

by the wagonroad 50 miles around. Big Tom is gamekeeper for Mr. Murchison of New York city who owns 13,000 acres of mountain land, bordering Big Tom's farm, and keeps it as a game and fish preserve. Included in Mr. Murchison's domain is Mt. Mitchell, on the very peak of which is the grave of Prof. Mitchell. Big Tom had gone to haul back some of Mr. Murchison's effects, for the first of August always finds the latter on his mountain preserve enjoying the invigorating air and scenery and prepared to indulge in the rich hunting and fishing. Our horses are cared for by the boys—Big Tom has ten children living—and soon supper is announced.

The night air is cool and rejuvenating and we slept soundly under abundant bedcovering and rose refreshed. The sun shone clear and promised a lovely day although it still continued warm. The forenoon was spent on the banks of Caney River with Sammy Wilson as guide. We fished—pretended to—some, loafed some and bathed in the clear, cold mountain stream. There are trout in these mountain streams, although one cannot expect to find them lying around loose.

At 2 P. M., Dr. Gatchell bade us good-bye and turned his horse's head in the direction of Ivy Gap and Asheville.

John Holden—one of Big Tom's sons—had our horses all ready, but a heavy thunder storm being in progress on the mountain we waited until 3 o'clock, then set out. For some distance our way led us alongside the Caney River and then branched, passing up and parallel to a small swift mountain stream emptying into the Caney.

At a distance of two miles we passed through a gate entering the domain of Mr. Murchison. Nailed conspicuously to a large tree directly in front of the gate was the usual notice against poaching. Soon we came to what might be called the region of the big trees. We rode around one mammoth poplar 11ft. in diameter and 32ft. in circumference 6ft. from the ground. There are many more 5 to 10ft. in diameter and 60 to 80ft. without a limb. Now our way led along the mountainside gradually but persistently ascending; down short but steep declivities to cross babbling mountain brooks only to scramble up the other side and pursue our tortuous course. At this altitude the rhododendron is just coming into blossom and the air is laden with perfume. How exquisitely lovely are the purple blossoms of these mountain shrubs; the leaves so large and of a brilliant dark green albeit somewhat stiff in arrangement. The rhododendrons about Asheville had long since covered the ground with their snow white petals. While anxiously and intently watching the narrow and difficult bridle path lest my horse should catch his foot in a root or slip on a rock, I availed myself of moments of respite to note the varied growth of forest trees as we ascended. They seemed to flourish in strata. First came the poplars, linden and cucumber, with occasional beeches and maples. Next magnificent maples and hemlocks from 3 to 6ft. in diameter. These are followed by the beeches, and then we pass into a solid growth of birches, the white, yellow and black. The large balsams are next in order. These seem to be of two varieties, at least the mountaineers distinguish them as the black and white. The first has a rough, dark bark with deep scoriings. The other (*Abies balsamita*?) has a smooth bark the color of a beech, and it is this tree which furnishes the balsam used medically. The sap exudes and forms small blisters containing a few drops each upon the bark, which the mountaineers puncture, and by slow and tedious labor gather for the market. As is well known, this balsam has wonderful curative properties, especially for catarrh and throat and lung diseases, consequently two physicians of this place have adopted a method of vaporizing the balsam, which is forced into all the air passages and lungs with wonderful results. Last of all we found the stunted, low-limbed, wind-swept, knotted and twisted balsams of the summit. The ends of the limbs, containing the new growth, were tinted with most exquisite frosty gray-greens. The foliage is massive and heavy, although the limbs are not long, except as they lie along the ground. The limbs and twigs are thickly studded with spines or needles about an inch in length and are quite stiff and the wood is heavy and firm.

