad wide flats, with their shallows teeming with life, and scantily covered by a warm brackish tide of mixed river and ocean water. Flying before the heavy south-westers, numerous sea birds find themselves swept up the Bay of Fundy, and then almost imperceptibly swept through the nar-

row Digby Gut into warm, peaceful and teeming waters. The numerous and discordant family of gulls are the first to arrive, which they do in September, they and their new fledged young. The passenger in the passing steamer hearing their wild cries, looks towards Bear Island or Goat Island, and seeing the sand whitened for many a yard, scarce knows whether it be surf or birds. Towards the middle of November, the sea coots, as they are locally and collectively called, come flying in, in parties between four or five to ten or fifteen. These are the scoters (Oidemia americana. Swaim). The velvet duck or white wing (Melanetta, velvetina. Cassim), and the surf duck (Pelionetta, perspocillata. Linn). These usually in small separate flocks, spread themselves along the shore diligently diving, though, when pressed by heavy weather, they seek a lee shore in large flocks of all species. In these birds, as well as in all which frequent our coasts, the number of adult plumaged males are as about one to four or five of female and immature ones. Coming sea-ward, also arrives about the same time the old wife, or old squaw (Harelda glacialis, Linn), and remains the winter. Whilst the sea is thus furnishing its peculiarly oceanic birds, our inland lakes, still waters and runs or rapids, as their waters are swelled by the autumnal rains and over-flow, their feeding grounds, or are coated in ice, are contributing also to this mutual feeding ground. In November, the garrots appear in the basin, two species, (Bucephala, Americana and B. islandica. Bon and Gmelin). These, though loving the fresh water best, resemble, in their short neck, robust shape, and leg placed far backward, the oceanic families, and seem much at home on their new fishing grounds. With them comes another species of this sub-genus, the buffle-head or spirit duck, (Bucephala albeola, Linn), and the scaups, two species, identical except in size, (Fulix affinis, Foster and F. marila, Linn), the latter less pelagic in figure, yet still alert divers. The wood duck, (Aix sponsa, Linn), never leaves his inland waters, but lingers around the open runs the whole winter. Not so the black duck (Anas obscura, Linn). This type of the fresh water ducks, with its slender bill, long neck, and legs placed well forward, fitted for the land, and to feed floating on shallow waters

with its long neck and head at bottom, a vegetarian, loving succulent winter grasses, and even berries, to feed upon which it must land upon the barrens—is the last to arrive. Reluctantly he quits his solitary lakes, retreating from the ice to the estuaries or tide mouths of the streams, driven from them by the frost, he seeks the basin and even the wild Bay. Not being an adroit diver like his congeners, mid-winter finds him creeping over the slippery rock at ebb-tide, perchance to feed upon the soft sea weeds, oftener to pick off the small mollusks adhering in such quantities upon our sea rocks. At flood tide, waiting for the ebb to bare his hunting ground, we even find him burrowing in the snow for warmth. The crop, a few months ago swelled with blue-berries, is now filled with shell fish. The luxurious floater and dreamer in the summer lakes, bivouacs with the furred hare and feathered grouse in the snow. His strong, non-migratory instincts do thus alter his food and habits to a degree that is almost incredible save to an eye witness; one would suppose too he should be made the peculiar study by those who support the views of natural selection origin of species, as in the contest of life, few birds are exposed to such repeated and violent changes of habit and food. The practical naturalist, however, finds no difference, saving a more robust form in those who pluck frozen mollusks from snow-covered rocks, and the busy fruit eaters in the soft September sun, on the blue-berry barren.*

From this pack of migratory sea birds meeting here on mutual ground, those from the cold north finding in the shallow sun warmed waters of the basin a genial retreat, others equally adapted to fresh or salt, finding comfortable quarters, and others again pure fresh water fowls a chilly tarrying-place, I have selected, a very restricted sub-genus of three species for this paper. These three species, the two species of Golden eyes or Garrots,

---

*On submitting two hundred and twenty-seven specimens of Mollusks taken from the crops of Blue Wings, Garrots and Scaups, shot during the winter 1876, Digby, N. S., to my friend, J. Matthew Jones, he gave me the following list:

