into them. This both dispersed and quieted them. Although all these nests were completed, even to the abundant supply of fresh leaves, that new nests always contain, no eggs had been laid. So the nests still attached to their respective positions were left at the base of the nesting tree.

A week later we chanced to return to the spot. The colony contained about the original number of nests hung in the tree. On the ground were the limbs in the place we had deposited them. But the only traces of the nests that had been attached were some short strands so inextricably woven about the leaves and their petioles that they defied unravelling.

Junco vulcani.—We were fortunate enough to meet with this snowbird in considerable numbers during our visit to the Volcano Irazu. Our observations differed somewhat from those of previous observers inasmuch that we found them among the oak timber, as low as 10,000 ft. as well as above the timber line. What I wish to record is the difference in amount of plumage wear this species is subject to under varying degree of humidity, at the same relative attitude and within an area of a few square miles.

As is well known, the south slope of the Volcano Irazu, although on the Caribbean slope of the continental divide, lies in what is termed the "shadow of the Volcano," and is thus deprived almost entirely, from December to May, and to a considerable degree during the balance of the year, of the perennial moisture carrying clouds that blow in from the East and Northeast. About three miles to the east of the main crater of the Volcano is a pass, through which a road passes that leads to the Volcano Turrialba. As soon as this pass is reached, the rainfall and humidity greatly increase and it is noticeable that pastures and herbaceous vegetation generally do not dry up in the winter and spring months as they do south of Irazu. The demarcation line between the wet and dry zones is but a couple of hundred feet wide at the pass.

Such individuals of this Junco as were taken on the slope of Irazu were all in very worn plumage, that could not be matched by a single specimen that came under observation taken at the pass or to the eastward. For the most part these individuals from the humid zone were in comparatively fresh plumage, such as the species should wear at the beginning of the nesting season, and from examination of the sexual organs I judged that the breeding season was near. While I saw no young of the species during my stay (May 3 to 19, 1920) I did shoot a female on the 10th, within the dry zone, carrying a crane-fly (*Tipula*) in her bill; and another female was taken on the 6th, while I was making the trip to the crater that had her bill full of dried grass stems.—Austin Paul Smith, *Cartago, Costa Rica.*

Observation of a Remarkable Night Migration.—A flock of birds, present in such numbers that they were continually passing across the field of the theodolite telescope, were noticed in the course of following

the track of a pilot-balloon released at this station to determine the upper-air currents on the afternoon of May 3, 1920. Since the birds appeared to be oriented in the same general direction and to be flying in compact group formation, I decided to take readings of the positions of the individuals which could be "spotted" in the telescope, with a view to determining the speed, direction and incidently the altitude of the birds.

Before giving the details of the observations I may state that no attempt has been made to come to a conclusion as to the kind of birds noted, but my belief is that they were either hawks or ducks, owing to the similarity of their mode of flight to that of the wild-goose but with more rapid beating of the wings than in the wild-goose, with whose flight I am familiar. At the distance at which the birds were observed neither color nor fine definition of type could be seen, although the spread of a single wing of the individuals seemed to approximate the size of the pilot-balloon which was last seen at about the same level as the birds were using.

Conditions were especially propitious for determining the altitude of the birds, for the clouds closely beneath which they were winging were of the cumulus type, with flat, equally elevated bases and domelike tops. Luckily the balloon rose into the base of one of these clouds and was lost to view at an altitude of 1700 meters.

Upon losing the balloon, I turned the theodolite against a background of cumulus cloud and awaited the arrival of an individual of the flock to come within the field. Some idea of the large numbers of the birds can be had from the fact that it was possible to pick up at random a space in the sky and promptly find one of the birds winging across it. The birds were more than a mile distant and efforts to see them with the naked eye were fruitless.

Both of the individuals sighted were kept in sight for 60 seconds; before a second minute-interval elapsed they had become immersed in cloud and lost to view. The first bird "spotted," whose altitude was assumed to be 1600 meters by reason of its passage under the cloud base, was picked up at azimuth 193.2° (0 equal to North, 90 equal to East), and at elevation 25.2°. Sixty seconds later it was found at azimuth 198.9°, and elevation 21.2°. The resulting track shows a ground speed of 13.2 meters per second toward azimuth 223° (SW).

The second bird was picked up at azimuth 182.3°, elevation 36.2°; sixty seconds later it was found at azimuth 189.2°, elevation 31.7°. Its resulting track shows a ground-speed of 9.3 meters per second toward azimuth 221° (SW), when an altitude of 1800 meters is assumed. This was arrived at from the fact that this bird flew into the edge of one cloud after passing indistinctly through the extreme lower side of another cumulus cloud.

As the first individual was encountering a north wind of 4.5 meters per second (as computed from the pilot-balloon run) his wing-speed was 7 meters per second. The second individual encountered a north-northwest wind of 4.0 meters per second at the 1800 meter level, hence its wing

speed was 11.5 meters per second. It was quite noticeable that the birds were being blown off-course, because of the lack of similarity between the direction in which they were headed and the direction in which they were progressing.

Emphasis should be given to the good fortune in having two factors known within narrow limits: the altitude of the cloud bases, and the nearness of the birds' levels to the cloud bases. I may add that on rare occasions birds pass singly across the field of the theodolite, but no instance of such numbers being visible in the field at one time has ever been my experience in following balloons during the past two years.

It should be remarked that there is little by which to identify the kind or even the type of bird observed. The mean diameter of the balloon was .71 centimeters, and it is estimated that the spread of a single wing of one of the birds would have completely covered the balloon. There seemed to be moderate length of neck, little or no length of tail, and no distinguishable trailing legs about these birds. The main point of interest probably is the determination beyond question of the rate of speed maintained by birds evidently flying with a fixed objective in flock or group formation.

I would add that the further observation of these birds would have been carried out had time permitted, but as the immediate despatch of upper-air data computed from the balloon run is of great urgency it was necessary to bring the theodolite sighting to a close.

The kind assistance of Mr. B. B. Whittier, Observer U. S. Weather Bureau, who checked and corroborated the readings is gratefully acknowledged.—C. G. Andrus, *Observer, U. S. Weather Bureau, Lansing, Mich.*