THE AUK

A QUARTERLY JOURNAL OF

ORNITHOLOGY

VOL. 57 JANUARY, 1940 No. 1

IN MEMORIAM: SAMUEL PRENTISS BALDWIN

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Plate 1

ORNITHOLOGY lost a resourceful pioneer in the passing of Samuel Prentiss Baldwin. He was fully as much a pioneer in both spirit and deed as any explorer of unknown realms either present or past. Exploration for him was into new fields of thought, into the development of new methods, and into the establishment of new facts to add to world-wide wisdom. These explorations led him no farther than his own garden and farm and into the minds and manners of our most common birds.

Samuel Prentiss Baldwin was born in Cleveland, Ohio, October 26, 1868. He died of coronary thrombosis in the same city on December 31, 1938. Never of very rugged constitution even from early youth, he had nevertheless, by intelligent conservation of energies, led an active and useful life.

The Baldwin ancestry in this country can be traced back to Sylvestor and Sarah Bryan Baldwin, natives of England, who became Massachusetts colonists in 1638. The line led to Hon. Charles Candee and Caroline Sophia (née Prentiss) Baldwin, parents of Samuel Prentiss and one daughter, Mary Baldwin, who became Mrs. John Sawyer. Charles Candee Baldwin was a judge of the circuit court of appeals of Ohio but, in addition to his law practice, was widely known for his writings in archaeology and general science. These interests of the father served as inspiration to the son, who became engrossed in similar pursuits. In his early days, Samuel Prentiss collected birds and birds' eggs extensively and later built up a collection of native plants of parts of Ohio and New Hampshire. When only eighteen years old, he became an assistant to Professor G. F. Wright, the well-known geologist, and went with him on expeditions to explore Muir Glacier, Alaska, the Snake River Valley between Yellowstone and Oregon, and later went with him to Europe to study glacial geology. This early interest

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in geology was so keen that after graduating from Dartmouth College in 1892, he continued his studies in this field. His researches dealing with the glacial topography of the Lake Champlain region were of such high caliber that he received a Master of Arts degree in 1894 from his Alma Mater. Later he was honored by election as a Fellow in the Geological Society of America. While busy reading law in 1893, he spent a year in New Mexico, partly for reasons of health, but also to make a geological survey of the northeastern part of what was then a territory. This work was so well done that in recent years, a resurvey found little to be changed. In spite of both their interests in natural science, Samuel Prentiss' father discouraged him from taking up this field as a profession largely because of the lack of financial opportunity in it. Therefore, he turned to law, mastered it largely by his own efforts, and graduated in the first class from the Western Reserve Law School with the degree of LL.B. in 1894. He was admitted to the Ohio bar that same year and began practicing at once in the firm of Ford & Baldwin. About 1900 his health failed him and he retired from law but continued in a business career. It was at this time that the Williamson Company was formed, which he helped to organize and in which he held various offices until the time of his death, and the Williamson building was erected. At the time of its construction it was the tallest and most pretentious building on the Cleveland Public Square. This business venture proved so successful that in 1908 the company purchased the New Amsterdam Hotel and in later years greatly enlarged it by the addition of more rooms.

On February 15, 1898, Samuel Prentiss Baldwin married Lilian Converse Hanna also of Cleveland. Although without children, Mr. and Mrs. Baldwin had a happy life. From June to October of every year since 1901, they lived on their beautiful Gates Mills estate, except for the month of August, which they usually spent on the seashore at Magnolia, Massachusetts. The rest of the year found them at their home in Wade Park in Cleveland, although previous to 1924, they often journeyed to Thomasville, Georgia, for two months in the late winter. Their country home at Gates Mills is of New England architecture which, in fact, is almost universal in this small suburban village nestled in the deep Chagrin River valley. The Baldwins were always a guiding influence in the development of this village and surrounding country; they planned and named the streets and really turned it into a transposed bit of New England. They were prominent in social life both here and in Cleveland and sponsored many worthy civic and philanthropic projects.

Mr. Baldwin listed himself as a Presbyterian. Human nature and relations of mankind deeply interested and concerned him, and in various ways he contributed to the welfare of people with whom he came in contact. Many of his associates in science and business are in debt to his kindness for

their present attainments and position in life. With people in all ranks of life, his contacts were of the best and he was highly respected.

Following again in the footsteps of his father, who was one of the founders and supporters of the Western Reserve Historical Society, Samuel Prentiss was a trustee of this institution from 1907 until the end of his life. Likewise, since 1923, he was a trustee of the Cleveland Museum of Natural History and was an active and enthusiastic sponsor of its development. Other honors came to him. He became research associate in biology at Western Reserve University. Dartmouth College, recognizing the importance of his contributions to the development of ornithology, granted him the degree of Doctor of Science in 1932. Having been a member of the American Ornithologists' Union since 1917, he was elected a Fellow in 1934. Since 1930, he has been honorary president of the Northeastern, Eastern, Inland, and Western Bird-banding Associations, a title sponsored for him, I believe, by his friend, the late William I. Lyon. The American Society of Naturalists honored him with membership. In addition to scientific organizations already mentioned, others to which he belonged included the American Association for the Advancement of Science, in which he was a Fellow, American Society of Zoologists, Ecological Society of America, American Genetic Association, Ohio Academy of Science, in which he also ranked as a Fellow, British Ornithologists' Union, Deutsche Ornithologische Gesellschaft, Australasian Ornithologists' Union, and the Cooper and Wilson Ornithological Clubs. In several of these organizations he held a life membership. These diverse fields provide some indication of the breadth of his interests in science.

