ity. Professor J. J. Nassau, of the department of mathematics and astronomy of Case School of Applied Science, and Dr. G. Strömberg, of the staff of the Mount Wilson Observatory, have given very great assistance in the mathematical analysis, and have developed solutions of various parts of the problem, and also a complete least-squares solution of the general problem. A definitive numerical calculation will require several months of continuous work and is now in progress.

The ether-drift experiments at Mount Wilson during the last four years, 1921 to 1925, lead to the conclusion that there is a positive displacement of the interference fringes, such as would be produced by a relative motion of the earth and the ether at this observatory, of approximately ten kilometers per second, being about one third of the orbital velocity of the earth. By comparison with the earlier Cleveland observations, this suggests a partial drag of the ether by the earth, which decreases with altitude. It is believed that a reconsideration of the Cleveland observations, from this point of view, will show that they are in accordance with this presumption, and will lead to the conclusion that the Michelson-Morley experiment does not and probably never has given a true zero result. A complete calculation of experiments, to be made in the immediate future, should give definite indications regarding the absolute motion of the solar system in space.

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RISKS INCURRED IN THE INTRODUCTION OF ALIEN GAME BIRDS

WITH the decrease in the supply of game animals which has inevitably accompanied the close settling of our country by Europeans, it has commonly occurred to those interested to remedy the situation by importing and planting non-native species which it is thought might be more prolific or hardier than the native species. This idea at first thought is appealing, and it has seemed so reasonable to many game administrators that it has been tried over and over again both in our own state (I am writing from California) and in other states, at great public expense. Experiments of this sort within the state of California alone have entailed the expenditure of upwards of fifty thousand dollars, as shown by the printed reports of our California Fish and Game Commission. But, not one non-native game species has become established here to a degree of success warranting the declaration of an "open season" upon it.

It has just been announced through the public press that our state fish and game commission, apparently forgetting all these past and unsuccessful experiments, has again under serious consideration a plan for raising in captivity and liberating certain non-native game birds; and the kind specifically mentioned is the Hungarian partridge. This announcement must bring dismay to every student of nature whose concern (as is my own) extends to include the welfare and usefulness to man of California's wild life generally and is not restricted to objects of sport alone.

In the first place, it is believed by some thinking naturalists that the chances are decidedly against the success of this project—success as bringing the beneficent results expected of it by the gunner. To repeat, such experiments have already been tried,[1] and these have involved no less than twelve non-native game species and an aggregate of at least 13,000 individual birds, by record, liberated. No success has been achieved. Are chances of success now, with further depletion of natural food and cover, any better than before?

Howsoever, *if* the introduction now proposed *should* prove successful from the sportsman's standpoint and, say, the Hungarian partridge become fully established, what would be the possible, even probable, results? One result, about which there is no question whatsoever in my own mind, would be the crowding out, the supplanting, in partial measure if not altogether, of our native California quail.

An axiom which I think all close students of natural history would accept without reservation is as follows: No two species of identical or even closely similar biological predilections can long occupy the same niche or ecologic space at the same time. If the same food supply, in kind and amount, if the same type of shelter for roosting or resting, or if the same sort of breeding places be resorted to by two species, there will be inevitable conflict. One or the other species will give way, because bound to be at less advantage in some respect as to structural equipment or instinctive manner of reacting to the conditions about it. The Hungarian partridge and the California quail belong to two genera of gallinaceous birds within the same family. While there are undoubtedly some differences between these two birds in their ecological requirements, the general similarities are exceedingly close. More or less keen competition would be bound to operate sooner or later to the disadvantage of one of them. I, for one, hereby protest against any act that will likely jeopardize the existence of our native Califor-

[1] See Grinnell, Bryant and Storer, "Game Birds of California," 1918, pp. 29 to 44.

nia quail, than which there is no finer game species in the world, according to the testimony of experienced sportsmen themselves. A species once exterminated is beyond recall.

