

1. Notes on the Procreant Instincts of the three Species of *Molothrus* found in Buenos Ayres. By W. H. HUDSON, C.M.Z.S.

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About three years ago I wrote two letters to the Secretary on the habits of the various species of the genus *Molothrus* found in this country. Since that time I have continued my observations on these interesting birds, and have now great pleasure in submitting to the Society the following notes regarding their procreant instincts.

I. "*Mistakes and imperfections*" of the instinct of *Molothrus bonariensis*.—1. The *M. bonariensis* frequently wastes its eggs by dropping them upon the ground. 2. They also occasionally lay eggs in old forsaken nests: this I had often observed; and, to make assurance doubly sure, last summer I fixed several old nests up in trees and bushes, and found that eggs were laid in them. 3. They also frequently lay in nests where incubation has actually begun. When this happens the egg of the *M. bonariensis* is lost if incubation is very far advanced; but if the eggs have been sat on three or four days only, then the parasitical egg has a good chance of being hatched, and the young bird reared along with its foster-brothers. I have often found nests of the Yellowbreast (*Pseudoleistes virescens*) and of the Scissor-tail (*Milvulus violentus*) containing fledged young of both species.

4. One female will often lay several eggs in the same nest, instead of laying but one, as does, according to Wilson, the *Molothrus pecoris* of North America. I conclude that this is the case from the fact that in cases where the eggs of a species vary considerably in form, size, and markings, each individual of the species lays eggs precisely or nearly alike. So when I find two, three, or four eggs of the *M. bonariensis* peculiar in form and size, also alike in coloration and disposition of spots, in one nest, and yet, in half a hundred eggs out of other nests, cannot find one to match with them, it is impossible not to believe that the eggs found together, and possessing so strong a family likeness, were laid by the same bird.

5. Several females often lay in one nest; so that the number of eggs in it frequently makes incubation impossible. It occurred to me this summer (December 1872) to count the eggs of *M. bonariensis* in several nests, in order to ascertain the average number deposited in each nest—thence the wasted eggs; for more than one bird is seldom reared. I obtained ten nests of *Milvulus violentus* and give the result (see page 154).

It is worthy of remark that the *Milvulus* lays in October or early in November, and rears but one brood in the season; consequently these ten nests, obtained late in December, are of birds whose first nests had been lost. Probably three fourths of the lost nests of the *Milvulus* are abandoned in consequence of the confusion caused in them by the *Molothrus bonariensis*.

Nests of <i>Milvulus violentus</i> .	Eggs in each.	Of <i>Milvulus violentus</i> .	Of <i>Molothrus bonariensis</i> .
1st.....	9	1	8
2nd	3	3	0
3rd	2	0	2
4th	7	2	5
5th	5	1	4
6th	3	3	0
7th	4	0	4
8th	6	1	5
9th	4	0	4
10th	4	1	3
	47	12	35

Thus of forty-seven eggs found in ten nests thirty-five were parasitical!

6. The female *M. bonariensis*, and sometimes the male, destroy many of the eggs in the nests they intrude into, by pecking holes in the shells, breaking, devouring, or stealing them. This is the most destructive habit of the bird, and is probably possessed by individuals in different degrees; for sometimes one nest appears exempt whilst others are completely ruined by it. I have often carefully examined all the parasitical eggs in a nest, and after three or four days discovered that these eggs had disappeared, others newly laid being found in their places. The large number of Scissor-tails' nests containing no eggs of the Scissor-tail, even after incubation has begun, shows how many eggs must be removed or devoured; for the *M. bonariensis* destroys indiscriminately the eggs of its own species and those of others.

II. *Advantages of this instinct.*—After a perusal of the preceding note one might ask, If there is so much that is defective and irregular in the reproduction of the *M. bonariensis*, how can the species maintain its existence, and even increase to such an amazing extent? for it is certainly more numerous, over an equal area, than other parasitical species. For its being more abundant than other species with analogous but apparently more perfect instincts, there may be many reasons unknown to us. The rarer species may be less hardy, have more enemies, be exposed to more perils in their long migrations, &c. But for its being able to maintain its existence there is a very obvious reason, viz. in the many circumstances giving its egg and young an advantage over the eggs and young of the species it is parasitical on. Some of these favourable circumstances are derived from those very habits of the parent bird that at first sight appear most defective; others from the character of the egg and embryo, time of evolution, &c.

1. The egg of the *M. bonariensis* is usually larger, and almost invariably (the one exception I know being the eggs of the Yellow-breast) much harder-shelled than are the eggs with which it is placed. Now the greater hardness of the shell of its own eggs considered in relation to the destructive egg-breaking and -stealing

habits of the bird, gives its own egg the best chance of being preserved; for though the *Molothrus* never distinguishes its own eggs, of which indeed it destroys many, those with soft shells have the poorest chance of being preserved whenever several in the nest are indiscriminately broken.

2. The vitality or tenacity of life appears greater in the embryo *M. bonariensis* than in other species; this circumstance also, in its relation to the egg-breaking habit and to the habit of laying many eggs in a nest, gives it a further advantage. I have examined nests of the Scissor-tail containing a large number of eggs, after incubation had begun, and have been surprised at finding all the eggs of the Scissor-tail addled, even when they were placed most advantageously in the nest for receiving the heat of the sitting bird; whilst those of the *M. bonariensis* contained living embryos, even when under all the other eggs, and, as frequently happens, glued immovably to the nest by the matter of broken eggs spilt over them before incubation had commenced.

3. The comparatively short time the embryo takes to hatch gives it another and a great advantage; for, whereas the eggs of other small birds require to be sat on from fourteen to sixteen days, that of *M. bonariensis* hatches in eleven days and a half from the moment incubation commences; so that when the female *M. bonariensis* makes so great a mistake as to lay an egg with others that have already been sat on, if incubation is not far advanced, her egg has still a chance of being hatched before or contemporaneously with the others; but even if the others hatch before it, the extreme hardness of the embryo serves to keep it alive with the modicum of heat which it still receives from the foster-bird.

4. Whenever the *M. bonariensis* is hatched together with the young of its foster-parents, if these are smaller than the parasite (and in most cases they are smaller), soon after exclusion from the shell they disappear, and the young *M. bonariensis* remains sole occupant of the nest. How the latter succeeds in expelling or destroying them, if he indeed does destroy them, I have not been able to learn.

To all these circumstances favourable to the *M. bonariensis* may be added another of equal or greater importance. The *M. bonariensis* never being engaged with the dilatory and exhaustive process of rearing its own young, and for this reason continuing in better condition than other birds, and moreover being gregarious and practising promiscuous sexual intercourse, must lay a vastly greater number of eggs than other species. In our domestic fowls we see that hens that never become broody frequently lay many dozens of eggs more in a season than others. Some of our small birds rear two, others but one brood in a season—building, incubation, and tending the young taking up much time, so that they are usually from two to three months and a half employed. But the *M. bonariensis* is like the fowl that never incubates, and continues dropping eggs over four months and a half. From the beginning of September till the end of January the males are seen incessantly wooing the females; and during most of this time the eggs are found. I find that small birds will, if de-

prived repeatedly of their nests, lay and even hatch four times in the season, thus laying, if the full complement be four, sixteen eggs. Probably the *M. bonariensis* lays at least twice (perhaps four times) that number. Before dismissing the subject of the advantages this species possesses over those that are its dupes, and of the real or apparent defects of its instinct, some attention should be given to another circumstance, viz. the new conditions introduced by civilized man, and their effect on the species. The effect of these altered conditions has been to make the species more numerous, and, by the removal of certain extraneous checks, to increase excessively those irregularities that must be concomitants of a parasitical instinct like that of this *Molothrus*.

