likely it was a fish, still with fin supports. It doubtless had fin bones homologous with those of the modern tetrapod limb, such as those of the rhipidistian crossopterygians. These fins would have become "tetrapod limbs," albeit weak ones, by the simple transformation of losing their fin rays and increasing the size of the fleshy base. Thus, the so-called "origin" of the tetrapod limb, as differentiated from a fin, was simply the loss of fin rays. There is no other place to draw the line. Eaton (*6*) has pointed out, in this connection, reasons why the first land invader was probably a "fish," as he called it, rather than an amphibian. He said that the only way an adaptive premium could be placed on reduction of the fin membrane was for the "fish" to spend part of the time out of water "to escape predators or for other reasons." Presumably, while these processes were going on, the lungs were increasing and other characteristics of the Amphibia were evolving, so that the original land-invading fish became a sort of amphibiopiscine, later a piscioamphibian, and then finally a true amphibian, by a process so gradual that even if we had the actual specimens it would be difficult to place them all in the separate major categories.

The limbs and girdles of present-day caudate Amphibia are small and weak—similar, we may postulate, to the weak limbs of an animal that has recently come from the water to shuffle clumsily about on dry land. Few of the caudate Amphibia of today are given to extensive excursions across really dry land, for which they are not fitted because of their weak limbs and moist, living skins; the early amphibians of Devonian swamps must have had similar limitations, at least with regard to weak legs. A situation involving fairly long journeys overland could be met by the Amphibia only after considerable evolution of the legs had taken place, and it is reasonable to suppose that this situation may have led to perfection of the limbs, by selection against the weak, long after the limbs arose. Thus, the suggestion of Romer (*1*) fits very well into the picture when it is considered as operative at a much later stage in the evolution of the tetrapod limb than the "origin."

Summary

The paired fins of fishes were first used as props and supports for resting on the bottom; these were later used in a clumsy, walking manner, and this behavior perforce began first in the water, because the weak props could not support the animals without the water bouyancy; increased perfection of the mechanics of walking took place in the shallows, which was a refuge from the chief predators; the land was also attractive as a haven and as a source of food; the first vertebrate invaders of land probably had fins, and these became legs by enlargement of the fin base and loss of fin rays; these original limbs and girdles were weak and probably underwent a considerable period of evolution in swampy country; later they were perfected by further selection when it became necessary for early amphibians to move across dry land because of a failing local water supply.

This syllogism conforms to the known behavior and capabilities of fishes and amphibians and to the general facts of zoology and paleontology. It suggests that common, continuous activities and stresses—escape from enemies and food getting—led to the origin of the tetrapod limb. This obviates the necessity for explaining how discontinuous and somewhat catastrophic events, such as the drying up of water bodies, could have led to the origin of limbs, which at the very outset had to be fairly strong.

The general theory stated here is fairly clearly implied by Berry (*8*), who said, "Those fishy pioneers with air-bladders —and paired fins—which, after ages of using their fins for pushing and paddling themselves over mud flats, gradually ventured onto drier and drier ground—where they avoided the competition for food—and the dangers of swarming hordes of ganoid pirates of the waters, were the ancestors of the amphibians."

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C. R. Moore, Zoologist and Contributor to Medicine

The morning was clear and cold, and the autumn leaves had covered the ground with colors of red, brown, and yellow. The family and a small party of friends had come to the summer home of Carl R. Moore in northern Michigan to scatter his ashes in a grove of white pine trees. Dr. Moore had planted these trees in front of the north window of a little study some 200 yards back of the main cottage. In the quiet of this retreat in the woods, he spent many hours over his microscope and with his manuscripts. Here he did much of the work that gained him fame as a zoologist and as an endocrinologist who made a major contribution to medicine. The summer home was also a place of relaxation and enjoyment for Dr. Moore.

Thirty years earlier a small group of faculty friends had established a summer colony that came to occupy an important place in the lives and affections of its members. Carl Moore loved the open country. He was an ardent and indefatigable fisherman, and he loved to work in the woods, to plant trees, and to engage in the many tasks of country life.

He was born 5 December 1892, on a farm in Green County, Missouri, and spent his early years there. Although he loved his home and associations in the colony in northern Michigan, he never forgot the scenes of his boyhood and looked forward to spending years of retirement on some little farm in the Ozarks, a dream that he never realized. After preliminary education in the schools of Springfield, he entered Drury College in 1909, coming under the in-

fluence of an inspiring teacher, C. H. Spurgeon, head of the department of biology.