As bearing further upon this question of the dangers of competitive replacement, I would point out what seems to be a general natural law, which may be stated as follows: When a species native to a large area is successfully introduced into a new small area the related species which is native in this area and with which the former comes into competition is soon supplanted. There are scores of cases supporting this law—among European species introduced into Australia and New Zealand, Australian species introduced into New Zealand, and European (that is, Eurasian) species introduced into North America. It looks as though the environment of large compass, where the long-time inhabitants have been subjected to the widest range in the rigors of existence, has developed species of the greatest hardihood, and particularly of the greatest degree of aggressiveness. The European house sparrow, the European starling and the Chinese mynah have been spreading at an amazing rate in North America, with testimony overwhelmingly to the effect that American species of wild birds are giving way before them. The Hungarian partridge, if, as our state fish and game commission expects, it be once established in California, would, according to this apparent law, eventually dominate our territory as against the less aggressive native valley quail and mountain quail. These would be crowded to the wall; at worst, become extinct.

Do sportsmen themselves, let alone nature-lovers and scientific students of wild life, invite such a calamity? It is perfectly clear to me that this one threatening peril, that of displacement of our wonderfully attractive native quail and grouse, should decide against the carrying out of any plan to bring in and plant any alien game bird.

Besides, there are other dangers which, in the larger interests, even essentially economic interests, should not be overlooked in weighing the wisdom of the proposed introduction. There is the danger that some disease or parasite inherent in a species of foreign origin would be brought in and transmitted to native birds of various sorts or even to domestic birds. These native or domestic species would likely enjoy no such relative immunity to a disease new to them as would the species in which the said disease is, one may say, normal. Instances of this very sort have occurred in other countries. Is it justifiable to run even the faintest chance of receiving into our agricultural districts some new poultry disease?

All students of nature, sportsmen themselves, will grant that in final analysis *the* factor which is operating to reduce our supply of native game, aside from concentrated shooting in thickly settled districts, is that of constantly diminishing subsistence. This factor, of diminishing subsistence, becomes critically effective at the seasons of the year when suitable food is scarcest and when shelter (safety from enemies when resting or roosting, and safe breeding places) is most necessary. Close settlement and the clearing of the lower country, the using up of the surface water by taking it out of the stream courses up in the hills and by underground pumping (which results in the disappearance of brushy growths along the lower stream courses), incessant and close grazing and browsing of the higher country by sheep and cattle, are some of the human-wrought processes continually modifying this factor of subsistence of not only our game birds but of most other native and desirable forms of wild life. The rule is manifest, that the total permanent population of a given species, its breeding stock, can not be above the number that will find subsistence at the severest period of the year. And furthermore, to bring in the main theme of the present plea, if a competing species be introduced, the latter will become established "successfully" only in direct proportion as it appropriates food and shelter upon which the population of the native species of similar ecologic bearing depends. Reduction, and possibly ultimate disappearance, of the native bird will follow as night follows day.

It has been claimed by those who advocate the introduction of non-native game birds that it is much the more likely that Asiatic pheasants and European partridges would thrive on reclaimed, closely settled lowlands, where the native quail have already disappeared from various human-wrought causes. This *might* prove true; but there is no guaranteeing that those alien species would, if successful to the desired extent, then "stay put." There would be no barrier, certainly, to prevent their going beyond the cultivated districts, and then their inherent aggressiveness would lead them into direct competition on the wild territory with the native species.

It is not unfair, and is certainly germane to the question, if I remind my readers of the tenet that game birds at large do not belong exclusively to those who go out to shoot them. Rapidly increasing numbers of people are finding recreation in the outdoor study of wild life, in observing living animals, in trying to understand the intricate problems of their existence. Mental as well as physical recreation comes with this sort of use of our wild life assets. More and more, the field glass and the camera are taking the place of the shotgun and the rifle. The newer generation by hundreds of thousands is turning to nature-out-of-doors, for recreation, in-

struction and pleasure through such agencies as the Boy Scouts, Girl Scouts, Camp Fire Girls, summer camps and national parks. These people are interested in all forms of wild life—including the native game species. While I, myself, take out a hunting license, and have within a year shot quail with exercise of the sportsman's instincts, I am ready to grant that other people have claims on our game for reasons not involving the use of the shotgun. I am willing to grant, not total protection of truly game species of birds, but that the interests of *all* concerned should be heeded in the administration of our natural resources. Far and away the greatest value—recreationally, educationally and scientifically—inheres in our *native* complement of wild animal life.