The procreant habits of *M. bonariensis* do in reality appear different in wild regions (where they were formed) from what they do in cultivated ones. In the former the birds are much rarer; and it is, in such regions, an uncommon thing to find its eggs, and nests are there probably never overburdened with them. But in cultivated regions the birds congregate in orchards and plantations in great numbers, and avail themselves of all the nests, ill concealed as they must ever be in the clean and open-foliaged trees planted by man.

III. *Diversity in colour of eggs*.—An extraordinary circumstance in connexion with the reproduction of *M. bonariensis* is the diversity in the coloration of its eggs; I have heard of no other species laying eggs so varied. Perhaps as many as half the eggs, or nearly half, are pure unspotted white, like the eggs of most birds that lay in dark holes. Others there are sparsely marked with such exceedingly smooth specks of pale pink or grey, as to appear quite spotless until very closely examined. After the entirely white, the most common variety is an egg with white ground thickly and uniformly spotted or blotched with red. Perhaps the rarest variety is an egg entirely of a fine deep red. But between this lovely marbled egg and the white one with almost imperceptible specks, there is an infinite number of varieties; for there is no such thing as "certain characteristic markings" in the eggs of this species, though, as I have already inferred, the eggs of the same individuals closely resemble each other. I will mention two more of the beautiful varieties:—one pure white with a few large or variously sized chocolate spots; another, not uncommon, with a very pale flesh-coloured ground, thickly and uniformly marked with fine characters, that appear as if inscribed on the shell with a pen.

This summer (1872-3) I have found five nests of the Yellowbreast (*Pseudoleistes virescens*). The first three nests were abandoned soon after being completed, owing to the confusion caused by the *M. bonariensis*, that began laying and breaking eggs in the nests before the Yellowbreast had laid any. The fourth nest was in a cardoon bush, and contained nine eggs, four of the Yellowbreast and five of the *M. bonariensis*: two of the parasitical eggs were pure white; the others were mottled. The fifth nest, also in a cardoon bush, contained five eggs—two of the Yellowbreast, and three parasitical. These three were of the variety most thickly mottled

with red and consequently closely resembling the eggs of the Yellowbreast. I was surprised to find five more eggs of *M. bonariensis* on the ground, near together and about three feet from the bush; these five eggs were all pure white and spotless. Naturally I asked, How came these eggs on the ground? They had not fallen from the nest, which was very deep; this one contained few eggs, and was scarcely 30 inches from the ground. Then they were all white, while those in the nest were mottled. That the eggs had been laid in the nest I was quite sure; and the only way I can account for their being in the place I found them, is that the Yellowbreast itself removed them, taking them up in the bill and flying to the ground. If I am right we must believe that this individual Yellowbreast had strongly developed an instinct unusual to the species, by which it is able to distinguish, and cast out of its nest, eggs very different from its own—an instinct, in fact, the object of which would be to counteract the parasitical instinct of the *Molothrus*. What would be the effect of such an instinct should the species acquire it? Doubtless it would be very prejudicial to all the parasitical birds that laid white eggs, but those that laid mottled eggs would be preserved. This would be natural selection operating in a very unusual manner; for the Yellowbreast, or other species, would improve another to its own detriment, because the more the parasitical eggs resembled its own the better chance would they have of being preserved. But, it may be added, if besides the Yellowbreast some one other species laying very different eggs (a *Zonotrichia* or *Tyrannus* for instance) should also acquire this distinguishing-habit and eject all eggs differing greatly from its own from its nest, the instinct in two species would ultimately cause the extermination of the parasite. Some light might be thrown on this obscure subject by examining for two or three summers a large number of nests, to ascertain if the nests of the Yellowbreast are often found without any white eggs, or if the same proportional number of white (parasitical) eggs are found in the nests of the Yellowbreast, Scissor-tail, *Sturnella*, and other species.

IV. *Habits of young M. bonariensis*.—Little birds of all species when just hatched closely resemble each other; after they are fledged the resemblance is less, but still comparatively great; grey interspersed with brown is the colour of most of them, or at least of the upper exposed plumage. There is also a great similarity in their cries of hunger and fear—shrill, querulous, prolonged, and usually tremulous notes. It is not to be wondered at, then, that the foster-parents of the young *M. bonariensis* so readily respond to its cries, understanding the various expressions denoting hunger, fear, or pain, as well as when uttered by their own offspring. But the young *Molothrus* never understands the language of its foster-parents as other young birds understand the language of their real parents, springing up to receive food when summoned, and concealing themselves or striving to escape when the warning note is given. Again the young *Molothrus* does not learn to distinguish, even by sight, its foster-parents from any other bird approaching the nest. It gene-

rally manifests no fear even at a large object. On thrusting my fingers into any nest, I find the young birds, if still blind or but recently hatched, will hold up and open their mouths expecting food; but in a very few days they learn to distinguish between their parents and other objects approaching them, and to show alarm even when not warned of danger. Consider the different behaviour of three species that seldom or never warn their offspring of danger. The young of *Synallaxis spixii*, though in a deep domed nest, will throw itself to the ground, attempting thus to make its escape. The young of *Mimus patagonicus* sits close and motionless with closed eyes mimicking death. The young of our Dove, even before it is fledged, will swell itself up and strike angrily at the intruder with beak and wings; and by making so brave a show of its inefficient weapons it probably often saves itself from destruction. But any thing approaching the young *Molothrus* is welcomed with fluttering wings and clamorous cries, as if all creatures were expected to minister to its necessities.

December 24, 1872.—To-day I found a young *Molothrus* in the nest of *Spermophila ornata*; he cried for food on seeing my hand approach the nest; I took him out and dropped him down, when, finding himself on the ground, he immediately made off, half-flying. After a hard chase I succeeded in recapturing him, and began to twirl him about, making him scream so as to inform his foster-parents of his situation; for they were not by at the moment. I then put him back in, or rather upon, the little cradle of a nest, and plucked half a dozen large measure-worms from an adjacent twig. The worms I handed to the bird as I drew them from the cases; and with great greediness he devoured them all, notwithstanding the ill-treatment he had just received, and utterly disregarding the wild excited cries of his foster-parents, just arrived and hovering within three or four feet of the nest.

Last summer (1871-2) I noticed a young *M. bonariensis* in a stubble-field, perched on the top of a slender dry stalk; as it was clamouring at short intervals, I waited to see what bird would come to it. It proved to be the diminutive *Polioptila dumicola*; and I was much amused to see the little thing fly directly to its great foster-offspring and, alighting on its back, drop a worm into the upturned open mouth. After remaining a moment on its singular perch the *Polioptila* flew away, but in less than half a minute returned and perched again on the young bird's back. I continued watching them until the *Molothrus* flew off, but not before I had seen him feed seven or eight times in the same manner.