Without doubt the example and teaching of Spurgeon at Drury College and of Frank R. Lillie at the University of Chicago were the dominant influences that shaped the career of Moore in zoology and in the study of the biology of sex. After graduating from Drury, he came to the University of Chicago as a graduate student and fellow in the department of zoology in 1914. He received a Ph.D. degree in 1916 and continued thereafter in the department. He became an instructor in 1918, a professor in 1928, and chairman of the department of zoology in 1934 on the retirement of Lillie. He was a vigorous and effective chairman, and under his direction, the department of zoology continued the enviable record it had established under the leadership of Lillie as one of the foremost departments of zoology in any university.

During his lifetime Moore served in many positions of trust and on many committees, both in his university and in national societies. He had firm convictions and expressed himself with utter candor and without fear. He was an excellent teacher, and class after class of medical students at the University of Chicago secured their training in embryology under his direction. It is possible that this contact with medical students insensibly influenced the direction of Moore's later investigations. As a matter of fact, he told me only a short time before his death that in his earlier years he had wanted to become a physician. The field of his investigations concerned the biology of sex, the physiology of reproduction, and the functions of the glands of internal secretion. These studies are described in more than 80 publications, in journals of the biological sciences, and in medicine.

Early in his career Moore became interested in the internal secretions of the sex glands as they affect body development and especially the so-called "secondary sex organs," such as the prostate and seminal vesicles in the male and the mammary glands in the female. Innumerable experiments involving excision and transplantation of the gonads were performed by Moore and his associates, and the effects produced were exhaustively studied, both grossly and microscopically. Much of the microscopic work was done at his summer home. He pointed out that the growth of the prostate and seminal vesicles and the maturation of the spermatoza were dependent on the internal secretions of the testes. These fundamental studies by Moore formed the physiological basis for the subsequent researches of Charles Huggins when he demonstrated that the removal of the testes in man exerts a retarding effect on the growth of cancers of the prostate.

The interrelationship between the anterior lobe of the hypophysis and the gonads also occupied Moore's interest, and these studies, together with those previously mentioned, played a large role in directing the attention of investigators to the effect of hormones on so-called "target organs" or tissues. In connection with his work on the sex glands, Moore became interested in the sterility of men with undescended testes. It occurred to him that failure of the spermatozoa to develop in testes that remain within the abdominal cavity might be due to the fact that the temperature within the abdomen is greater than in the scrotum. By a series of experiments, he was able to prove that this inference was correct and so established the function of the scrotum as a temperature-regulator for the testes. In later years he turned his attention to experimental studies with the hormones of the ovaries and testes when these became available.

In addition to the medical students with whom Moore worked, 33 zoologists, working under his direction, secured their doctor of philosophy degrees, and 15 obtained the master's degree. He was a member of the National Academy of Sciences and of the American Association for the Advancement of Science, serving as vice president of Section F in 1943; he served as president of the Society for the Study of Internal Secretions from 1944 to 1946; as vice president of the American Society of Zoologists in 1925. He was also a member of several other honorary and national organizations. Many honors came to Moore, and, among these, he probably prized most the Francis Amory award of the American Academy of Arts and Sciences in 1941 and the Endocrine medal and award of the Society for the Study of Internal Secretions in 1955.

No account of Moore is complete without reference to his remarkable courage. As his physician, I can testify to these traits, observed during his long illness. In connection with a colleague whom he admired greatly and who suffered from a major physical handicap for a large part of his life, Moore commented in one address: "Yes, although admirably carrying on in spite of difficulty, his days are severely numbered, but you may rest assured that he will go forth from this world figuratively and literally with his boots on whether he can walk or not. Such attitudes toward life, such will and determination to fight off misfortunes of life and never give in rest with the individual. These attitudes can be cultivated and their merits are beyond mere idle words in a world so in need of courage and conviction." No better statement of Moore's own great spirit can be made than this.

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Science is the century-old endeavor to bring together by means of systematic thought the perceptible phenomena of this world into as thorough-going an association as possible. To put it boldly, it is the attempt at the posterior reconstruction of existence by the process of conceptualization.—ALBERT EINSTEIN.