Littorina	palliata, Gd.	221 adult & young.
L.	tenebrosa, Gd.	2 young.
Purpura	capillus, Linn.	3 young.
Lucuna	vincta, Gd.	1

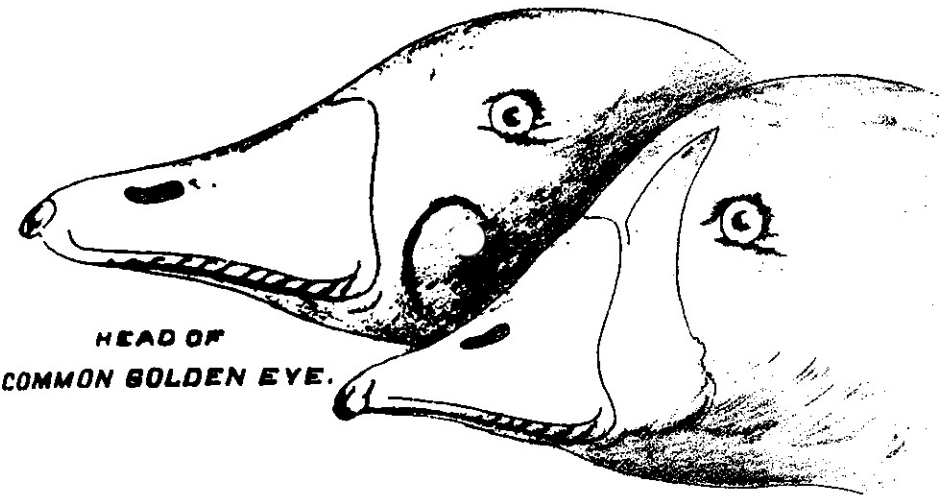
known locally as Whistlers, and the Spirit duck or Buffle-head, locally Dippers, have been formed into the sub-genus Bucephala, by Dr. Baird, in his catalogue of the Birds in the Smithsonian Institute. In this sub-genus the males have all tumid head crests, and parti-colored plumage. The females ashy-brown—tails of sixteen feathers, robust necks, round bodies, legs far behind, seek their food by diving, escape from enemies by diving rather than flying—can, from backward position of leg scarce walk, but with wings and tail stretched, and webbed feet, obliquely striking the sand with awkward splash, and in a semi-erect position drag themselves a short distance along. They are frequently seen sleeping upon the rocks, and oftener perhaps upon the water. They arrive from the fresh-water lakes during November, probably the rise in the waters of the lakes as well as the early ice driving them out, and are seen spreading themselves about sixty yards apart along the shore and diligently diving for food. In February or the last of it, other thoughts than food steal over them. The warm February sun often finds the male with tumid head dress, drooping neck and tail erect swimming in short circles, about two or three females seemingly avoiding his advances. In March this powerful instinct begins to send them to the far north for reproduction. The last of April or beginning of May finds a few loiterers about the deserted shores. Such are the habits of this sub-genus about the Digby Basin, and no doubt in many bays and coves of Nova Scotia. In studying the Golden-eyes, I soon found there were two varieties if not two species amongst them, and that though they frequently kept together, yet very often each kind kept by itself, that the males were easily distinguished, but the females and young birds were very hard to separate, and that some of the immature males and females of each variety had parti-coloured (yellow and black) bills, whilst all the adult males and many females had dark-blue bills, the number of yellow bills being very few comparatively. I found that the Rocky mountain Golden eye, though described by Gmelin, according to Dr. Baird, but usually known by Dr. Richardson's description as an inhabitant of the arctic regions, and by Nuttal, said to be found in the Rocky mountains only,

was by no means rare amongst us. In this paper I shall make as minute a comparison as I am able between the males and females of each species, and hope by showing some anatomical differences heretofore not observed by naturalists, to prove that they are two distinct species, for though Richardson distinctly asserts it, yet the last writer upon American birds, Dr. Elliott Coues, leaves the question an open one.