In the two foregoing anecdotes may be seen the peculiar habits of the young *M. bonariensis*. As the nests in which it is hatched, from those of the little *Serpophaga* and Wren to those of *Mimus*, vary so much in size and materials, and are placed in such different situations, the young *M. bonariensis* must have in most of them a somewhat incongruous appearance. But in the habits of the young bird is the greatest incongruity or inadaptation. When the nest is in a close thicket or forest, though much too small for the bird, and

although the bird itself cannot understand its foster-parents, and welcomes all things that, whether with good or evil design, come near it, the unfitness is not so apparent as when the nest is in open fields and plains.

The young *M. bonariensis* differs from the true offspring of its foster-parents in its habit of quitting the nest as soon as it is able, trying to follow the old bird, and placing itself in the most conspicuous place it can find, such as the summit of a stalk or weed, and there demanding food with frequent and importunate cries. Thus the little *Polioptila* had acquired the habit of perching on the back of its charge to feed it, because parent birds invariably perch above their young to feed them; and the young *M. bonariensis* prevented this by always sitting on the summit of the stalk it perched on. The habit is most fatal on the open and closely cropped pampas inhabited by the Cachila (*Anthus correndera*). In December, when the Cachila rears its second brood, the *Milvago chimango* also has young, and feeds them almost exclusively on the young of other, chiefly small, birds. At this season the Chimango destroys great numbers of the young of the Cachila and of *Anumbius ruficularis*. Yet these birds are beautifully adapted in structure, coloration, and habits to their station. It thus happens that in districts where the *Molothrus* is abundant, their eggs are found in a majority of the Cachilas' nests: and yet to find here a young *M. bonariensis* out of the nest is a rare thing; for as soon as they are able to quit the nest and expose themselves they are all or nearly all carried away by the Chimango.

V. *Nidification of Molothrus badius*.—A pair of Leñateros (*Anumbius acuticaudatus*) have been nearly all the winter building a great nest on a locust-tree within sixty yards of the house. This nest is about 27 inches deep and 16 or 18 in circumference, and appears now nearly completed. To-day (September 28, 1872) I saw a bay-winged *Molothrus* on the nest; it climbed about it, deliberately inspecting every part, taking up and rearranging some sticks and throwing others down. Whilst thus engaged, two Blackbirds (*M. bonariensis*), male and female, came to the tree; the female dropped into the nest, and began also to examine it, peering curiously into the entrance and quarrelling with the first bird. After a few minutes she flew off followed by her consort. The Bay-wing continued its strange futile work until the owners of the nest appeared, whereupon it hopped leisurely to one side, sung for a few moments, and then flew away. The similarity in the behaviour of the two birds struck me very forcibly; in the great interest they take in the nests of other birds, especially in large covered nests, the two species are identical. But when the breeding-season has come their habits begin to diverge: then the *M. bonariensis* lays in nests of other species, abandoning its eggs to their care; whilst the Bay-wings usually seize on the nests of other birds, and rear their own young. Yet, as they do occasionally build a neat elaborate nest for themselves, the habit of taking possession of nests of other birds is probably recently acquired; probably also its tendency is to eradicate the primitive building-instinct.

October 8, 1872.—This morning, whilst reading under a tree, my attention was attracted by a shrill note, as of a bird in distress, issuing from the Leñatero's nest; after having heard it repeated at intervals for more than twenty minutes I went to ascertain the cause. The Bay-wings flew up from the ground under the nest; and on searching in the rank clover that grew under the tree I discovered the female Leñatero with plumage wet and draggled, tumbling and appearing half dead with the rough treatment she had experienced. I put her in the sun; and in about half an hour's time, hearing her mate calling, she managed to flutter feebly away and joined him. The persecutors had evidently dragged her from the nest, and probably would have killed her had I not come so opportunely to the rescue. Since writing the above I have watched the nest every day. Both the Bay-wings and Leñateros had left it; within a week's time the owners of the nest returned and resumed possession. Three or four days afterwards the Bay-wings also came back; but on finding the nest still occupied they took possession of an unfinished oven of the Oven-bird on a separate tree within twenty yards of the nest, and immediately began carrying in materials to line it with. After having left them time sufficient to finish laying, I took their five eggs, at the same time throwing down the oven, and waited to see what the next move would be. They remained on the spot singing incessantly and manifesting anxiety when approached. I observed them four days, and was then away from home as many more; on returning I found the Leñateros had disappeared and their great nest was again held by the Bay-wings. I also noticed that the latter had opened an entrance at the side of the nest and near the bottom; for the receptacle of the eggs is placed at the lower extremity, and is reached by a narrow covered passage from the top. It was now about the end of October, the height of the breeding-season, and numbers of Blackbirds constantly visited the nest; but I was particularly interested in a pair of the *M. rufoaxillaris* that had also begun to grow fond of this nest, the theatre of so much contention, and I resolved to watch these birds very closely. As these last birds spent so much of their time near the nest, showing great solicitude whenever I approached it, I thought perhaps they would take possession and breed in it could the Bay-wings be driven out. I therefore waited patiently, giving the Bay-wings time to lay the full complement of eggs; for I did not wish to shoot them, and believed that when they found themselves deprived a second time of their eggs they would certainly decamp.

In a few weeks time I climbed to the nest, and found, very much to my astonishment, ten eggs, instead of four or five as I had confidently expected. All these eggs were of the Bay-wings, and I concluded that the two females were laying together; for, as I said in a former communication on the subject, more than one female will sometimes lay in the same nest. After taking the ten eggs the Bay-wings still remained; and I observed them a great deal, but could never see more than one pair about the nest. The next time I climbed to the nest it contained five eggs; these I also took, and thought that the

bird that laid the additional five eggs before had gone away on finding herself robbed. The birds still remained ; and when I had reason to believe that they had commenced to lay the fourth time, I visited the nest and found two eggs in it ; I left them, and returned in three days expecting to find five eggs, but found seven ! Certainly more than one female had on this occasion laid in the nest. I have invented several theories to account for the additional eggs ; but they are not satisfactory, and it is useless to record conjectures. After taking the last eggs, the Bay-wings left ; and though the *Molothri rufoaxillares* continued to make rather frequent visits to the nest, to my great disappointment they did not lay in it. Last summer (1871-2) I found one nest of the Bay-wings ; it was deep and nicely made of long dry grass and fibrous roots. All the other pairs I observed bred in nests of other birds, most of them in Leñateros' nests. This summer (1872-73) all the pairs of Bay-wings I have observed have laid in the nests taken from other birds.