Before reaching the balsam growth we passed through a blackberry patch, the tops of the vines of which I could not reach from my horse. We were obliged to force our way through these vines, with the mud sin deep, due to the heavy rains and the numberless springs. The vines, bushes and trees were heavy from the previous showers, and the Professor, who led the way on foot, was drenched to the skin. We finally reached an open space, about a mile from the peak, and for the first time in our ascent obtained a view of the region round about. We exclaimed with wonder and admiration, but the guide interrupted with, "Come, gentlemen, it is late, we cannot stop; wait till you get to the peak." Just before arriving at this open spot John Holden had noticed a snowbird fly out from a mossy bank beside the trail, and, dismounting, he pushed aside the portiere of damp moss and thrusting in his hand brought out one of the delicate eggs for our inspection. The remaining mile the trail is composed of rough, loose stones and boulders, with an occasional ledge of rock. At last John, who is lame, slips off his mule, with the remark, "You'll have to walk to the summit." A huge flat rock, inclined at an angle of 60 and 15ft. long by 6ft. wide, with only a seam or ledge 2in. wide for a foothold, and situated on a sharp curve in the trail, must be overcome before we can stand upon the very peak. The mule goes up like a fly on a window pane. George's horse also does very well. Will mice do as well? I looked around to find some way by which I could dodge the obstacle. I dared not leave the trail, so scrambled up and called to my horse to follow. He made a good start, progressed about half way, his feet slipped, and, going on his haunches, he slid to the bottom, where he sat up, forefeet hanging like a poodle begging for a cracker. The sudden jerk nearly dislocated my neck and shoulder, and I was forced to follow my horse. Fortunately my feet found a small projection, and by pulling lustily on the bridle rein I prevented my horse from rolling over backward. Gaining my feet by the time the horse does his, I started again, and the horse came with a rush and gained the top, trembling in every limb.

We have reached our goal and stand beside the rocky cairn surrounding the grave of Prof. Mitchell, 6,711ft. above sea level. Our heads are bared to the breeze and the company stand several minutes lost in reverent admiration, wonder and delight at the magnificent panorama spread before us. Mt. Mitchell stands nearly in the center of a sea of mountain peaks more or less sharp, some

of which are almost as high as itself. To the east and far below stands a curious shaped mountain called Table Rock. Its conformation justifies the name, and it guards a gap into the valley of the Blue Ridge. Bald Mountain is in the northwest. The rugged Balsams stand far away in the southwest, while far beyond them, faint and hazy in the fading light, the great Smokies guard the boundary line between North Carolina and Tennessee. Below us to the southeast the Blue Ridge stretches along at this height more like a range of hills than mountains. Hawk's Bill in the north is very suggestive. Lying between us and Hawk's Bill are Hairy Bear and Cat Tail peaks in the order named. A short distance away, south southwest, stands Clingman's Peak, nearly as high as Mt. Mitchell. Pisgah, which from Asheville appears mighty and towering, with the ever-climbing, never-wearying Rat struggling up its crest, now has dwindled to an almost insignificant hill, and occupies a position 50 miles distant southwest. The Grandfather Mountains bound the horizon on the southeast. John says, "I wish papa was here, he could tell you the name of every peak and valley you see." I am told one can, on a clear day, look into seven States from Mitchell's Peak, and cover with his gaze a radius of 200 miles. John cuts our meditations short by saying "Come gentlemen, it'll soon be dark and the wood is wet." We turn reluctantly, and following him down a sharp declivity reached our camping place. A large shelving rock projecting out 12ft. or more and extending along the side of the cliff 30ft. offers us shelter. By extra exertions and much blowing we succeeded in starting a blaze. Balsam boughs are gathered, which, together with what have been used by a previous party of campers are to form our mattress. Some spread the blankets while two others go to a neighboring spring for water and to gather more wood for the night. Supper is next in order. During the progress of the meal George regales us with an account of his experience a year ago when some time in the night the horses concluded they had had enough of camping and left for pastures new and home. They were found in the morning by Big Tom half way down the mountain. We expressed the hope no such calamity would befall us, and John said "They won't go off, and if they do the trailing ropes will stop them." After a time John startled us with the exclamation, "I believe those doggoned animals have gone off!" Neither the horses nor the mule were in sight, and John and George jumped up and ran around the cliff. Soon they returned, leading the erring beasts, who, led by the mule Beck, were found on the peak headed for home. The horse Nig and Beck are securely tied and the other remains near. We reclined about the fire and caught what few stray tints were vouchsafed us from the setting sun reflected in the east.

