

DISCUSSION AND CORRESPONDENCE

BIRD COLLECTING AND ORNITHOLOGY

THE letter from Mr. Joseph Grinnell published in *SCIENCE* for February 12 last, in which he pleads for the conservation of the old-fashioned bird collector has led the present writer to suggest a few points on the other side of the question. The menace to our laws protecting birds and to our system of government bird reservations contained in Mr. Grinnell's attacks on them does not seem serious, nor does anything in his letter appear likely to greatly affect the opinion now prevailing not only among the general public, but among scientific men, that even a much more complete disappearance of such bird collectors can be contemplated without anxiety for the future of science in general and of ornithology in particular; that the usefulness of such collectors except in remote and little explored regions has largely gone by; that their assistance to real science is rarely more than very slight and oftener nothing at all; and that their destructiveness is very great. Too many of Mr. Grinnell's claims are directly opposed by the results of practical experience. For instance, who can deny that many holders of permits for collecting birds for scientific purposes are using them for commercial collecting, and that many of those who are making bird collections either with or without such permits encourage violations of the law by others through buying specimens from those who have no right to kill or sell them? Yet Mr. Grinnell would have us break down all restrictions, and have collecting permits "issued by both state and federal governments freely to applicants upon avowed sincerity of purpose."

Neither does Mr. Grinnell's claim that sportsmen are more liberally treated than those claiming to have scientific purposes in view require discussion here. The rapid decrease of our game birds indicates the need of better control of the sportsmen, but not necessarily the removal of restrictions from others.

On the other hand, there are many questions raised in or suggested by this letter that are timely and deserve serious consideration, and it is to some of these that the writer in-

tends to confine his communication. Are any real scientific investigations, even of very minor importance and doubtful value, being prevented or hindered by existing restrictions on collecting? If so, can Mr. Grinnell name them? Has not systematic ornithology, that is the distinguishing and describing of new species, subspecies and races, proceeded to such a point in nearly all parts of North America that material is now needed as a basis for any reliable conclusions in amount far beyond what even the most capable amateur can accumulate, even if unrestricted in his collecting? Are not the large collections of the National Museum and other public and semi-public institutions made partly for just that kind of study, and is not the help of such institutions liberally given to those who desire it?

The writer will not maintain that there are not still many restricted and special problems in systematic ornithology even in the United States, which independent study can effectively deal with. Is there any would-be investigator having a definite problem of that kind to settle that finds his purpose blocked by the refusal to permit him to collect the limited and special material necessary for his needs?

The scientific value of the average bird collection, or even of one made with far more than average care, is greatly overrated. As a rule the collector publishes little or nothing in regard to his studies, if indeed he does study his specimens at all. If he happens to be a wealthy man he may acquire large series of birds and eggs, entailing great destruction of bird life and disastrous effects on some of our rare and disappearing species; but when he tires of his fad, or when his collection comes into the possession of his heirs, it is not unlikely to perish from dust, moths and careless keeping, or, if eventually donated or sold to some public or educational institution, to reach the latter in a condition where most of its scientific value has been lost. Amateur collectors frequently fail to preserve those notes and data by which they might fill the gaps in our scientific knowledge and the deficiencies in the descriptions in our scientific

books, because they do not know enough to do so, or are too careless or too hurried in their endeavors to get large series of specimens. The source, localities and dates of the specimens in such collections are often doubtful, since the collectors are likely to be careless in distinguishing between reliable first-hand information and that which somebody tells them, and too ready to accept as truth and to record as facts statements of unscrupulous dealers in regard to the specimens they sell; and the existence of material scattered in small collections is generally unknown to those who might employ it to advantage in the investigations they are conducting. The number, cheapness and general accessibility of reliable books on birds, many of them with photographs from life and colored illustrations of a high degree of accuracy, has greatly detracted from the educational importance of bird collections, not only for the general public, but for those wishing more than a superficial acquaintance with our birds.

If annoying restrictions are in some places imposed on scientific ornithologists, is it not largely because they have too often allied themselves with those who collect birds and eggs merely as a hobby, and who might better be engaged in the less destructive pursuit of collecting postage stamps? No doubt this alliance has been partly for the sake of increased opportunities for obtaining specimens by purchase or exchange, and partly because of a belief that some ornithological genius might develop among the amateurs thus incited to greater efforts. But has not the actual result been to lower the character of bird study—to place ornithology in a position apart from other branches of zoology and nearer to pursuits not truly scientific?