VI. *Habits of Molothrus rufoaxillaris*.—This species is by no means rare, though not so abundant as the others ; probably its close resemblance to the *M. bonariensis* kept it so long unknown to ornithologists. Like the *M. badius*, it remains with us the whole year. The *M. rufoaxillaris* is never seen alone ; nor are they strictly gregarious, but in winter go in parties never exceeding five or six in number. One of its most noteworthy traits is an exaggerated hurry and bustle it throws into all its movements. When passing from one branch to another it goes by a series of violent jerks, smiting its wings loudly together ; and when a party of them return from the fields they rush wildly and screaming to the trees, as if pursued by a Falcon. Their language is as abrupt as are their motions. They are not singing birds ; but the male sometimes, though rarely, attempts a song, and utters, with considerable effort, a few brief and unmelodious notes. The chirp with which he invites his mate to fly has the sound of a loud and smartly given kiss. His warning or alarm note when approached in the breeding-season has a soft and pleasing sound ; it is his only mellow expression. This most common as well as remarkable vocal performance is a cry beginning with a hollow-sounding internal note, and swelling into a sharp metallic ring ; it is uttered with tail and wings spread and depressed, the whole plumage raised like that of a strutting turkey-cock, whilst the bird hops briskly up and down on its perch as if dancing. From its manner of puffing itself out, and from the peculiar nature of the sound it produces, I believe that, like the Pigeon and other species, it has the faculty of filling its crop with air, using it as a "chamber of resonance." The note I have described is quickly and invariably followed by a scream, harsh and impetuous, uttered by the female, though both notes always sound as if proceeding from one bird. Frequently, when the flock is on the wing, these screaming notes without the prelude are uttered by all the birds in concert. The plumage of this species has a strong musky smell ; the œsophagus is remarkably wide. It lives almost exclusively on seed ; but sometimes a large caterpillar or spider is also found in the stomach.

VII. *The M. rufoaxillaris is parasitical on the M. badius.*—April 12, 1873.—To-day I have made a discovery, and am as pleased with it as if I had found a new planet in the sky. The mystery of the Bay-wings' nest twice found containing over the usual complement of eggs is cleared up, and I have now suddenly become acquainted with the procreant instinct of *M. rufoaxillaris*. I esteem it a great piece of good fortune; for I had thought that the season for making any such discovery was already over, so near are we now to winter. The Bay-wings are so social in their habits, that they appear reluctantly to break up their companies in the breeding-season; no sooner is this over, and when the young birds are still fed by their parents, than all the families about a plantation unite into one flock. About a month ago all the birds about my trees had associated in this way together, and wandered about in a scattered party, frequenting one favourite spot very much, about fifteen minutes' walk from the house. The flock was composed, I think, of three families, about fifteen or sixteen birds in all: the young birds are indistinguishable from the adults; but I know that most of these birds were young hatched late in the season, from their incessant strident hunger-notes. From the time of my first seeing them together before the middle of March, I never observed the flock closely till to-day. A week ago I rode past the flock and noticed among them three birds with purple spots on their plumage. They were at a distance from me; and I of course concluded that they were young of *M. bonariensis* casually associating with the Bay-wings. It surprised me very much at the time; for the young male *M. bonariensis* always acquires the purple plumage before March. To-day while out with my gun I came upon the flock and observed four of the birds assuming the deep-purple plumage, two of them being almost entirely that colour; but I also noticed with astonishment that they had bay wings like the birds they followed, also that those that had least purple on them were marvellously like the Bay-wings in the mouse-coloured plumage and blackish-brown tail. I had seen these very birds a few weeks ago and before the purple plumage was acquired, and there was not the slightest difference amongst them; now they appeared to be undergoing the process of a transmutation into another species! I immediately shot four of them along with two genuine Bay-wings, and was delighted to find the purple-spotted birds to be the young of *M. rufoaxillaris*.

I must now believe that the extra eggs twice found in the nest of the Bay-wings were those of *M. rufoaxillaris*, that the latter species has a particular predilection for laying in the nests of the former, that the eggs of the two species are identical in form, size, and coloration, and that, stranger still, the mimicry is as perfect in the young birds as in the eggs.

The *M. rufoaxillaris* is the fourth *Molothrus* with the procreant habits of which we are now acquainted; for besides the three Buenos-Ayorean and the single North-American species, I know not that the habits of any others have been ascertained. There is a network of affinities in the nesting-habits, colour of plumage and the changes it

undergoes, and in the peculiar language and gestures of these four species that is complex enough; but the complexity will probably be much increased when we become familiar with the instincts of the other members of the genus. We may wait to hear something out of the common in their nesting-habits, as confidently as we expect to find pale green eggs in the nest of a *Coccyzus* or feathers in the stomach of a Grebe.

April 15, 1873.—This morning I started in quest of the Bay-wings. As soon as I got near them (for they were in the usual place) I observed one bird, that had somehow escaped detection the day before, assuming the purple plumage. This bird I shot; and after the flock had resettled a short distance off, I crept close up to them under the shelter of a hedge to observe them more narrowly. One of the adults was closely attended by three young birds; and they all, whilst I observed them, fluttered their wings and clamoured for food each time the parent bird stirred on her perch. One of the three young birds was spotted with purple; and this bird I brought down, together with its foster-parent and one of its foster-brothers. These last two specimens (for I could see no more) were more interesting than the others I had obtained, as they had fewer purple feathers; and it may be seen in them how closely at first these birds resemble their foster-brothers the young of *M. badius*. The hunger-cry of the young *M. badius* is quite different from that of the young *M. bonariensis*. The cry of the latter is a shrill two-syllabled note, the last syllable being lengthened out into a continuous squeal when the foster-parent approaches to feed it. The hunger-cry of the young *M. badius* is short, somewhat strident, tremulous, and uninflected. The resemblance of the young *M. rufoaxillaris* to its foster-brothers in language and plumage is the more remarkable when we reflect that the adult *M. rufoaxillaris* in all its habits, gestures, and notes, as well as in its purple plumage, comes vastly nearer to *M. bonariensis* than to *M. badius*. It seems impossible for mimicry to go further than this. A slight difference in size is quite imperceptible when the birds are flying about; but in language and plumage the keenest ornithologist would not detect a difference. But it may be questioned whether this is in reality a case of an external resemblance of one species to another acquired by natural selection for its better preservation. Is it not as reasonable to believe that the young of *M. rufoaxillaris* in the first stage of its plumage exhibits the ancestral type (that of the progenitor of both species), that it has not supplanted the unvarying and consequently unimproved descendants (*M. badius*), simply because its elective parasitical instinct has made its existence dependent on that species? Did the *M. badius* belong to some other group, *Sturnella* or *Pseudo-leistes* for instance, it would not then be possible to doubt that the resemblance of the young *M. rufoaxillaris* to its foster-brothers resulted from mimicry; but as the two species belong to the limited group *Molothrus* the resemblance might be ascribed to community of descent.

VIII. *Probably Molothrus badius always hatches its own eggs.*

—Formerly I believed that though the *M. badius* is constantly observed to nidificate, they also occasionally dropped their eggs in the nests of other birds (see P. Z. S. 1870, p. 671). I could not doubt that this was the case after having seen a couple of their young following a Yellowbreast and being fed by it. But later and more careful observations, together with the discovery I have just recorded, have made me alter my opinion. What then appeared to be proof positive is now no proof at all; the young birds I observed were perhaps those of *M. rufoaxillaris*. Indeed it is much more probable that they should have belonged to this than to the other species, since the Bay-wings are constantly seen to rear their own young, whereas I have never found a nest of *M. rufoaxillaris*, and believe they are altogether parasitical.