The clouds were still heavy and low enough to hide the glories of the sunset which we had come so far to see, and we consoled ourselves with hopes for the morning. As night shut down a cooler breeze blew across the mountain, although coming from the west and our cave opening to the east we were in a measure protected. At four o'clock in the morning, as if by mutual instinct, Professor Waller and I simultaneously sat bolt upright and gazed upon the eastern sky as the first cool gray tints arose. We stood upon our feet and piling on a fresh supply of fuel placed our backs to the fire and watched. How thankful we were for the promise of a clear sky, with just enough of the floating cumuli to give value to the rising sun and his glory. Look at the mass of clouds below us. How cold and like the heaving sea frozen in its moment of action.

See this is a bold rocky headland upon which westward. Yonder projecting peak is a mighty rock rising from the sea cold and dark, gray with its covering of seaweed and drift. Out there is a rocky island, while scattered about are inlets and rocks bordering a dangerous coast. Beyond is the almost landlocked harbor, out through the gate stretching far, far away is the frozen sea with its broken undulating surface. We cannot be deceived, this is a glimpse of the silent polar sea. Meanwhile the sky is flushed with the richest of crimson colors, and the mass below us reflected in cooler tints the glory above. About us twitter the snow birds as they flitted from rock to cliff and shrub to tree in cheeriest appreciation of the beauty of the scene. As the sun rose higher the ruddy richness of his countenance changed to a more metallic lustre, and the projecting surface of the motionless sea reflected a golden hue, while the cold blue shadows gave place to warm gray tones.

Prof. Waller likened the mass directly under our feet to a mighty glacier, its precipice here at the opening to the sea and its body stretching far up among the everlasting mountains. The sun has reached sufficient height to touch some of the masses of clouds, and as his ray penetrate and warm them portions are detached, and rising float away on noiseless wing like thistledown on the morning's breath. Language fails and adjectives lose their value. To very few is it vouchsafed to behold such a sunrise from Mt. Mitchell.

Holden has been some time astrig preparing breakfast, and while eating we questioned John about Prof. Mitchell and how and where his father found the body.

Thirty years ago on the 8th of July, having searched for days, Big Tom Wilson found the body of Prof. Elisha Mitchell in a pool of water 18ft. deep at the foot of a cliff 40ft. high on Sugar Camp branch of the Cat Tail fork of Caney River. He had evidently wandered around, no one knows how long, lost in the darkness and jungles of the mountain side, and falling over the precipice had been drowned in the pool below. The remains were taken to Asheville for interment, but were afterward removed to the very summit of the mountain which bears his name.

Prof. Mitchell at the time of his death was sixty-four years of age, and had gone upon the mountain to verify measurements and observations taken at a previous time. Around the grave he's been reared a cairn of loose stones picked up from the mountain top, and each visitor adds one to the wall in memory of the illustrious sleeper.

Breakfast over John said we must start soon in order to reach home for dinner. We cast one long, lingering look to photograph the picture on our memories, and just as we were passing off the crest I dismounted to cut a balsam stick for a memento. It was just nine o'clock when we left, and we anticipated reaching the house at eleven. On our way we started a woodcock feeding along the trail. The others did not recognize it, but the whistle was music to my ears.

It was 9 A. M. the next day when we bade good-

bye to the hospitable family and turned our faces toward Ivy Gap. At 1 P. M. we reached Chambers, and before leaving I planned with Hardy for a week's hunt some time in the fall. We reached Asheville at 7 P. M., tired but in jolly good humor, and reveling in the memory of what we had seen, having spent four days on the trip.