When Samuel Prentiss turned from his early interest in geology to the practice of law and then later was compelled to give this up, his attention to business did not require all of his energy. This was the time that he and Mrs. Baldwin were developing their country home, and his interests naturally turned to flowers, trees, and horticulture in general. The plantings on his estate were made under his immediate direction, and he obtained a great variety of species from all over the country, most of which he could identify even to scientific names without a moment's hesitation. For many years he had a regular practice of making a complete survey through his gardens and lawns two or three or more times a week, and noting the time and order of leafing, flowering, and seeding. These data have not been compiled and summarized although one or two articles of a horticultural nature were published.

First an ornithologist, then a geologist, next a lawyer, then a business man, then a horticulturist, Samuel Prentiss Baldwin finally reverted to his first interest and during the last twenty-five years of his life was an earnest student of bird life. This pursuit of information concerning birds started

perhaps as an avocation but soon developed into the status of a vocation as it required the greatest share of his time and energies. Doubtless he will be remembered for two major contributions to the science of ornithology. The first of these—and upon which, perhaps, his reputation is primarily based—is the development of modern bird-banding techniques with a demonstration of type of results to be obtained and problems solved. The second is the development of methods of study and a biological point of view in the detailed study of the life history and behavior of the living bird in Nature, particularly as illustrated by the House Wren. There may be interest in tracing the progress of these two general contributions.

In his own words, Dr. Baldwin describes how he began trapping adult birds (1919):

> "About the year 1913 I began a diligent campaign against the House Sparrow, on my farm, at Gates Mills, near Cleveland, Ohio, using the so-called Government Sparrow Trap, which catches the birds alive and unharmed.
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> "The Sparrows were destroyed in large numbers, and the farm pretty well cleared of them, greatly to the comfort, evidently, of the native birds; for it was very noticeable that, as the Sparrows decreased in number, the native birds greatly increased. The result was most satisfactory, and the traps should be recommended to all who are interested in attracting native birds to their vicinity.
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> "But, it was when I learned of the American Bird-Banding Association that the traps acquired a new and much greater significance, for, as the House Sparrows decreased, the traps became the resort of various kinds of native birds.
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> "In the spring of 1914 I began placing bands, not only upon young birds in the nest, but upon many adults secured from the traps, and by 1915 it became evident that this could be done on a large scale, and with most interesting results in returned birds."

The importance of the former American Bird-banding Association during this early period is evident. Though not successful in banding many birds, it nevertheless kept the idea alive and made available to those interested a limited number of bands. Dr. Baldwin often remarked that any special recognition he may have received for developing bird-banding was due in large part to his good fortune in securing bands from this association while others were compelled either to make their own or to wait until an additional supply became available.

During the years 1914 to 1918, sixteen hundred bands were placed on birds by Dr. Baldwin both at the Gates Mills, Ohio, estate and at Thomasville, Georgia. Only three of these birds were heard from again at other localities, although some sixty were retrapped at the same localities where first taken, some even the third and fourth years. The record of this banding was published in 1919 in the 'Proceedings' of the Linnaean Society of New York and at once aroused considerable interest. Results for the years 1919 to 1921 later appeared in 'The Auk' and showed increased perfection of the methods employed.

On the suggestion of ornithological friends, Dr. Baldwin told of his bird-banding experiences at the 1919 convention of the American Ornithologists' Union in New York City. This talk was a very stimulating and persuasive one. The next year the Biological Survey of the U. S. Department of Agriculture decided to assume responsibility for organizing the work in this country, since information obtained from the movements of banded birds would be of great value in the administration of the migratory-bird treaty, which had just come into existence two years before. The extent to which this bird-banding project had developed at the time of Dr. Baldwin's death may be realized from the fact that there were some 2,193 bird students cooperating with the Government in placing bands, and since 1920, these collaborators banded a total of 2,828,100 individuals. The method had become a well-established and necessary one in various types of ornithological investigations.

Of course, Dr. Baldwin did not originate the bird-banding method. He advanced the subject by showing how adult birds could be trapped and later retrapped so that a large percentage of returns could be obtained. Previously, bird students depended primarily upon the banding of nestlings, and further information from these marked individuals depended largely on chance recovery of dead birds. It was when recoveries of living individuals could be insured in a significantly high number of instances that the method became a valuable one. In his very first paper of 1919, he described various traps and devices employed. He continued an interest in the development of new methods during succeeding years and in 1929, together with Mr. F. C. Lincoln of the Biological Survey, published a complete manual for the use of bird-banders generally.