IX. *Reasons for believing that the M. rufoaxillaris is parasitical almost exclusively on M. badius.*—I have spoken of the many varieties of eggs *M. bonariensis* lays. Those of the *M. badius* are a trifle less in size, in form elliptical, very thickly and uniformly marked with small spots and blotches of dark reddish colour varying to dusky brown; the ground-colour is white, but sometimes, though rarely, a very pale blue. It is not possible to confound the eggs of the two species *M. bonariensis* and *M. badius*. Now, ever since I saw, many years ago, the Yellowbreast already mentioned tending the young Bay-wings, I have looked out for the eggs of the latter species in other birds' nests. I have found many hundreds of nests containing eggs of *M. bonariensis*, but never one with an egg of *M. badius*, and, I may now add, never with an egg of *M. rufoaxillaris*. It is wonderful that *M. rufoaxillaris* should lay only in the nests of *M. badius*; but the most mysterious thing is that *M. bonariensis*, which apparently lays in as many nests as ever it can find, never, to my knowledge, drops an egg in the nest of *M. badius*! It will be hard for naturalists to believe this; for if the *M. badius* is so excessively vigilant and jealous of all other birds approaching its nest as to succeed in keeping out the subtle, silent, grey-plumaged, ever-present *M. bonariensis*, why does it not also keep off the rarer, noisy, bustling, rich-plumaged *M. rufoaxillaris*? But this bird may enter the nest forcibly. The *M. badius* may also possess sagacity sufficient to distinguish the eggs of *M. bonariensis* from its own and cast them out of the nest. This point must remain unsettled.

X. *Comparative perfection of the parasitical instinct of Molothrus rufoaxillaris.*—It is with a considerable degree of repugnance that we regard the parasitical instinct in birds: the reason it excites such a sensation is manifestly because it presents itself to the mind, in the words of a naturalist who lived a hundred years ago and believed the Cuckoo had been created with such a habit, as "a monstrous outrage on the maternal affection, one of the first great dictates of nature"—an *outrage*, since each creature has been endowed with the all-powerful affection for the preservation of its own, and not another, species; and here we see it by a subtle process, an unconscious iniquity, turned from its original purpose, perverted, and made subservient to

the very opposing agency against which it was intended as a safeguard! The formation of such an instinct seems indeed like an unforeseen contingency in the system of nature, a malady strengthened, if not induced, by the very laws established for the preservation of health, and which the *vis medicatrix* of nature is incapable of eliminating. Again, the egg of a parasitical species is generally so much larger, differing also in coloration from the eggs it is placed with, whilst there is such an unvarying dissimilarity between the young bird and its living or murdered foster-brothers, that, unreasoning as we know instinct, and especially the maternal instinct, is, we are shocked at so glaring and flagrant an instance of its blind stupidity. In the competition for place, the struggle for existence, said with reason to be most deadly between such species as are most nearly allied, the operations are imperceptible, the changes so gradual, that the diminution and final disappearance of one species is never attributed to a corresponding increase in another more favoured species over the same region. It is not as if the regnant species had invaded and seized on the province of another, but appears rather as if they had quietly entered on the possession of an inheritance that was theirs by right.

Mighty as are the results worked out by such a process, it is only by a somewhat strained metaphor that it can be called a *struggle*. But even when the war is open and declared, as between a raptorial species and its victims, the former is manifestly driven by necessity. And in this case the species preyed on are endowed with peculiar sagacity to escape its persecutions; so that the war is not one of extermination, but, as in a border war, the invader is satisfied with carrying off the weak and unwary stragglers. Thus the open, declared enmity is in reality beneficial to a species; for it is sure to cut off all such individuals as might cause its degeneration. But we can conceive no necessity for such a fatal instinct as that of the Cuckoo and Molothrus, destructive to such myriads of lives in their beginning. And inasmuch as their preservation is inimical to the species on which they are parasitical, there must also here be a struggle. But what kind of struggle? Not as in other species, where one perishes in the combat that gives greater strength to the victor, but an anomalous struggle in which one of the combatants has made his adversary turn his weapons against himself, and so seems to have an infinite advantage. It is impossible for him to suffer defeat; and yet, to follow out the metaphor, he has so wormed about and interlaced himself with his opponent that as soon as he succeeds in overcoming him he also must inevitably perish. Such a result is perhaps impossible, as there are so many causes operating to check the undue increase of any one species; consequently the struggle, unequal as it appears, must continue for ever. Thus, however we view the parasitical habit, it appears cruel, treacherous, and vicious in the highest degree. But should we attempt to mentally create a perfect parasitical instinct (that is, one that would be thoroughly efficient with the least possible prejudice for or injustice towards another species; for the preservation of the species on which the parasite is dependant is neces-

sary to its own), by combining in imagination all known parasitical habits, eliminating every offensive quality or circumstance, and attributing such others in their place as we should think fit, our conception would probably fall far short in simplicity, beauty, and completeness to the real instinct of the *M. rufoaxillaris*. Instead of laying its eggs promiscuously in every receptacle that offers, it selects the nest of a single species; so that its selective instinct is related to the adaptive resemblance in its eggs and young to those of the species on which it is parasitical. Such an adaptive resemblance could not exist if it laid its eggs in the nests of other species, and it is certainly a circumstance eminently favourable to preservation. Then, there not being any such incongruity and unfitness as we find in nests into which other parasitical species intrude, there is no reason here to regard the foster-parent's affection as blind and stupid; the similarity is close enough to baffle the keenest sagacity. Nor can the instinct here appear in the light of an outrage on the maternal affection; for the young *M. rufoaxillaris* apparently possesses no superiority over his foster-brothers. He is not endowed with greater strength and voracity to monopolize the attentions of the foster-parents and to eject or otherwise destroy the real offspring; but being in every particular precisely like them, he has only an equal chance of being preserved. What the most philosophical of naturalists has remarked concerning the architecture of the hive-bee may be applied to this parasitical instinct:—"Beyond this stage of perfection natural selection could not lead;" for it seems absolutely perfect.

XI. *Occasional aberrant procreant habits*.—When considering the parasitical procreant habits of birds, every irregularity in the breeding-habits of other species becomes interesting. I therefore introduce a note on the occasional habit of wasting eggs of some species, and of more than one female laying in the same nest. The *Molothrus bonariensis* wastes many eggs; so also do our two species of *Rhea*; but in the former the parasitical habit is the immediate cause of the occasional habit. Birds that build and observe seasons in laying do not finish their nests precisely at the time when they are ready to drop their eggs, but some little time, often two or three or more days, beforehand; if the nest is destroyed, the growth of the ova is arrested till a new nest is completed. Every summer we see here pairs of parasitical Martins (*Progne tapera*) breeding in November; these birds have succeeded, immediately after arriving, in possessing themselves of ovens of the *Furnarii*, in which alone they breed; but in all the birds that have failed in their attacks on the Oven-birds and do not breed till December and January, the ova, though large, are in abeyance, and only become fully developed when the birds have seized on the ovens about which they have been long fluttering.