P. P. STAUNTON.

## Natural History.

### A CHAPTER ON PTERYLOGRAPHY.

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WERE the question propounded to any person who had never given the matter a thought—are the feathers of birds implanted in their skin in such a way as to spring from it by an even and unbroken distribution over the entire surface of the body, or are the feathers arranged upon any plan, so that were they all trimmed down close to the skin there would be presented to us some definite pattern of arrangement duly outlined by the remaining extremities of the quill-butts? I am inclined to suspect that not only that person but perhaps a great many people would at first say, "Why, a bird's body is entirely covered with feathers, of course, and they arise by an even distribution all over it." Now, the truth of the matter is that there are but a very few birds indeed that at all approach any such condition (penguins, toucans and ostrich-like birds), the vast majority of the class having their feathers arranged upon their bodies after some definite plan. This particular arrangement of a bird's plumage is technically designated by those engaged in investigating their structure as its PTERYLOSIS. From the several parts of the body the feathers spring from the skin along certain lines, or from definite circumscribed areas, in either case known as "tracts" (*pterylae*), while the unfeathered portions which occur in between these are defined as "spaces" (*apteria*). Such being the case science in due time seized upon this discovery and enlisted so useful a characteristic in aid to the classification of birds, as men were not long in finding out that the pterylosis differed in the several families and orders of the class. A great continental naturalist, Nitzsch, has done more for us in this direction than any one else, and I may add that the pterylosis of a great many of our United States birds remains yet to be described, and that, too, in many important forms demanding a more correct classification than has thus far been awarded them. Further on I will demonstrate this latter statement by a forcible example, and as the pterylosis of a bird with due care can easily be described and worked out, it is the chief object of this contribution to excite the interest of naturalists and others in this subject, with the hope that further investigation in the field will be duly undertaken.

Nitzsch employed four principal methods of studying the pterylosis of a bird; (1) by examining nestlings; (2) by plucking adult specimens; (3) by clipping off all the feathers, wetting the body, and then examining it; and (4) by skinning the bird, and studying the *pterylae* and *apteria* upon the inner surface of the skin.

In the present connection it is not the writer's intention to enter upon the subject of the study of the structure of the numerous forms that feathers themselves are known to assume, for as interesting as this is, space alone would prevent such a step here. Nor do I intend to dwell, and for the same reason, for any length upon the arrangement or number of the feathers-in-chief of the wings (*remiges*) or the tail (*rectrices*), both of which are known to be so various in birds. Much less do I intend to enter upon the character of plumage itself, and the fantastic variations it may display in a great many of the representatives of the class.

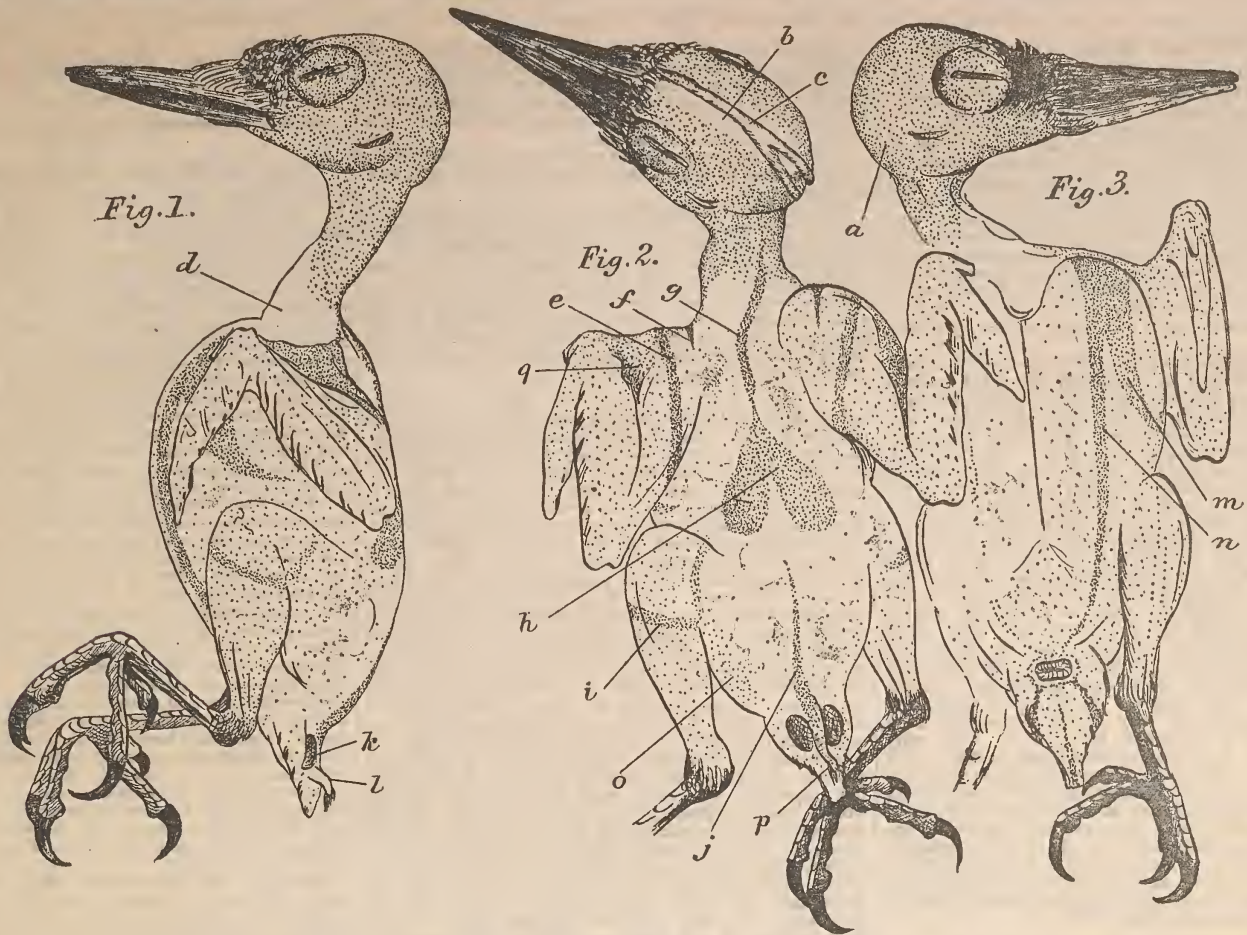
On the other hand, I shall aim to present the several names which have been bestowed upon the feather-tracts, to designate them; and by pointing them out by the aid of my drawings, herewith presented, show their relative position in one of our birds; and finally will offer another bird, nearly related, and with appropriate figures endeavor to point out the value of pterylosis in classification.

