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THE DYCHE MUSEUM AT THE UNIVERSITY OF KANSAS[1]

By Dr. ALEXANDER WETMORE

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SOME years ago I found myself a graduate from Montgomery County High School in Independence, Kansas. The study of birds was a paramount interest with me and I had aspirations for college. Iowa, California, other places, offered inducements, until a friend loaned me a catalogue of the University of Kansas and I learned of the University Museum, now the Dyche Museum. Among other descriptive details I read of a collection of Central American birds. Foreign birds at the time were unknown to me, except for a few that I had seen in circus menageries or stuffed in the parlors of friends, and were an irresistible attraction. I decided at once that the courses in biology offered at K. U. were the ultimate of my desire, and in September several days before the fall term opened I was in Lawrence. My first visit to the "Hill" led me to the cool great hall of this museum, and in this building it was my fortune to spend much of my time during my undergraduate years.

The foreign birds, I may add, proved to be the Gaumer collection from Yucatán, given by an alumnus who had worked with Snow and with Dyche, and who later had settled in Mexico. No one had studied these specimens, so that I had the keen delight of identifying and labeling many of them—and since I have known most of them in their native haunts in life.

[1] Address given at the reopening of the Dyche Museum during ceremonies on the occasion of the seventy-fifth anniversary of the founding of the University of Kansas, June 6, 1941.

I go back in my mind on this occasion beyond L. L. Dyche, for whom this museum is named, to Francis Huntington Snow and his work as the pioneer in natural science in Kansas so far as this university is concerned.

Early expeditionary parties sent out by the government to survey the West often crossed through Kansas, and their naturalists made many observations that have much value to workers of to-day. But it is to Snow that we owe the foundation of these studies on behalf of our alma mater. The story of his work has been told most sympathetically and understandingly by Dean Stouffer in a recent number of the *Graduate Magazine,* and the value of his teachings has been demonstrated by the accomplishment of his many students. As a freshman I came too late to have the privilege of attendance in his classes, but profited by his friendship in the later years of his life when he had retired from his administrative duties but was still occupied to the exclusion of other interests with the collections of insects that he had assembled.

As one more story of Dr. Snow's industry, in addition to those told by Dean Stouffer, may I relate the following. I returned to the university one year in midsummer with a collection of skins of birds that I had secured in northern Arizona. Work in the laboratories began for me at eight in the morning, but through rising at six I could reach the museum by seven and so have an hour for research on my specimens. But any feeling of personal vanity at this display of energy was humbled in me completely by the fact that each day as I came toward the building I met Dr. Snow coming down the hill on his way to breakfast after having spent two hours or more at work in the early morning. And often late in evening I saw lights in the windows of his study. That I knew Francis Huntington Snow has been one of my treasured memories.

Lewis Lindsay Dyche was one of Dr. Snow's students who remained at the university, first as an assistant and later as a member of the professorial staff. Dyche was interested especially in field work and the collecting of specimens, and for his period was a notable traveler. New Mexico, northern Minnesota, California, Greenland and southeastern Alaska, among many other places, were known to him, and from his travels in what were then wild places he returned to the university with skins and skulls and skeletons of deer, caribou, walrus, seals, polar bears, mountain sheep, goats, smaller mammals and birds, many of which were mounted in life-like attitude and which to-day form the nucleus of the groups shown in our renovated museum.

For years Professor Dyche traveled through Kansas to tell in high schools and other halls the story of his adventures illustrated with stereopticon pictures of the places that he had seen. Undoubtedly it is these lectures that made him one of the best-known members of the university faculty of his day throughout the state, and that helped to persuade reluctant legislators of the desirability of a special museum building to house the collections that he and others had made.

The World Columbian Exposition held at Chicago in 1893 gave Professor Dyche definite opportunity, and there he received great acclaim for his panorama display of mounted mammals in a semblance of their natural habitat. It was this idea of a panorama exhibition that controlled the early installation of the displays in the Dyche Museum when it was finally completed. Little did I imagine when as a very small boy I marveled at Professor Dyche's specimens at the Fair in Chicago that I should later have some hand in their arrangement and care in the museum of this university.

