ing that promises to be equally important in a different field. It has entered into a contract with Doubleday, Doran and Company, Inc., for the publication of a series of non-technical books on science to be known as American Association for the Advancement of Science Series. The books of this series will be on important subjects of wide public interest and will be written by competent and distinguished authorities. They will be for the intelligent general public—every scientist is an amateur except in his own field—for, in the final analysis, science and all the other avenues of progress depend upon society as a whole. Consequently, from the narrow view of the defense of science the association is justified in entering on this new undertaking.

There are, however, broader considerations, for it would not profit science even though it were worshipped if civilization should die. Science is no longer regarded as something quite apart from the strong currents of life. It is, on the contrary, the principal force that is hurrying mankind forward, whether toward a precipice or into serene waters of a finer and nobler civilization is not yet generally accepted as certain. Although theologians and philosophers and politicians are often despairing of civilization, scientists are haunted by no such misgivings. They have as a background the long history of the evolution of life on the earth. They know of the slow rise of man, with his many ups and downs, from the level of the lower animals. They are well aware of his physical, mental and moral imperfections and the ease with which he can stumble. Yet on the whole they regard his prospects with steady eyes, for they are developing methods of learning the realities of the inorganic and the organic worlds, and are confident that the continued pursuit of these realities and the organizing of both individual lives and society in harmony with them will lead inevitably to a better future.

There are no complexities in the arrangement the association has made for the publication of this series of non-technical books on science. Any person planning to write such a book may offer it to the association as one of its series. If it is accepted by the committee appointed to represent the association, and if the publishers approve of the book, the author will make a direct contract with the publishers for its publication under the usual terms and royalties for such works. The publishers assume all the financial risks.

Upon the appearance of a book of this series from the press, the association will buy from the publisher from time to time, at a substantial discount, as many copies as it may require and will offer them to its members at a substantial discount from the publisher's retail price. The publisher will also sell the book through the usual channels. The association will advertise each book published under this contract in both SCIENCE and *The Scientific Monthly*. And in all advertisements of each of these books the publisher will state that it is one of the American Association for the Advancement of Science Series.

All that remains is to secure manuscripts that have the desired qualities—soundness, timeliness, importance and literary excellence. It is expected that only a few books will be published each year, at least at first. The development of the plan will be guided by experience, as in the publication of the symposia. If the books in this new series are kept on a correspondingly high plane of excellence, they will set the general pattern for non-technical science and exert in time a profound influence on science and society. Inquiries respecting the project are invited.

F. R. MOULTON,
Permanent Secretary

THE LARGE MAMMALS OF THE GREAT PLAINS

IT is cogent to ask if the larger game animals of the Great Plains are not rapidly undergoing domestication. One who makes a brief study of the Great Plains big game reserves is likely to be impressed that the bison and antelope are rapidly being domesticated in all of them, due to (1) winter feeding on hay, and (2) various schemes for regulating breeding and care of young in close quarters.

The reserves are at the same time overgrazed to a considerable degree. One of the largest of these, at Wainwright, Alberta, is very badly overgrazed (1939). Here the smaller animals are, accordingly, deprived of shelter and are wanting or deficient as to numbers. Some of them, such as the badger, small vertebrates and various invertebrates, are threatened with extirpation.

This brings us to the consideration of the size of area necessary to prevent domestication of these animals and their associates. Taking the minimum daily range from home and normal wandering of a community of plains animals, for example, in Nebraska, 1,250,000 acres is found to be near the minimum. Men with large experience regard 1,000,000 acres as the ideal area at which to aim in the case of plains animals. Animals which roam the national forests and connected national parks have very much larger areas available. Boerker's list of national forests as of 1917 shows more than half of them with 800,000 acres of actual Forest Service-owned land. The Kaibab Forest contained 1,072,375 acres, giving ample range to the deer, the Kaibab squirrel, etc.; probably not over one fourth of the area is grazed by cattle, leaving 800,000 acres for the wild animals, recreation, etc.