By this means I hope to lay a safe guide before any one, who in the future may have the opportunity to study the pterylosis of our birds, and especially in those forms which, up to the present writing, have not fallen into the hands of science except in dried skins, which are useless for such purposes.

Any accurately recorded pterylographical notes are of the highest importance to the science of ornithology.

Let us next investigate this matter in the way I have already proposed above, and for this purpose I choose an adult male specimen of Harris's woodpecker (*Dryobates villosus harrisi*), and an adult male specimen of the red-naped woodpecker (*Sphyrapicus varius nuchalis*). These birds are now before me; and first we will pluck them both carefully, commencing at the base of the mandibles in each case, and extending it down as far as the root of the neck.

It will at once be observed that in these two woodpeckers the head-tract or capital pteryla (*P. capitis*) is very different. In Harris's woodpecker there is a median naked space on top, for the most part overlying the elevation caused by the epibranchials of the hyoidean arches, which Nitzsch says occurs in all the woodpeckers he ever examined, but this authority never inspected a specimen of our *Sphyrapicus*, and in this bird the head is completely covered with feathers (Figs. 4 and 5), and no such median naked space is to be found. Moreover, as *Sphyrapicus* has a hyoidean apparatus very much as we find it in the majority of birds where the epibranchials are not curled over the top of the skull as shown in Fig. 2 at c, the skin is not elevated along that region. In some birds, of course, as the condors, the head is destitute of feathers. THE HEAD-TRACT, as a rule, however, includes the head and the lateral tracts of the neck, merging below into the *ventral* and *spinal* tracts (Figs. 4 and 5). We may next completely finish the plucking of our two specimens, closely observing the position of the feathers as we deliberately remove them. Now it will be found that with some few, very few comparatively, birds a strip of feathers of uniform width run down the entire length of the back, but as a rule the greatest amount of variation exists in this particular. In the case of the two woodpeckers before us a marked difference is again seen, for this spinal-tract in Harris's woodpecker commences above



PTERYLOSIS OF HARRIS'S WOODPECKER.