The other collections housed in this building, in which Dyche had no hand, and often little interest, have equal importance in the attraction that the University Museum has for the constant procession of students with their families and their friends that come to its doors. The fossils, great and small, of the paleontological display, gathered under Williston, McClung and Lane, with Handel T. Martin as their early preparator and guardian, with their story of the past have awed and attracted thousands who have carried away from their visits impressions impossible to have been gained in other fashion. The many birds, mammals and reptiles are a constant source of study, and other creatures have come in for attention. The collections housed here are notable for an institution of this kind.

When in the history of mankind museums began is a matter concerning which we have no definite information. Man as a thinking animal is naturally curious about his surroundings and also acquisitive in gathering those concrete things that are attractive to him. Primitive man's first museum specimens no doubt were unusual objects that excited his interest, that he carried with him to his cave or shelter for further examination, or perhaps to prove to his wife and friends that his story about them was really so. Such interests must go far back in the history of the human race. In the United States National Museum in Washington we have on exhibition a replica of the two European bison modeled in clay by Pleistocene man in the cave of Tuc d'Audobert in southern France. Archeologists regard these as primitive magic concerned with the increase and abundance of the herds of wild game. This may well be, but to me as I stand before this case the figures represent the museum

exhibits of Aurignacian man of twenty thousand years ago. The horses, bison and birds drawn by early man of the same period on the walls of caves in the mountains of Spain must also represent early exhibitions of human art. That they have been preserved to the present day is one of the miracles of chance for which we must be forever grateful.

Aristotle, the father of modern natural history, was befriended by his pupil Alexander the Great, who assigned a considerable force of men to secure for him oddities in birds and beasts. It is related also that Ptolemy the first, in the famous library at Alexandria in Egypt, had what was in effect a museum and a university in combination, though we have little record of what was in it except for reference to manuscripts. More recently, in a palace at Ur dating about 3000 B.C., there has been found a labeled series of objects of archeological interest that evidently constituted a museum collection. We are told too that fossils and other curios were kept in some of the temples of the Greeks during the thousand-year period before the Christian era. These illustrate something of the little that we know of the beginnings of museums and are sufficient to indicate the definite antiquity of man's museum interest.

The oldest of existing museums had their foundations in the voyages of exploration of the fifteenth century. Columbus was charged by Queen Isabella to collect strange birds, and it is recorded that he took back to Spain from his voyages the skins of various beasts. We are told that in his triumphal parade in Barcelona, in April, 1493, there were displayed live parrots and the skins of birds. Men of wealth of this period of extensive exploration in new lands began to maintain collections of various kinds, and interest in natural history as a science became wide-spread. Such a collection was that of Sir Hans Sloane which, in 1753, became the foundation of the British Museum of Natural History, one of the great institutions of its kind in the world.

In the early days of the historical period in the New World our own country was the source of much natural history material that went abroad, but museum interest came early among the colonists of what is now the eastern part of the United States. Without going into too much detail, there is record in the year 1750 of a "Repositerry of Curiosity" at Harvard College, which included "horns and bones, fishes, skins and other objects." This was destroyed by fire in 1764, but in 1769 a room was set aside in the college for a "Musaeum." Thus began the present-day Museum of Comparative Zoölogy, of Harvard College. Among other existing institutions the museum in Charleston, South Carolina, was founded in 1773, and that of the Academy of Natural Sciences in Philadelphia in 1812. That there are to-day throughout the world more than 7,000 museums of which more than 1,000 are in the United States is a fact in itself significant in establishing the worth and value of the museum as a cultural feature of our modern life. Also significant is the fact that approximately 25,000,000 persons visit our American museums each year.

In considering American museums and their present place in our lives it is pertinent to say something about our National Museum in Washington, since it is this organization that has been a constant example in the development of museum projects with a more local field.

The Smithsonian Institution had its beginning in a bequest of money from James Smithson, an Englishman, who died in Genoa in the year 1829. In his will Smithson left his estate to the United States of America to found at Washington, under the name of the Smithsonian Institution, an "establishment for the increase and diffusion of knowledge among men."