This beautiful provision is not necessary in the *Molothrus*; indeed it is obvious that it would prove fatal to the species in a few generations did they possess it. Only when the egg is already in the oviduct and the time for its exclusion approaches, the bird begins to look about for a receptacle; its failing to find one, or its being repulsed

from it when found, is a contingency for which no provision has been made; consequently the egg is wasted. In the Rheas all the females in a flock lay in one nest, a male incubating the eggs afterwards. But as each bird lays a large number of eggs, and as they do not begin laying at the same time, long before they have all done laying the male becomes broody and drives them away. This is probably the cause of their wasting so many eggs; for all the females that are ready to lay when the male begins to incubate are compelled to drop them upon the plain. But how can we account for the habit of occasionally wasting eggs in another species—the Urraca (*Cyanocorax pileatus*) for example; for this bird builds an elaborate nest in which but one female lays? In a paper on the habits of this species (P. Z. S. 1870, p. 749) I said that they sometimes built such frail nests that all the eggs dropped through them; but I did not then know that they also wasted a surprising number of eggs. A flock of about sixteen of these birds passed the winter of 1872 in the trees about my house; on the approach of warm weather they began to scatter, incessantly screaming and chattering as their manner is when about to pair and breed. I observed these birds very attentively, but could not detect them building. At last I found three broken eggs on the ground, and on examining the tree overhead discovered an incipient nest, merely a dozen or so of little sticks laid crossways, upon, or rather through, which the eggs had been dropped. This was in October; and till January no other attempt at a nest was made; but eggs in abundance were wasted, for during four months I constantly found them about the orchard. Early in January another nest was made, but with less materials than a Cuckoo would have employed; five or six smashed eggs were on the ground beneath it. Towards the end of January two large nests were built, deep and well-lined with green leaves; in these nests fourteen or fifteen birds were hatched. In this case we see one essential link in the chain of procreant instincts struck out and the whole made abortive; but the cause of the loss or suspension for a time of the architectural habit seems very mysterious.

Besides the Rhea, I know of no species in which two or several females unite habitually to lay in one nest; but there are many species in which two or more females occasionally lay together. This is often the case with *Dendrocygna fulva*, *Vanellus cayennensis*, and *Nothura maculosa*. I can give but one case of two birds of different species laying together: this was the Teal (*Querquedula flavirostris*) and the common Partridge or Tinamou (*Nothura maculosa*). The nest was in a thistle-bush at a distance from the water, and contained the full complement of eggs of both birds.

XII. *Conjectures as to the origin of the parasitic instinct in M. bonariensis.*—The assertion that the “immediate and final cause of the Cuckoo’s instinct is that she lays her eggs not daily, but at intervals of two or three days” (‘Origin of Species’), carries no great appearance of probability with it; for might it not just as reasonably be said that the parasitic instinct is the immediate and final cause of her laying her eggs at long intervals? If it is favourable to a species with the

instinct of the Cuckoo (and it probably is favourable) to lay eggs at longer intervals than other species, then natural selection would avail itself of every modification in the reproductive organs that tended to produce such a result, and make the improved structure permanent. It is said ('Origin of Species,' chapter on instinct) that the American Cuckoo lays also at long intervals, and has eggs and young at the same time in its nest, a circumstance manifestly disadvantageous. Of the *Coccyzus melanocoryphus*, the only one of our three Cuckoos whose nesting-habits I am acquainted with, I can say that it never begins to incubate till the full complement of eggs are laid—that its young are hatched simultaneously. But if it is sought to trace the origin of the European Cuckoo's instinct in the nesting-habits of American *Coccyzi*, it might be attributed not to the aberrant habit of perhaps a single species, but to another and more disadvantageous habit common to the entire genus, viz. their habit of building exceedingly frail platform nests from which the eggs and young very frequently fall. By occasionally dropping an egg in the deep secure nest of some other bird, an advantage would be possessed by the birds hatched in them, and in them the habit would perhaps become hereditary. Be this as it may (and the one guess is perhaps as wide of the truth as the other), there are many genera intermediate between *Cuculus* and *Molothrus* in which no trace of a parasitic habit appears; and it seems more than probable that the analogous instinct originated in different ways in the two genera. As regards the origin of the instinct in *Molothrus*, it will perhaps seem premature to found speculations on the few facts here recorded, and before we are acquainted with the habits of other members of the genus. That a species should totally lose so universal an instinct as the maternal one and yet avail itself of that affection in other species to propagate itself, seems a great mystery. Nevertheless I cannot refrain from all conjecture on the subject, and will go so far as to suggest what may have been at least one of the many concurrent causes that have produced the parasitic instinct. The apparently transitional nesting-habits of several species, and one remarkable habit of *M. bonariensis*, seem to me to throw some light on a point bearing intimately on the subject, viz. the loss of the nest-making instinct in this species. The hypothesis will perhaps be considered very fine-spun indeed; nevertheless, when a larger body of facts have been got together, it may be of some use to future inquirers; the facts here adduced will also have their value.

Instincts vary greatly. It would be almost a truism to say that were it not so they would not be so well adapted to external conditions as we find them, unless the conditions themselves were unvarying, which is not the case; for whilst a species is well adapted to its station in its instincts or inherited habits, it is frequently not so well adapted to them in its relatively inimitable structure. Thus we have in Buenos Ayres a *Tringa* that avoids the wet, and has all the habits of a strictly upland Plover, a Sparrow (*Ammodromus manimbé*) with the manners of a reed-loving *Synallaxis*, likewise a Tyrant (*Pitangus bellicosus*) that in winter subsists chiefly on mice

when they are abundant. It hovers over the grass, and pounces hawk-like on its prey; but this does not suffice, the mouse being too large to be swallowed entire and the bird's bill too straight and weak to tear it in pieces. To remedy this defect or want of structural adaptation to its requirements, it has acquired a supplementary habit, and, carrying its prey to a tree and dexterously swinging it by its hind feet or tail, beats it with violence against a branch until it is bruised into a soft pulp. But however much the instincts of a species may have become altered—the habits of a species being widely different from those of its congeners, also a want of correspondence between structure and habits (the last being always more suited to conditions than the first) being taken as evidence of such alteration—traces of ancient and disused habits frequently reappear. Seemingly capricious actions too numerous, too vague, or too insignificant to be recorded, improvised definite actions that are not habitual, apparent imitations of the actions of other species, a perpetual inclination to attempt something that is never attempted, and attempts to do that which is never done—these and other like motions are, I believe, in many cases to be attributed to the faint promptings of obsolete instincts. To the same cause many of the occasional aberrant habits of individuals may possibly be due—such as of a bird that builds in trees occasionally laying on the ground. If recurrence to an ancestral type be traceable in structure, coloration, language, it is reasonable to expect something analogous in instincts. But even if such casual and often harmless motions as I have mentioned should guide us unerringly to the knowledge of the old and disused instincts of a species, this knowledge of itself would not enable us to discover the origin of present ones. But assuming it as a fact that the conditions of existence, and the changes going on in them, are in every case the fundamental cause of alterations in habits, I believe that in many cases a knowledge of the disused instincts will assist us very materially in the inquiry. I will illustrate my meaning with a supposititious case. Should all or many species of *Columba* manifest an inclination for haunting rocks and banks and for entering or peering into holes in them, such vague and purposeless actions, connected with the facts that all Doves build simple platform nests (like *Columba livia* and birds that build on a flat surface), also lay white eggs (the rule being that eggs laid in dark holes are white, exposed eggs coloured), also that one species, *C. livia*, does lay in holes in rocks, it would be easy to believe that the habit of this species was once common to the genus. We should conclude that an insufficiency of proper breeding-places, *i. e.* new external conditions, first induced Doves to build in trees. The *C. livia* also builds in trees where there are no rocks; but when able, returns to the ancestral habits. In the other species we should believe the primitive habit to be totally lost from disuse, or only to manifest itself in a faint uncertain manner. Still it will be asked, what, in faint and uncertain habits of species or in the occasional actions of individuals, is the criterion to distinguish those due to the laws of variation from those due merely to recurrence? I presume that