Fig. 1.—Left lateral view of a plucked specimen of Harris's woodpecker (*D. v. harrisi*); adult male; *d*, upper part of the "inferior space" (*Apt. mesogastrici*); *k*, the uropygial gland of the left side; *l*, its external papilla with opening at its summit, which is also "tufted." Fig. 2.—Dorsal aspect of the same specimen; *b*, capital apertum; *c*, the median (at the point indicated) elevation of the skin caused by the epibranchials of the hyoid apparatus beneath it; *e*, humeral tract; *f*, inner humeral tract; *g*, humeral tract; *h*, lower dilation of spinal tract (the saddle); *i*, lower part of spinal tract (rump tract); *j*, crural tract; *o*, femoral tract (very faintly seen in a woodpecker); *p*, caudal tract; *q*, alar tract. Fig. 3.—Anterior or ventral aspect of the same specimen, with its head turned to the left; *a*, capital tract; *m*, the ventral tract, and *n*, its external branch. All the figures drawn by the author from the specimen.

as a narrow, median, longitudinal strip, which dilates at the middle of the back as a bifurcated "saddle-tract" (Fig. 2, *g* and *h*); then occurs an interruption when a rump division of the spinal-tract commences and extends down over the tufted oil-gland (*j*), while that part which is carried over the caudal region (the true tail of a bird) is designated as the CAUDAL-TRACT. Turning to *Sphyrapicus* we note that there is no interruption in the spinal-tract,

Still referring to Figure 2, we note that the humeral region of each arm is obliquely crossed by a narrow feather strip (*e*), which is known as the humeral-tract (the single long bone of the arm is the humerus), while in our woodpeckers we see a character quite peculiar to them, being present in both of our specimens, and shown at *f*, a little separate tract, called the inner humeral-tract. Nitzsch found only one woodpecker that lacked this characteristic feature, a Sumatran type (*P. luridus*). Such feathering as a wing may show, aside from the flight feathers, is collectively spoken of as the ALAR TRACT (Fig. 2, *q*).

Over the region of the thigh there is a tract known as the FEMORAL TRACT (Fig. 2, *o*), which is but very faintly indicated in woodpeckers, not noticeable at all in most specimens and species.

Then across the leg there is a well defined strip which we call the CRURAL TRACT, shown in Fig. 2 at *i*, and is even more conspicuously seen in *Sphyrapicus* (Fig. 5).

We may also see from these figures that the *apteria*, or naked spaces, are sparsely covered over in some places by small, downy feathers of an elementary character.

Turning next to Figures 3 and 4, we are enabled to study the feather-tracts as they are found to occur upon the ventral aspect of the body—and here again we note that no little difference obtains between our two specimens of woodpeckers.

Most often the VENTRAL-TRACT is a single broad one, extending from the region of the shoulder in front down to the vent, being situated about half way between the middle line of the body and the side, and not so well marked for its lower moiety as it is above (Fig. 3, *m* and *n*). In these woodpeckers, however, the upper part of this ventral-tract bifurcates, giving rise to an external tract seen at *m* and of quite a different form in *Dryobates* and *Sphyrapicus*.

A circlet of feathers usually surrounds the vent, and in Harris's woodpecker there extends down over the anterior aspect of the coccygeal region, from this point, on either side, a narrow feather tract, which, taken in connection with a median line over the same part, we might collectively name the POSTVENTRAL-TRACT, in the absence of any other designation known to me for it.

We have, then, the following feather tracts to study and compare in birds with the view of assisting us in our classification of this group of vertebrates, viz.:

1. The spinal-tract (*Pteryla spinalis*).
2. The humeral-tract (*Pteryla humeralis*).
3. The femoral or lumbar-tract (*Pteryla femoralis seu lumbalis*).
4. The ventral-tract (*Pteryla gastræi*).
5. The lateral neck-tract (*Pteryla colli lateralis*).
6. The head-tract (*Pteryla capitis*).
7. The wing-tract (*Pteryla alaris*).
8. The crural-tract (*Pteryla cruralis*).
9. The caudal-tract (*Pteryla caudalis*).
10. The postventral-tract (*Pteryla postventralis*).

There will, too, of course, be some anomalies to be on the lookout for, as we see in the "internal humeral tract" and such others like it.

This chapter will not have been contributed in vain if it but prove to be the means of inciting even one careful observer to enter upon this very fruitful field of research.