THE COMMON GOLDEN EYE.

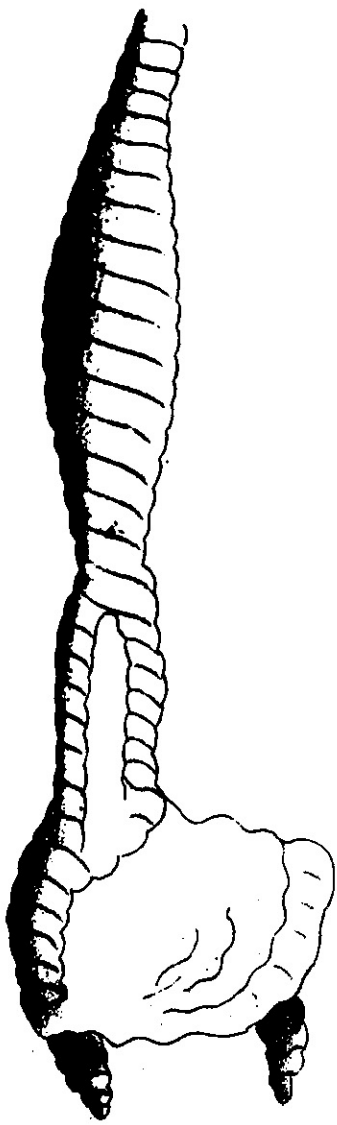
This description is taken from a mounted specimen in the Provincial Museum, Halifax. The whole head and about ten inches of the neck is black with duck green reflections, the green being more seen upon the cheeks. The rest of the neck to the shoulders, the breast, belly and beneath is white. There is an irregular round white spot at the corner of bill, reaching upward towards the eye. The back, shoulders and rump are jet black, the tail more brownish black. On looking at the bird from the back, two white axillary stripes commencing from the white collar, back of the neck, run down the back for about five inches, being very narrow and ending in a point. A second white patch joining the first narrow stripe on its upper position, runs down over the wing coverts about two inches broad and five inches long, ending in the white speculum on the wing. Thus the back may be said to be black with four distinct stripes or patches of white upon it. The long flank feathers covering the wings, and the spaces about the thighs are brownish with long black spots. The bill is black, a slight horn blue wash over it, nostril large, nearer the tip a round nail upon the tip, and decided hook. The irides are golden yellow. The feet and legs are orange, the webs black, nails black. There are on the inside black pencillings, running up to joint of tibia. and the hind toe is orange upon the outside, the inside black with orange edges. In form the head is large, forehead moderately high, figure round, neck robust, wing shortish, and tail long for a duck, plumage of head rather tumid than long. Those dimensions I take from Richardson:

Total length 22 inchs., 6 lines. Length of tarsus 1.6½.
of tail 4 " 6 "
of wing 9 "
of bill above 1 " 6½ "

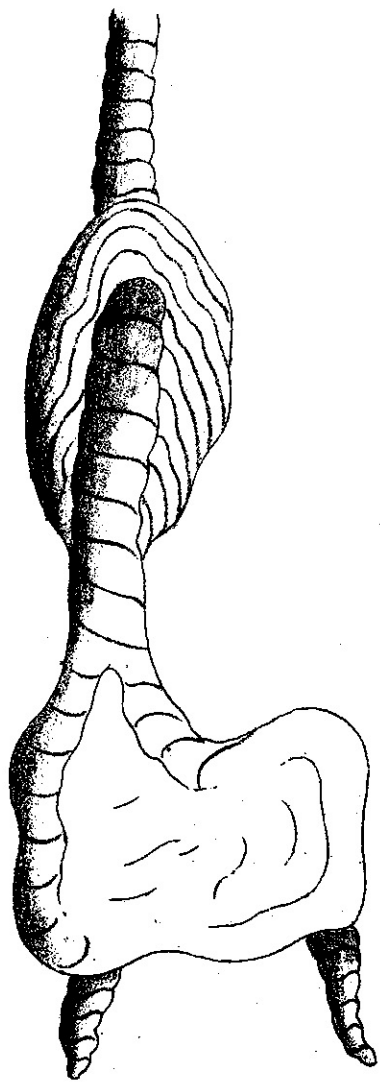


HEAD OF
COMMON GOLDEN EYE.