the two kinds of divergence, essentially different in origin, may be distinguished in much the same way as in divergences from type in structure, colour, &c. A horse clothed with hair 6 inches long would afford an instance of divergence arising from the laws of variation; for not one circumstance in the history of the genus could incline one to believe it an instance of reversion of type*. But the stripes on the dun horses and on mules are attributed to recurrence to an ancestral type, *because* other species of *Equus* are striped. In the following instances we have, I think, examples of these two kinds of divergence.

All the wild Pigeons of La Plata (four in number), when feeding, walk upon the ground in a somewhat leisurely manner. The *Zenaida maculata* of Patagonia, which in its other habits so closely resembles the La-Platan *Zenaida* when feeding hurries about, snatching up its food with such marvellous rapidity that the most animated motions of other birds that feed on the ground in flocks seem languid in comparison. This lively habit of the Patagonian Pigeon, in which it differs so much from its congeners, is, I believe, due to the conditions of life. The barren soil and scanty vegetation of the region it inhabits requires in an exclusively seed-eating species that goes in large bodies a far greater activity than is necessary in the rich fertile regions further north. When pursued by a bird of prey or by a man on horseback, the *Nothura maculosa* escapes into the burrows of the Vizcacha or Armadillo. To take refuge in burrows is not, I believe, a habit of any other gallinaceous species, but in every thing (structure, colour, and habits) they all appear to be beautifully adapted to elude their enemies on the exposed surface of the earth; so that the habit of the Buenos-Ayorean Partridge seems very incongruous. Such a habit can only be due to the special conditions in which the bird is placed—that is, to the shelterless plains with numerous burrows in which alone it can find security from persecution. One of the common Pampas butterflies, the *Pyrameis carye*, has a remarkable habit: when not feeding, it alights on the bare ground rather than on plants; and immediately on alighting it opens its wings and turns itself rapidly about till placed in such a position that the sun shines directly on the sloping surface of the wings and body. On cold days, when other species of Lepidoptera sit with closed wings amidst the leaves and appear weak and languid, the *P. carye* basks with open wings upon the barren ground, and is then just as shy and lively as when the weather is warm. This sun-loving habit is identical in one of our birds, the *Cyanocorax pileatus*, described in a former paper. Every year many individuals of *P. carye* survive the winter; and their extreme hardiness is perhaps attributable to the heat-catching habit. Two other Lepidopteres also possess the habit; but it is far less perfect in them, and they never live through the winter. This habit of our *Pyrameis* and *Cyanocorax* I am also inclined to attribute to variation induced by the conditions of life.

* The hide of a long-haired variety of the horse was brought by the Tehuelcho Indians to the settlement on the Rio Negro of Patagonia a few years ago.

The Patagonian Thrush (*Turdus falklandicus*) is not a singing bird; occasionally, however, in spring, an individual is heard to sing. I believe the singing in this case is a recurrence to a disused habit, because most Thrushes sing, also because the La-Platan Thrushes never sing in winter or during high winds in summer (high winds prevail all summer in Patagonia, though the winter is calm), also because the song of *T. falklandicus*, when it does sing, is like a laboured imitation of the song of *T. rufiventris* of La Plata, the species which it most closely resembles.

The following also appears to be an example of recurrence to an ancestral instinct. A physiological study of the Ophidians has, I believe, afforded some reasons for supposing that these reptiles or their progenitors were all originally aquatic in their habits. The extreme readiness with which land-snakes enter the water, their apparent fondness for it, as if it were their native element, and the facility with which they swim give greater strength to the supposition. Last summer (December 1872) I noticed a *Coronella anomala* on the border of a stream where I was fishing, with its body so much distended that, curious to learn what it had swallowed, I killed and opened it. There were in it fifteen little fishes, varying in size from 2 to $3\frac{1}{2}$ inches in length. A few of the fishes had begun to decompose; but they had evidently all been taken that day, showing in what marvellous perfection this individual possessed the fishing instinct. Yet the *C. anomala* (our commonest snake, though until lately undescribed) abounds everywhere on dry elevated plains where there is never any standing water. This snake was a full-grown male $14\frac{1}{2}$ inches long; the female differs in colour, and is much larger. From the number of leaves that had been swallowed along with the fishes it was evident that the snake had lain among the rotting leaves of the floating water-lilies to watch for its prey; and indeed the colour of the body, the stem-like raised neck, and still watchful habit seem to adapt it for preying on fish in the water rather than on mice, birds, &c. on dry land.

The last case of recurrence, or what appears such, will probably seem less obvious than the preceding ones; it refers to *Molothrus bonariensis*, and a strange purposeless habit of that species already mentioned in a former paper. Before and during the breeding-season the females, sometimes accompanied by the males, are seen continually haunting and examining the domed nests of some of the Dendrocolaptidæ. This does not seem like a mere freak of curiosity, but their persistence in the habit is precisely like that of birds that habitually make choice of such breeding-places. It is most surprising that they never do in reality lay in such nests, except when the side or dome has been accidentally broken enough to admit the light into the interior. Whenever I set up boxes in my trees, the first bird to visit them is the female *M. bonariensis*. Sometimes one will spend half a day loitering about and inspecting a box, repeatedly climbing round and over it, and always ending at the entrance, into which she peers curiously and, when about to enter, starting back as if scared at the obscurity within. But after retiring a