In the minds of many there is some confusion with regard to the relation between the Smithsonian Institution and the United States National Museum. The two are distinct, though many consider them as identical. In brief, the Smithsonian is a privately endowed organization that in the course of its history has developed, at the expense of its own funds, various activities that have been publicly accepted as important so that as they grew beyond Smithsonian means they have been supported by governmental appropriations. As examples of these I may mention the National Museum, the Astrophysical Observatory, the National Zoological Park and the Bureau of American Ethnology. The National Museum then is a bureau or branch supported by the government, under the administration of the Smithsonian Institution, which still contributes largely to museum researches and adds to its specimens through the income from its endowments. In fact, the Smithsonian administers various funds that have been given entirely for the support of collections in the museum.

The act of foundation of the Smithsonian provided that it should include a museum for objects of natural history, plants and geological, mineralogical and other specimens belonging to the Government. Under this provision there came to it immediately the collections made by the Wilkes Exploring Expedition, which under an appropriation of one million dollars was engaged from 1838 to 1842 in an exploratory journey around the world.

From small beginnings the United States National Museum has grown until it is one of the greatest that exists. Its collections now comprise more than 17,000,000 catalogue entries, and are valued at more than $150,000,000. This appraisal is made with the

statement that with ten times that sum of money available the collection could not be duplicated, because of the many unique things that it contains.

From the vast collections of this museum's five departments many specimens are arranged for exhibition in the public halls. That this forms an attractive feature to those who come to our capitol city is indicated by the figures of the last fiscal year when our visitors included more than two million five hundred thousand persons. On public view there are found such objects of patriotic interest as the original flag that, flying over Fort McHenry, inspired Francis Scott Key to write "The Star Spangled Banner," the sword and other relics of General Washington and similar articles from scores of other persons famous in American history. Airplanes, engines, early types of horse-drawn vehicles and ancient automobiles, and scores of important patent models attract hundreds to the engineering exhibits. Skeletons of huge dinosaurs and other animals of the past, groups of mounted animals collected in Africa by Theodore Roosevelt, birds, reptiles, life-size models of Indians and other peoples in their appropriate dress fill the halls of the Natural History Building.

But in addition to these public displays there are even more valuable study collections, arranged properly for reference in the museum laboratories, that are in constant use for scientific studies of many kinds. A short time ago some one asked if any single person had seen all the objects in our great collections. My answer was that the life-time of an individual would not be long enough, as such an inspection carried on at the rate of a reasonable number of specimens per hour for eight hours a day would require more than one hundred years.

I have just indicated that our National Museum in Washington is a national asset in its educational contacts with the entire world, through its exhibition halls open to visitors, through its publications that make available everywhere the results of researches on its vast collections and through the reference collections that are used not only by our own staff but also by the many accredited investigators who come to Washington to study. This university museum that we have come to formally open to-day, equally valuable in proportion to its size, differs in that its field is more directly educational through its definite contact with students. Such a museum with proper support both in finances and interest becomes one of the important factors in the scheme of education of its institution. We are fortunate that Kansas has recognized that fact, one well-known to our present chancellor through his own acquaintance as an undergraduate with our museum halls.

Let me add here that while museums will be developed and expanded so long as our civilization continues the earlier in their history they receive adequate support the more effective they will become. This is true not only because of the greater facilities that this may afford at the current time but also because in most branches of museum interest many of the most desirable materials become each year more difficult to obtain.

Civilized man is steadily occupying increasing areas of the surface of the earth, and with his occupation come such vast changes from the original condition that natural conformations are destroyed, and hundreds of thousands of individuals of animals and plants and hundreds and thousands of species must disappear. Only those can remain that are sufficiently adaptable to fit into the modified scheme brought by man's presence. Those at all sensitive to change or that require special conditions for their existence inevitably disappear. The next fifty years will offer the last opportunities to secure many forms of nature for preservation for the future. This does not mean that present timely interest in conservation is not worthy of the attention that it receives. I wish merely to indicate that many things of museum interest must be acquired now, as in later years they may be extinct, or may be found only in reserves in such small numbers that none may be taken for museum use lest the entire stock be weakened until it is destroyed. Yearly, therefore, it becomes more and more important, in fact, a duty, to secure such material for the information and study of future generations, while it may be obtained without pressure on the species concerned. Opportunities now neglected may never offer again.