HEAD OF BURROWS G.EYE



WIND PIPE OF BURROWS G.EYE.



WIND PIPE OF COMMON G.EYE.

Maritime Steam Lith Co. St. John N.B.

A female common Golden Eye, shot at Digby, March, 1876, measured:

Total length.....1 ft. 4 inch.
Length of bill.....1 ft. 8-10 "
Height of bill..... 9-10 "

I considered this to be a female of the common species, because its bill was longer and forehead lower actually than other females of larger dimensions. Colour of head, cheeks and nape, dark, umber brown, with a yellowish wash on forehead, a narrow greyish white ring about the neck, followed by a French grey collar, with whitish pencillings two inches broad. Below the breast, belly, and beneath tail, pure white; the sides of belly however, marked with black and grey pencillings, and an interrupted line of black through the vent. On the back this obscure French grey collar spread itself down the shoulders and back, insensibly joining with the sooty black of back and tail. As each feather was lighter on its edge than middle, it gave the idea of scales. Primaries black, secondaries white, two or three posterior ones with a black spot on inner veins. In the folded wing, a few of the greater coverts being white, and uniting with the speculum, make a good sized white patch upon the wing. In this specimen there was no interrupted line of white and grey upon the shoulders, as there is in many. On the inside of the wing the primaries, secondaries and tertiaries were slate blue, the other parts were darker, nearly black. The bill was longer and lower than in other specimens; it was blue-black with the slightest brownish yellow upon culmen and tip of lower mandible. The legs and feet pale orange; the webs black, a black line running up the back of the leg to tibia; hind toe, outside yellow, inside black with yellow edge. The irides were golden yellow. In figure this specimen was tumid head, short neck and very round body, short wings and long tail. I have given the exact colour of this specimen, which being shot in March may be considered a good type, but in looking carefully over a series, I found they varied only in intensity of colour; the most having an irregular patch of black and whitish grey upon shoulders. The dark umber of the head sometimes approaches black and

again black with green reflections. Of the colour of the bills, some being black and others having yellow patches upon them, as I have found the same in the next species also, I will refer to it more fully after I have described them.

THE ROCKY MOUNTAIN, OR BARROW'S GOLDEN EYE.

This description is taken from a male in full plumage, shot January, 1876, Digby Basin:

Total length 1 ft. 8 in.,—length of bill 1 8-10 in. } dried
height, 1 inch, } specimen.

colour head and neck for about two inches, dark with purple reflections on the crest and forehead, duck green upon cheeks; a triangular spot beginning a little below the corner of the mouth rises above the culmen of the bill ¾ of an inch, the outside edge for two-thirds lining the bill. This triangle is white. The neck, upper shoulder, breast and belly white. The long flank feathers with long black spots, and a black band crossing the belly at vent. The back and tail black. The axillaries on their upper part have a few white feathers that make an interrupted line. The greater wing coverts have a patch two inches long and half inch wide white, and the secondaries forming the speculum with a few of the greater wing coverts make another white stripe. The inside of the tail slate, inside wings slatish, other parts black. The irides golden yellow, bill black, nostril large nearer the tip, a decided nail and hook, the bill narrowing at point, where the feathers meet the culmen subcircular. The feet and legs yellow orange, webs and nails black, hind toe orange outside, inside black with yellow edging. Black pencilling running inside of leg to joint. The form of this specimen was robust, head tumid with occipital crest, neck short and body very round. Female Rocky Mountain Golden-eye. This description is taken from one shot with a drake of the same species, on the 15th February, and therefore in good plumage. It may be considered the type of a female in nuptial plumage—

Total length 1 ft. 6 inches; breadth 2 ft. 2 in.; length of bill 1½ inch.