little space, she will return again and again, as if fascinated with the comfort and security of such an abode. It is amusing to see how pertinaciously they hang about the ovens of the Oven-birds, apparently determined to take possession of them, flying back to them after a hundred repulses, and yet not entering them, even when they have the opportunity. Sometimes one is seen following a Wren or a Swallow to its nest beneath the eaves, and then clinging to the wall beneath the hole into which it disappeared. I could fill many pages with instances of this habit of the *M. bonariensis*, which, useless though it be, is as strong an affection as the bird possesses. That it is a recurrence to a long disused habit, I can scarcely doubt; at least, to no other cause, that I can imagine, can it be attributed; and, besides, it seems to me that if the *M. bonariensis*, when once a nest-builder, had acquired the semiparasitical habit of breeding in domed nests of other birds, such a habit might conduce to the formation of the instinct which it now possesses. In my former letter on the *M. bonariensis* I mentioned that twice I had seen birds of this species attempting to build nests, and that on both occasions they failed to complete the work. So universal is the nest-making instinct that one might safely say the *M. bonariensis* had once possessed it, and that in the cases I have mentioned it was a recurrence, too weak to be efficient, to the ancestral habit. Another interesting circumstance may be adduced as strong presumptive evidence that the *M. bonariensis* once made itself an open exposed nest as *M. badius* occasionally does—viz. the difference in colour of the male and female; for whilst the former is rich purple, the latter has what naturalists consider an adaptive resemblance in colour to the nest and to the shaded interior twigs and branches on which nests are usually built. How could such an instinct have been lost? To say that the *M. bonariensis* occasionally dropped an egg in another bird's nest, and that the young hatched from these accidental eggs possessed some (hypothetical) advantage over those hatched in the usual way, and that so the parasitical habit became hereditary, supplanting the original one, is an assertion without any thing to support it, and seems to exclude the agency of external conditions. Again the want of correspondence in the habits of the young parasite and its foster-parents would in reality be a disadvantage to the former; the unfitness would be as great in the eggs and other circumstances. For all the advantages the parasite actually possesses in the comparative hardness of the egg-shell, rapid evolution of the young, &c., already mentioned, must have been acquired little by little through the slowly accumulating process of natural selection, but subsequently to the formation of the original parasitical inclination and habit. I am inclined to believe that *M. bonariensis* lost the nest-making instinct by acquiring that semiparasitical habit, common to so many South-American birds, of breeding in the large covered nests of the Dendrocolaptidæ. We have evidence that this semiparasitical habit does tend to eradicate the nest-making one. The *Synallaxes* build great elaborate domed nests; yet we have one species (*S. agithaloides*) that never builds for itself, but breeds in the

nests of other birds of the same genus*. In some species the nesting habit is in a transitional state. *Machetornis rixosa* sometimes makes a shallow elaborate nest in the angle formed by twigs and the bough of a tree, but prefers, and almost invariably makes choice of, the covered nest of some other species or of a hole in the tree. It is precisely the same with our Wren, *Troglodytes fuscus*. The *Sycalis pelzelni* invariably breeds in a dark hole or covered nest. The fact that these three species lay coloured eggs, and the first and last very darkly coloured eggs, inclines one to believe that they once invariably built shallow exposed nests, as the *M. rixosa* still occasionally does. It may be added that these species that lay coloured eggs in dark places construct and line their nests far more neatly than do the species that breed in such places, but lay white eggs. As with the *M. rixosa* and Wren, so it is with the Bay-winged *Molothrus*; it lays mottled eggs, and occasionally builds a neat exposed nest; yet so great is the partiality it has acquired for the domed large nests, that whenever it can possess itself of one by dint of fighting, it will not build one for itself. Let us suppose that the *M. bonariensis* also once acquired the habit of breeding in domed nests, and that through this habit its original nest-making instinct was completely eradicated, it is not difficult to imagine how in its turn this instinct was also lost. A diminution in the number of birds that built domed nests, or an increase in the number of species and individuals that breed in such nests, would involve the *M. bonariensis* in a struggle for nests, in which it would probably be defeated. In Buenos Ayres the Common Swallow, the Wren, and the *Sycalis chloropsis* prefer the ovens of the *Furnarius* to any other breeding-place, but to obtain them are obliged to struggle with the *Progne tapera*; for this species has acquired the habit of breeding exclusively in the ovens. They cannot, however, compete with the Martin; and the increase of one species has thus deprived three other species of their favourite building-place. Again, the *Machetornis rixosa* prefers the great nest of the *Anumbius*; and when other species compete with it for the nest, they are invariably defeated. I have seen a pair of *Machetornis* after they had seized a nest attacked in their turn by a flock of six or eight Bay-wings; but, in spite of the superior numbers, the fury of the *Machetornis* compelled them to raise the siege. Thus some events in the history of our common *Molothrus* have perhaps been accounted for, if not the most essential one—the loss of the nest-making instinct from the acquisition of the habit of breeding in the covered nests of other birds, a habit that has left a strong trace in the manners of the species, and perhaps in the pure white unmarked eggs of so many individuals; finally we have seen how this habit may also have been lost. But the parasitical habit of the *M. bonariensis* may have originated when the bird was still a nest-builder. The origin of the instinct may have been in the occasional habit, common to so many species, of two or more females laying

* The nest in which Darwin (Voy. of Beag. iii. p. 79) found this *Synallaxis* breeding, and which he naturally supposed to have been built by the bird, was probably a nest of *S. modesta*.

together; the progenitors of all the species of *Molothrus* may have been early infected with this habit, and inherited with it a facility for acquiring their present one. *M. pecoris* and *M. bonariensis*, much as their instincts differ in some points, are both parasitic on a great number of species—*M. rufoaxillaris* on *M. badius*; and in this species two or more females frequently lay together. Supposing such a habit as of two or more females very frequently laying together in the *M. bonariensis* when it was a nest-builder, or incubated its own eggs in the nests it seized, the young of those birds that oftenest abandoned their eggs to the care of another would probably inherit a weakened maternal instinct. The continual intercrossing of the birds with weaker and stronger instincts would prevent the formation of two races differing in habit; but the whole race would become deteriorated and decline, and would only be saved from final extinction by some individuals laying occasionally in the nests of other species, perhaps of a *Molothrus*, as *M. rufoaxillaris* still does in the nest of *M. badius*, rather than of birds of other genera. Certainly in this way the parasitic instinct may have originated in the *M. bonariensis* without that species ever having acquired the habit of laying and incubating in the covered dark nests of other birds. I have supposed that they once possessed it merely to account for their strange partiality for such nests, appearing, as it does to me, so much like recurrence to an ancestral habit.

2. On a small Collection of Birds from Barbadoes, West Indies. By P. L. SCLATER, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received February 5, 1874.]

I have the honour of exhibiting a small collection of birds from Barbadoes, West Indies, which has been transmitted to me in spirit by Sir Graham Briggs, F.Z.S. The only authority on the birds of this island at present is the unsatisfactory nominal list given by Sir Robert Schomburgk in his 'History of Barbadoes' (London, 1847), p. 680*.

The collection forwarded by Sir Graham Briggs contains specimens of the following species.

1. *DENDRÆCA PETECHIA* (Linn.).

A well-known Antillean species.

2. *CERTHIOLA MARTINICANA* (Gm.).

The *Certhiola* of Barbadoes appears to agree best with that of Martinique and S. Lucia, but shows hardly any of the characteristic white on the middle of the throat, as do my specimens from the last-named island. As, however, my single skin from Barbadoes has

* Cf. P. Z. S. 1871, p. 267.



Hudson, W. H. 1874. "Notes on the Procreant Instincts of the three Species of *Molothrus* found in Buenos Ayres." *Proceedings of the Zoological Society of London* 1874, 153–174. <https://doi.org/10.1111/j.1096-3642.1874.tb02466.x>.

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