Future generations have a right to see these animals

in a wild state. There would be many distressing appeals from botanists if redwoods, beech and giant cedars and other trees with their associated shrubs and herbs were rapidly coming under cultivation as nursery stock.

This need has been realized by animal ecologists and students of wild life for some time. It was brought to more general attention at about the same time by the National Park Service and a committee of the Ecological Society. This resulted in the investigation of thirteen areas, four or five of which were considered suitable for a Great Plains National Monument.

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ZOOLOGY FOR PRE-MEDICAL STUDENTS

UNDER the above title, Dr. H. S. Diehl[1] advised less zoology and criticized the alleged arts college advice to pre-medics "to take as much zoology as they can possibly get in."

Zoologists in charge of pre-medics are really not advising "all they can possibly get in," but urging all such zoology courses (as well as those chemistry courses) which will give the pre-medics a sufficiently thorough preparation to do well in the medical aptitude tests, and get in and stay in medical school. To "take only those courses which are required for entrance to medical school," as we are told some medical deans advise, is ambiguous. It probably means the well-known minimum, as given in all medical catalogues, including one year of zoology or biology, one of physics and three semesters of chemistry. It is ambiguous, because experience shows such zoology (and chemistry) inadequate, and considerably more zoology advantageous, as we are assured in reading the aptitude tests and in heeding all that is related by our graduate pre-medics who visit after a year or two in medical school.

Moreover, and most important here, medical school catalogues when studied more, as I studied over 40 of them, show many cases of various other required zoology courses and other courses that are recommended. I summarized in detail these courses for half a dozen medical schools, nearer our institution or to which most of our pre-medics have gone. This summary was found to be too extensive to appear in these columns, however. To prepare our students advantageously in this larger scope and different pattern of zoology requirements, we have in our four-year pre-medic curriculum three times as much zoology as the one-year minimum, plus a course in bacteriology. Only the latter would not be necessary according to the various requirements and recommendations.

Dr. Diehl criticized taking arts college courses of the same type as medical school courses, to which we agree, as most likely such courses in arts college would be dilute and poor. A course in human physiology should be displaced by a foundational laboratory course in general physiology. Following advice of medical school men, we give that type of course. Genetics is an essential course. Human embryology (which our critic cites) is not to my knowledge given in arts colleges, but a basic laboratory course in general vertebrate embryology, on frog and chick mostly, is and should be given. Finally, comparative vertebrate anatomy is an entirely different course in the arts college from human anatomy in the medical school. The comparative may not cause students to make an appreciably higher grade in mastery of details of regional gross anatomy when working on the cadaver, but it will give the beginning medical students a far broader and wiser outlook upon human anatomy.

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[1] SCIENCE, 89: 604, June 30, 1939.

SCIENTIFIC INVENTION AND SOCIAL CONSCIOUSNESS

SOME months ago, in the pages of this journal,[1] before aerial frightfulness broke out in Europe, I drew attention to the remarks made in 1670 by the inventor of the first airship, Francesco Lana. Lana conceived the greatest objection to his invention to be the inhuman and unconscionable uses to which it might be put by unscrupulous men.[2] Now that submarine frightfulness has for some time been under way in Europe, it may not be without some interest to hear what the inventor of the first submarine, who wrote 170 years before Lana, thought of his work. He writes (about the year 1500):

> How by an appliance many are able to remain for some time under water. How and why I do not describe my method of remaining under water for as long a time as I can remain without food; and this I do not publish or divulge on account of the evil nature of men who would practice assassination at the bottom of the seas, by breaking the ships in their lowest parts and sinking them together with the crews who are in them; and although I will furnish particulars of others they are such as are not dangerous, for above the surface of the water emerges the mouth of the tube by which they draw in breath, supported upon wine-skins or pieces of cork.

The writer of these words was Leonardo da Vinci.[3]

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[1] SCIENCE, 90: 180, 1939.
[2] F. Lana, Prodromo, Brescia, 1670.
[3] Leicester Mss., 22 v. See Edward MacCurdy, "The Notebooks of Leonardo da Vinci," 850–51, New York, 1939.