It has resulted in spreading altogether mistaken ideas of what science is and of what ornithology should be, and encouraged such false and destructive delusions as the common idea that one of the highest achievements of the ornithologist is to kill some rare straggler or accidental visitor and "establish a record" or "add to the fauna" of his state or county some species not previously listed, which, from any common sense point of view does not prop-

erly belong to the fauna at all. If such rare bird visitors are of species formerly found in the region but now practically or entirely exterminated, their killing may effectually put an end to an attempt to reoccupy the abandoned territory, and thus prevent the species being added to the fauna in reality, not merely in ornithologist's language. The writer thinks that many ornithologists and other scientific men who believed in their younger days that it was a necessary incident, if not the largest element, in being an ornithologist, to go out and shoot catbirds, scarlet tanagers and bluebirds, and rob their nests, have now discovered that they did so because they did not know any better, or followed bad advice given by other collectors or contained in the older manuals for ornithologists. Most of them will certainly be inclined to suspect that they could have learned many times as much about birds in less destructive ways, and probably few of them would in that case have found bird study any less interesting. More is being discovered about birds to-day with field glasses and cameras than with gunpowder and shot, and much of it is trustworthy scientific information, which to say the least ranks as high in interest and value to humanity as that which the average bird collector's cabinet of bird skins and egg shells can afford.

In closing the writer would like to emphasize the fact that this is no time for reactionary protests and attacks on the tardy and insufficient efforts that are at last being made to save our native birds and animals from extinction. The indifference displayed by scientific men to the destruction that has been and is still being carried out in every part of the world is far from creditable, since in many cases they are the only ones who realize its extent and inevitable results, and who can bring the subject to the attention of the public and intelligently plan and direct methods to stop it. The list of North American birds already destined to extinction within the next few years is considerable. Only very prompt action will save a good many others whose preservation is not yet hopeless.

The large whales and certain other marine mammals, a considerable proportion of the

larger land mammals of the world, and the peculiar and interesting indigenous faunas of many small islands may still be permanently preserved by prompt protective measures, and not merely state and national action, but as soon as the war is over, international agreements to bring about cooperation for these ends are urgently needed. Future generations will look back on the present time as an age of shameful vandalism as far as nature is concerned. Our present imperfect and feebly carried out efforts for the preservation of the most interesting and wonderful of the birds and mammals that still survive are insufficient. They must be on a larger scale and more effectively and intelligently conducted than at present. It should be the effort of every scientific man, and especially of the larger and more influential scientific associations, to bring the seriousness of the situation to public notice and to insist on prompt action. This is vastly more important for zoology to-day than the naming of new subspecies or than disputes over the validity of scientific names, and should put an end to complaints over small personal and temporary inconveniences which regulations of the greatest importance may incidentally occasion.

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FUNDAMENTAL EQUATIONS OF MECHANICS

TO THE EDITOR OF SCIENCE: We are greatly interested in the contribution to the teaching of elementary dynamics made by Professor Kent in his letter to SCIENCE appearing in the issue of March 19, in which he presents as the fundamental equation of mechanics $V = FTg/W$, where F , T and W are, respectively, force in pounds, time in seconds and quantity of matter in pounds, g a numerical factor of proportionality and V velocity in feet per second. This equation has the great advantage of avoiding the extremely awkward necessity involved in apparently simpler formulations of the experimental laws under consideration, of defining force in terms of mass, as so many of the more conservative physicists insist on doing, or of defining mass in terms of force, a thing which many of these conservative physicists seem to consider as the only alter-

native and which all engineering writers appear to disclaim with equal vehemence.

There can be no doubt of the difficulty of measuring quantity of matter, that is comparing the quantities of matter in two bodies, one of which is taken to be a standard, except by resorting to forces acting upon them. On the other hand, there can be no doubt of the inadvisability of attempting to preserve an international prototype force instead of a prototype quantity of matter, owing to the probability that secular changes in the elastic properties of material bodies would be vastly greater than changes in their quantity of matter. To be sure it would be possible to define the international prototype force in terms of the gravitational relation of a given body to the earth, but this would be open to the same objection as the one that was raised in regard to measuring the quantity of matter in a body by resorting to forces. We therefore think that Professor Kent has done well to retain force and quantity of matter as equally fundamental.

What seems to us as unfortunate is the necessity of defining velocity in terms of distance and time. Why not regard all dynamical quantities that are sufficiently distinct to be given different names as equally fundamental? Why stop with distance, time, quantity of matter and force? We see no reason for imposing on ourselves such a limitation.

On this principle the equation $F = ma$, to which Professor Kent objects because it is not true unless we make m an arbitrary symbol for W/g , is open also to our objection that a has been defined in terms of other magnitudes, whereas nature has furnished us with a definite acceleration, that of a body under the influence only of its gravitational relation to the earth at sea-level and latitude 45° as modified by its tendency to rise due to the rotational motion, which may well be taken as unit acceleration.

It appears to us that Professor Kent's contention is essentially this: that since the *concept* of force is independent of quantity of matter, distance and time, it is irrational to force people to take their *measure* of force from a dynamical equation involving these three sorts of magnitudes. We should take