As for myself, I was never so fully impressed with the value of pterylography as an aid to correct taxonomy in birds, as I was when I came to investigate this character and compare it in the swifts and hummingbirds, forms hitherto supposed to be related to each, sufficiently so at

least, to place them in the same order. I found the pterylosis in a swift widely different from the pterylosis in a hummingbird, a fact which further supports a former proposition of mine, elsewhere published, to the effect

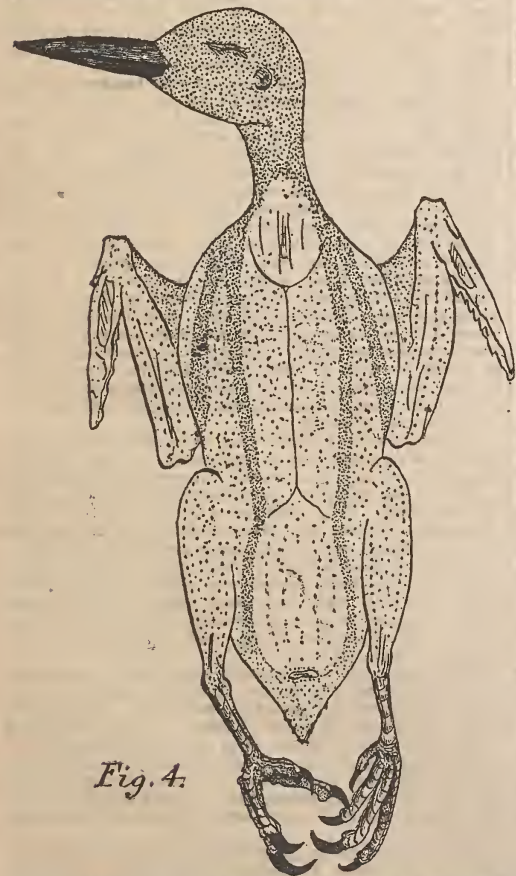


Fig. 4.

Fig. 4.—Ventral view of a plucked specimen of the red-naped woodpecker (*Sphyrapicus v. nuchalis*), showing its pterylosis or feather-tracts. (Life size, by the author from nature.)

and that the "saddle portion" is a lozenge-shaped area, as shown in Fig. 5. This is particularly interesting when taken in connection with the condition of the hyoid in this bird, for the arrangement is quite similar to the spinal-tract as it is found in passerine birds generally. Birds also show a great variation in their spinal tracts, and I hope some of the readers of FOREST AND STREAM will demonstrate this to their own satisfaction.

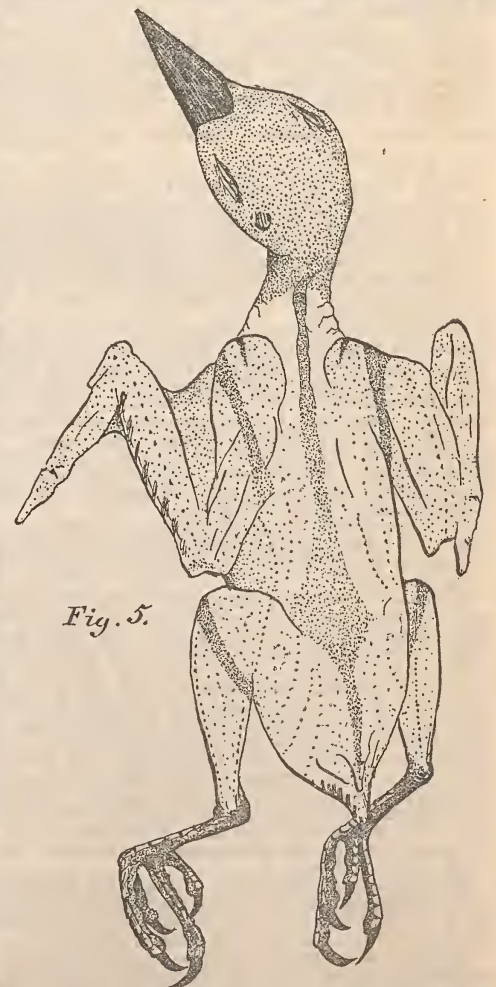


Fig. 5.

Fig. 5.—Dorsal aspect of the same specimen of *Sphyrapicus*, shown in Fig. 4, designed to illustrate its pterylosis. (Life size, by the author.)

that these birds belong in entirely different groups, they not having any special affinity whatever, as any one may see who has ever taken the trouble to fully investigate their structure.