The folded wing reached to sixth feather of tail, and the feet to nearly the end of tail. Colour dark umber brown with a

slightly yellowish wash on head and cheeks, a small ashy white ring about neck, then a French grey collar with white pencilling about two inches broad. Below this the breast, belly, and beneath tail pure white, with the sides of the belly having black and grey pencilling, and an interrupted line of black crossing the vent. These pencillings were darker about and behind the thighs. On the back, the French grey collar spread itself over the shoulders and back, insensibly joining with the sooty black of back, rump, and tail. Each feather having a lighter edge than middle, it gave one the idea of scales. The primaries were black, but the secondaries and speculum white, a few black spots on the last of them making the white bar obscure, a little above the speculum, an interrupted bar of white, black and grey upon wing coverts one-half inch wide and two and one-half ins. long. Indsie of wing primaries, secondaries and tertiaries plumbous, other parts dark, irides golden yellow, bill yellow, with black nail, margins and tips of lower mandible black, upper mandible with a few black markings on front and sides. Feet as bright orange as in the male, and marked the same—toes and webs black, hind toe black inside with yellow edging, outside yellow, black line inside leg. This is an exact description, but in looking over a series I find they differ in darker or lighter plumage; the umber brown of the head running in some into black, and black with green reflections.

In studying the specimens of both species, both male and female, I found that whilst the males of both species had black bills, the females and immature birds had many specimens with yellow and black bills. In these cases the nail and the margins of both bills were invariably black, whilst in some cases the yellow covered nearly the whole of the bill, at other times only below the nostrils, and again with scarce a trace upon the culmen. There were females of both species with all black bills and some young males of the common golden eye with yellow bills. I have no doubt that the Rocky mountain young males would also be found with yellow bills, but I have no specimens. From the very few yellow bills in comparison with the dark ones found, we are led to conclude that the yellow is only as it were

a transient mark of the young, and that the adults of both species have dark bills: that the young should have gaudier bills than the adults, or the female than the male, is almost unknown in natural science. Here then we have two species, in the male easily distinguished by colour, but in the female by colour impossible, and our only guide is that the Rocky Mountain bird, though larger, has a shorter and higher bill, and in consequence of this height a difference in the shape of the forehead, where the feathers meet the culmen, tolerably well enough shown in the male adults, but more obscurely in the female and young—all being in the recent state, and in the dried or mounted specimens scarcely discernible. Dr. Coues, the last American writer upon the subject, says: "Female doubtfully distinguished from that of clangula (common golden eye) with certainty, unless by the dark bar in wing," and again, "doubtfully distinct from the last, from which I am not prepared to unite it," Coues, 290 Key, N. A. birds. In searching further for some typical mark of distinction, I was led to the anatomy of the birds, but whilst finding little or nothing in the parts of reproduction, the ovaries and testes, I unexpectedly found in the male birds so great a difference in the shape of the windpipes as at once to mark a different species. This difference is much more easily seen than described, as is readily shown in the plate. In the male common golden eye, the wind-pipe soon after leaving the throat and before it enters the breast, has a very sudden enlargement, almost as it were a broad hoop thrown obliquely around its stem, on the inside this leaves large circular pouches on the posterior surface before the restriction of the pipe takes place again. In the Rocky Mountain species, the wind-pipe simply and gradually enlarges itself, becoming restricted again before it enters the breast. In one the enlargement is suddenly from 2-8 of an inch to an inch and an 1-8, while in the other from 2-8 to 5-8 inch, and that with no protuberances. In the males alone of both species there is, after the wind-pipe has entered the breast, that very complicated subquadrangular knob, from which the bifurcation of the pipe proceeds. This form is common in a modified degree to other species. According to our present ideas of species, this great

divergency in form of wind-pipe, existing in the males though lost in the female, must mark them as two different species, although in the males a little more or less white on head and back, a little purple reflection in one, and a higher base of bill and forehead marks the only difference, and in the females as regards colour no difference can be found. The tails, wings and feet of both, in the most minute examination, affording no differential types.

THE SPIRIT, OR BUFFLE-HEAD DUCK.