Our own life-time as individuals indicates the meaning of what has just been said. The spread of population here in Kansas is an excellent illustration, since agriculture here has expanded to the exclusion of vast numbers of wild things that formerly ranged within our borders. That all this is right and proper no one will deny, but the effect on much of the wild life of the surrounding region will remain.

We see in the newly opened halls of the Dyche Museum attractive exhibits of many kinds, of mammals, birds, fossils and other objects where the subjects are presented in interesting and often in lifelike manner. The new installations are fascinating and valuable, and we may return to them time after time with friends and relatives or alone to enjoy them and to profit from them to the utmost.

But let me impress upon you the very pertinent fact that these displays, attractive though they may be, are not the most important properties of this museum. The exhibitions once installed may be renovated periodically, but such changes come only at long intervals. While definitely important as educational factors they are in a sense static.

Behind the scenes in this museum, as in the National

Museum in Washington, are rows of cases of study specimens of skins and skeletons of birds and mammals, specimens of reptiles and amphibians, and many other creatures, which are used for the training and study of advanced students and are seen only by such visitors who have special interest in them. These collections, augmented greatly from their early beginnings by the work of Lane, Bunker, Taylor, Hibbard and their assistants, to name only those now here, are known to scientific investigators everywhere. They form a portion of the valuable properties of our university, and constitute in considerable part the dynamic force of this museum. From the investigations concerned in their gathering and study there has come the enthusiasm that has trained dozens of workers in biology who have gone out from the university to make good names in their chosen fields in museums and laboratories throughout this country.

Those who remain in Lawrence may have difficulty in attaining perspective on this point, but to illustrate my meaning it is necessary only to think of the graduates from this university now working in biological or related fields in institutions throughout the United States. Their number and the importance of their work has been constantly evident to me in recent years as administrative duties have claimed more and more of my attention. Their training began here in this museum, and without that early opportunity and inspiration they could not have attained their present status and experience.

Instruction in biology necessarily covers the broader aspects of the subject particularly in the beginning courses, and research in university laboratories on the part of the professors and graduate students, centers often on investigations where there may be developed laws or summations common to large groups of species or to life as a whole. In the enthusiasm that attends this type of investigation we must not forget, however, that in the end we are dealing with species, whether of plants or animals, and that it is a matter of prime importance to us to know the name or names of the groups with which we deal. As our information in physiology, general anatomy and psychology of species other than man increases we find surprising differences in reaction between forms that appear so closely similar superficially, that it may be difficult to those not expert to distinguish them. It is obviously necessary to know the proper identity of these if one is to interpret correctly observations of any kind made upon them. The ecologist is entirely dependent on the proper identification of material for his investigations of animal and plant forms, and studies of individual variation or of chromosomes or of those things included in the science of genetics, whether in kinds of mice or insects, obviously may be misleading if the material used includes two or more closely related forms that hybridize freely, unless this hybridization is known and understood.

In training in such identifications the University Museum stands in the same relation as the library. The museum laboratories with their study collections are therefore of prime importance in all biological work, not alone in their training of workers who may go out into museums but in the facilities that they offer for basic identifications. The laboratory collections, therefore, that to the uninitiated may appear unattractive, are, nevertheless, a truly dynamic part of the organization. They are the inspiration that leads to understanding of the infinite variety of species that make up our world of living things. Their worth increases as they themselves grow and increase. Let me repeat that, while the exhibition halls of this museum are attractive and instructive, behind the scenes in the laboratory collections there is found a most valuable function and one that continues year after year with steadily growing importance.

During my days as a student in this building we realized that its construction was such that extensive changes would some day be necessary, and finally some years ago it was required that the collections be removed to storage until repairs could be completed. Thanks to the interest of those charged with appropriations this work was made possible, and now finally the great work of installation has been completed. The success of this is evident to all and needs only our admiration. Our thanks must go to those who have done this work so skilfully and so well.

The halls of the Dyche Museum now are open again, but though closed to the public for a period the work that the institution typifies has continued steadily, quietly and unostentatiously behind the scenes. Its training and its opportunities in the kind of science that it concerns have never ceased, though its exhibitions were stored and inaccessible. The spirit of the organization has continued without break.