The common problem of the sportsman and nature student alike is that of *maintaining* our native fauna, as nearly as is possible consistently with the inevitable disturbance due to settlement of our country. The practicable way of saving both our game and our non-game birds in largest measure is to provide refuges for them; to recognize the necessity of leaving here and there strips of wholly natural cover for them, especially by eliminating close grazing and browsing from such tracts; to insure game law enactment and enforcement to a point where the annual draft by hunters will not exceed the annual increase. And a final consideration must be heeded, namely, the danger in permitting the implantation of alien kinds: *We do not want* anything "bigger and finer" than, for example, our own California and mountain quails!

The California Fish and Game Commission has, it is true, done splendid work, upon a sound biological principle, in establishing game refuges here and there in suitable places throughout the state. But in any attempt to plant alien kinds of game within our borders I believe the commission to be wrong. One aim in my present endeavor to give clearly the reasons against such attempt is so that in future years it can not be said that some responsible student of natural history, who should have recognized the dangers threatened, did not speak in time.

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SCIENTIFIC EVENTS

A NATIONAL PARK IN THE BELGIAN CONGO

HIS EXCELLENCY BARON DE CARTIER DE MARCHIENNE, Belgian Ambassador, wrote on April 23, 1925, to Dr. John C. Merriam, president of the Carnegie Institution and vice-president of the National Academy of Sciences, as follows:

Ambassade de Belgique,
1780 Mass. Ave.,
Washington, D. C.

April 23, 1925

My dear Dr. Merriam:

In accordance with our conversation when I last had the pleasure of seeing you, I am now sending you some additional details in regard to the "Albert National Park" ("Parc National Albert"), which has been established in the Belgian Congo for the protection and scientific study of the native flora and fauna.

The advance of civilization into Central Africa has brought with it its inevitably attendant menace to primitive forms of wild life. This National Park has therefore been laid off, under the auspices of His Majesty King Albert, as a sanctuary where both animals and plants and natural scenery may be preserved and where scientists from all over the world may eventually come to study the flora and fauna of Africa in their original and natural surroundings.

During the past few years there has been an ever-increasing influx of big-game hunters and natural scientists into the Belgian Colony which is the last refuge of many rare species of African fauna. The Belgian Government has recognized the necessity of permitting a certain number of such rare animals to be taken for scientific purposes, but has consistently endeavored to preserve these rare species and also to prevent the wanton destruction of other less rare, but harmless, animals, whose slaughter serves no useful purpose.

In these circumstances the Belgian Colonial Authorities have found it necessary to restrict not only private hunting expeditions but also similar expeditions contemplated by many of the most distinguished Museums of Natural History and other scientific bodies.

Among the rare animals which are in danger of extinction is the Gorilla—an animal of extreme interest to scientists. The Belgian Government has, in the past, felt it its duty to permit a few specimens to be killed or captured for strictly scientific purposes, but the time has come when, in the interests of humanity, as well as in the interests of Science itself, steps must be taken to preserve the remaining gorillas from extermination.

A short time ago King Albert's attention was drawn to the possibility of establishing a "sanctuary" for the wild flora and fauna in the Kivu District which lies in the northeastern section of the Belgian Congo.

In this region, besides many other rare wild animals, are still to be found a number of gorillas, perhaps 100 or 200, and it is thought that, if properly protected, they may not only be preserved, but may become so accustomed to man that they may be studied in their native surroundings in a way that would rapidly produce most interesting scientific results.

In pursuance of this idea, His Majesty the King signed a Royal Decree on March 2nd, 1925, defining the limits of the "Parc National Albert," setting forth its pur-