Description of male in Provincial Museum, Halifax,—colour, head and part of neck, duck-green with purple reflections; a broad white bar beginning behind the eye, spreads out to the back of the head. The breast, belly, the rest of the neck and under parts white. The back velvet black, the primaries black with brownish wash; the tail and tail coverts brown with a slate wash. The under tail coverts white, with some slaty pencilling about the anus and legs. On the shoulders, the outside axillaries, the shoulder and the wing coverts make one continuous white patch. In the female, also in the museum, the head, neck, back are dark brown, the primaries and tail rather lighter. There is an obscure white patch upon the cheeks. The throat, the sides of the breast and flanks shaded brownish white. Beneath white, but brownish beneath tail. The greater wing coverts with part of secondaries, make a small interrupted white bar. The tail in both sexes is long and graduated, the male much the longer, the bills bluish-black and legs yellowish. So far from a mounted specimen; but from Sir John Richardson we find, that the length of the male is about sixteen inches, and of the wing 6 inches and 8 lines, and the length of the female 14½ inches, and that in the male, of the secondaries, five or six have their outer edges white, things that we could not get from the mounted specimens. This bright and active little duck, with its tumid and brilliant head in the male, and very plump form, leaves our inland lakes to which it has arrived during the fall from its Arctic breeding grounds, in November for the sea coves and sheltered bays. He remains with us all winter —leaving us in April. He is a diligent diver, and in hard cold

days may be seen spread along the shore in pairs, or threes, or single. If the weather is warm he keeps further off shore, but a storm will drive him far away to windward seeking a lee, where huddled together with Garrots, sometimes even with Heralds, whole flocks may be seen nestling almost in contact with the coarse beach grasses which line the salt lagoons of the coast, or again bravely keeping the open sea, head to windward, and couched into his back and tail turned up—the living model of a fishing pink.

I have chosen these two species for a paper, because in the first place they differ from all other annatide that I know, in having the bills in the female decorated with brighter colours than those of the male. The females, and in one instance at least the young males of the common Golden eye having lemon yellow upon the bills, whilst the males of both species have black bills. This yellow sometimes extends to the nostrils, but usually shows as a ring about the tips of both mandibles, the tips themselves being black; at the same time the far greater number of females and immature birds have black bills. Thus from the many specimens I have studied, I can only conclude that the yellow is common to the females of both species, that three specimens at least of young common Golden eye had it, and that it is transient, and in the old females passes into black. The fact that those markings are not very pronounced, and that in a series of bills the yellow will pass from bright edge to a tranfused yellow wash, sometimes pervading the nostrils, sometimes not, and that sometimes it fades out after a few days, on the dead bird, are sufficient to form this conclusion. But the fact of the female being higher ornamented than the male as regards bills is almost a solitary fact. As in other species this coloured bill may be brighter during the nuptial season, and fade darker at other times, and altogether in old age.

Another reason for choosing these species for a paper is the addition of Barrow's Golden eye for the first time to the fauna of Nova Scotia. There is one specimen in the Museum of Halifax of a male Barrow, mounted some twenty-five years ago, and with no history or date attached, but with that excep-

tion it is only within a few years that they have been found in some numbers wintering in Digby Basin. Mr. Boardman records them as occurring at St. Stephen's, New Brunswick. Coues, (Birds of the North-west, 1874), acknowledging it a true species, notes its occurring at New York, and Merriman (Birds of Connecticut, 1877), at Long Island Sound and Cape Cod, 1867 and 1871. Thus a bird first described one hundred years ago, then lost sight of till Richardson described and figured it as a new species, ignored by Audubon and subsequent writers, is at last restored to its original name and discoverer, Gmelin. It must be that for some reason unacountable to us, it is extending its migrations, and appearing where it never was before, into regions from which the Labrador duck (C. Labradorius) is disappearing in our own times, for like unaccountable reasons.