That the present day is one of difficulty is a fact continually in the minds of all of us. The conflict abroad is now nearer to us than ever before and steadily our own responsibility both individually and as a nation increases. A few days ago a friend in England sent me a bit of shrapnel with the laconic statement that it had fallen on his house the night before. I know this house in the heart of residential London well, and to hold this bit of metal in my hand has brought the terrible conflict now raging over that great city to me with a clarity that no press accounts of the destruction wrought by German bombs can ever equal. Our nation is expending huge sums of money for armament to guard that such terrors may not come

to us here. These entirely necessary expenses mean increased taxes and financial troubles for all, a condition that may continue throughout the rest of our lives.

Support of this great defense program is paramount and essential, but with it let us not forget that in cultural and esthetic pursuits there are not only improvement for the mind and training for the future, but also momentary escape for the individual from the troubles that beset him. In the halls of our museums, our art galleries and our libraries throughout our great nation there is found enjoyment and recreation for the public to be encountered nowhere else. The contemplation of nature and its laws, and of the individual objects that exemplify these, brings a relief and a peace not elsewhere possible. Public morale, of maximum importance under the grim threats of war, is fostered by such mental relaxation. These are facts to be remembered in periods of stress, that the small financial support for such activities be not denied. Let us consider this as a contribution to the defense armament of the mind and of the soul.

SOME UNSOLVED PROBLEMS OF THEORETICAL DYNAMICS[1]

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As was first realized about fifty years ago by the great French mathematician, Henri Poincaré, the study of dynamical systems (such as the solar system) leads directly to extraordinarily diverse and important mathematical problems in point-set theory, topology and the theory of functions of real variables.

On the other hand, the abstract point of view emphasized by the foremost American mathematician of the same period, E. H. Moore of the University of Chicago, led him in the early years of the present century to his "general analysis." Moore sought to introduce an absolutely general independent variable, ranging over an abstract space, whereas previously attention had been limited to an independent variable ranging over ordinary n-dimensional space. He hoped that in this way the abstract essence of various current theories in analysis might be more clearly revealed. Ideas of a somewhat similar type had been proposed a little earlier by Maurice Fréchet and also by Erhard Schmidt. But only Moore saw the full significance of general analysis for mathematical thought; and it is only in recent years that his ideas are receiving the attention which they deserve from mathematicians.

An early illustration of the wide scope of these Moorean ideas was furnished by the "recurrent motions" of dynamical systems first defined and studied by the writer in 1910, shortly after the completion of his graduate studies at Chicago. The possibility of making an extension of this theory so as to define "recurrent motions" and certain analogous "central motions" in the sense of general analysis was announced by him in his Chicago Colloquium Lectures on Dynamical Systems in 1920.

The principal part of his paper was occupied with this abstract phase of dynamics, which has been the subject of much recent work by American mathematicians and by the powerful contemporary Russian mathematical group. The kind of abstract space, R, which it seems best to employ is a compact, metric space. Corresponding to the change in "time" t there is a steady flow of the space R into itself, each point tracing out a "curve of motion" in R. The individual points represent "states of motion," and each curve of motion represents a complete motion of the abstract dynamical system. Thus there is provided not only an abstract space R but a "continuous group": $G: t' = t + c$. In other cases this group may be discrete: $t' = t + n$ (n, an integer), or of still more complicated form. For a continuous flow in such an abstract space R, the recurrent motions are merely those which trace out with uniform closeness in *any* sufficiently large period of their entire history, all their states; a periodic motion, represented by a closed streamline, affords the simplest illustration of such a recurrent motion. The analogous central motions are those which recur infinitely often near to any particular state of the motion, or at least have such motions in the infinitesimal vicinity of any state.

The first ten of the sixteen problems presented and briefly discussed were of this abstract type.

Problem 1 embodied a conjecture as to the interrelationship between continuous and discrete flows in such an abstract space R. It is easy to see that this relationship must be an intimate one by recalling the close connection between an ordinary changing visual image of continuous type and the corresponding moving-picture image of discrete type. In the abstract space R a species of reduction of a continuous flow to a discrete flow or at least one of "extensibly discrete" type may be effected by a process of sectioning,

[1] Summary of a paper presented at a fiftieth anniversary symposium of the University of Chicago, September 24, 1941.