Amongst writers of the present day, the term "mimicry" is often used, that is, that in some cases certain bright colours, are given in nature to attract the different sexes or repel them, or neutral ones to avoid the notice of enemies, and by the word used it is insinuated that the possessors of these colours have an instinctive knowledge of them, even though the principle is pushed so far as insects and plants. Now in studying these two species we find two co-ordinate species, each carrying out its individual life and condition, without any assistance of colour. Though naturalists have scarce yet acknowledged the differences in the males, the females are still without a distinguishing mark in science, and which can only be discovered by a still further, long and exact study; yet we find both species living together, and under exactly the same circumstances, and yet preserving their separate conditions. To enumerate opposite facts is perhaps the best argument to oppose the laying down of such general principles, which owe their existence to the brilliancy of their authors rather than objective reasons. Similar cases can be brought from our small plover and stints and sand-peeps, where the smallest web perhaps ½ inch wide, is all that distinguishes species. It has boldly been said that there is no man of science at the present, but believes in evolution or development. A theory whose practical proofs, when you ask for them, its authors tell

you are lost in the immense lapse of time, that it has taken by the gradual, slow and all but imperceptible changes, from vegetable life to animal life of the present day. Years by the tens of thousands or hundreds of thousands having swallowed all links in the great chain. But when you look at their proofs, we find them all drawn from modern life and variations of so short a period as ten or fifteen years. The many variations of pigeons developed by breeders from one species, the blue rock or common pigeon; the infinite variety of dogs of most opposite forms from one species, bull-dogs, hounds, collies with no tails, or grey hounds with long ones, thus developing in one a bony variation of numerous vertebræ, the bones being always considered more typical than colour, or the soft parts; the wonderful variations in cattle and horses produced by man, are also cited. But there can be no analogies between variations of three or four generations watched over most carefully, continually sliding back if not prevented into old forms, (as witness the long horn either of the African ox or Texas heifer, in opposition to the modern short horn), and one great principle drowning all other principles, never going back, always advancing into new forms, resistless, unceasing, yet counting thousands of centuries in its work. There may be such a grand necessity in creation, but the pigeon fancier or the stock-breeder may not prove it. Yet if we can advance forms that externally are so much alike, that it is impossible to distinguish them, but which, by some fixed inherent power, are still keeping up as it were an internal anatomical difference, we may at least say that here is one form that does not obey the grand principle of evolution, but that commencing as two species, still run in courses parallel, so close indeed as almost to evade connection. In this sense, these two species that I have presented to you this evening, I hope are of greater interest. The immense number of facts that are supposed to bear favorably on evolution, which have been massed together by those brilliant compilers, is perhaps the most splendid record of the age. Would they turn their attention to gather all facts that oppose it, they would not only be adding equally to our stores of science, but only doing what, from their fairness and candour, the world is expecting from them.

During the preparation of this paper, I have been examining many more specimens of Golden eyes, especially females, which I now can immediately separate from young males by their different wind-pipes. I find that females vary in having, or not having a narrow black bar across the white on the wings. This narrow black bar is formed by the white greater coverts having black tips, where they cover the white secondaries or speculum. In all the specimens studied, I have found this bar only in those I had already considered Barrow's females, whilst the common female had none. But as this bar differs in specimens, and also in the wings of the same bird, as respect to size and interruption, and as I never have had the opportunity to study it in the young males, I think it requires more observation before it is pronounced a typical mark. The pansy purple of the head dress of the male Barrow, in distinction to the duck-green of the common species, noted as typical by Richardson, does not hold, as I had before me this winter, a common Golden Eye drake with head dress of the finest pansy purple. It is now in the collection of Mr. A. Downs, Halifax, N. S.

ART. VI.—OF THE STRUCTURE OF THE BONES IN BIRDS, AND OF THEIR DIFFERENCES IN THE VARIOUS SPECIES. BY PIERRE CAMPER, 1771. TRANSLATED BY R. MORROW, FROM VOL. 3, PAGE 449, ET SEQ, PARIS EDITION OF CAMPER'S WORKS PUBLISHED IN 1803.

(Read April 8th, 1878.)

WHENEVER I have examined the internal structure of animals, I have admired the observation of the great Galileo, that one there always meets with new wonders! I have already given many proofs of it in the exhibition of the generation of the toads of Surinam; in that of the organ of hearing in ordinary and cartilaginous fishes and of the cachalot, which I have pre-