Dr. Baldwin never made a special point of banding large numbers of individuals for the sake of a big record. Rather an attempt was made to obtain all possible information from those that were handled. During recent years practically all birds captured were examined for malformations or injuries and were weighed, ectoparasites were collected, and notations made as to progress of molt. Usually the banding work was most intensive from late May to early September, although occasionally from April to November, and for a few years it was extended one day weekly or bi-weekly throughout the winter months. Up to the end of 1937, 21,682 birds belonging to eighty species had been banded at Gates Mills. Over half of these, 11,214 to be exact, were House Wrens in which a large number of nestlings are included. During the years of work at Thomasville, Georgia, which extended from 1915 to 1924 inclusive, 2,560 individuals of 38 species were banded. Including both these localities and allowing some for the season of 1938, the records for which have not yet been compiled, Dr. Baldwin has been responsible for the marking of about 25,000 individuals.

Banding, of course, gives the individual an identity. It permits an attack on ornithological problems from a different angle than had previously been prevalent. Instead of discovering general principles from the activity of species and then applying these principles to the interpretation of behavior of individuals, the reverse is true. Reactions of a large number of individuals are recorded and from this multiplicity of detail generalizations applicable to the general species may be formulated. Concepts arising in this manner are not only more trustworthy but also show the limits in which the concept holds true. This has had a very healthful influence on ornithological research and has influenced and stimulated the recent splendid studies in bird behavior, territory establishment, social relations, migration phenomena, and nesting activities of various sorts. Dr. Baldwin was early aware of the great value of this approach to the study of birds. His very first 1919 paper is filled with case histories of individuals and their differences in behavior are noted. Doubtless this paper will go down in the annals of ornithology as one of the classic publications of all time in this science. It opened a whole new field for ornithological endeavor and the results have been fruitful.

One of the early objections to bird-banding that made some people hesitant about adopting it was the possible harm it might cause the birds handled. Dr. Baldwin fought this idea diligently and published a special article on the subject in 1924. Repeatedly he demonstrated that because of banding, the use of bait at the traps, the erection of boxes, and planting of suitable trees and shrubs to make a better trapping station, the abundance of birds around his home was increased and the native birds were not frightened or driven away. After twenty-five years of trapping and intensive study of birds on his Gates Mills estate, the 'Bird-Lore' breeding-bird census for 1938 showed that the fifteen acres around his home ranked fourth highest in density of bird population out of 38 censuses in all sorts of habitats all over the country. In 1931 he published a short article on how to encourage birds around the home. Cats, red squirrels, and English Sparrows were the only enemies of native birds he advocated eliminating. This is well shown in the following quotation, which also illustrates his manner of expression: "*Cats:* I allow no cats on the place; I have no grudge against the cat, but I am raising birds, not cats. A friend of mine assures me she has a perfectly good cat that does not catch birds, but I would not have such a cat, it is not a healthy, normal cat; when a cat has so lost its spirit that it no longer enjoys the sport of catching live game, and is content to eat out of a dish, it is no longer much of a cat."

Throughout the vicinity of Cleveland and even throughout the State of Ohio, Dr. Baldwin's name was a potent one in conservation. He continually fought against the cutting out of underbrush from city parks and the walling

in of city streams to resemble "open sewers" where no wild animal could safely go down for a drink; he advocated constructive measures in bird protection and the increase of birds. Probably his biggest battle was fought for the protection of hawks and owls in Ohio. This demanded his constant attention, more or less, for two years. Here his training in law helped him well as did also his very wide acquaintance among the influential people of the State. As a result of this campaign, the bounty law was repealed, the hawk and owl law clarified to such an extent that only two or three species were left unprotected, and the farming and sportsmen's organizations were educated as never before to the value of these birds of prey. The legislature and leading officials were converted to the conservation point of view and what was even more valuable, they were convinced of the desirability in turn to educate their followers in the various sportsmen's and farmers' organizations. This campaign demonstrated to Dr. Baldwin's satisfaction that the better class of members in these two groups, which are frequently considered opponents of conservation, are reasonable and when given the facts often come over to the other side. The problem of conservation seemed to be, therefore, a problem of mass education. The good of the campaign was probably not so much the changes in conservation laws effected as the initiation of educational programs among the various organized groups over the State.

Along with the fight for the birds of prey, the question as to whether or not the Bob-white should remain on the songbird list was also in the forefront. This was before the present impetus for the management of wildlife was well under way, and the question was not of controlled hunting in local regions but of throwing down the laws for hunting by all throughout the State. That this latter would have been disastrous was demonstrated by arguments, and the species remained on the protected list.

Dr. Baldwin was not a hunter nor did he belong to any sportsmen's organization, although occasionally he tramped the fields with friends and relatives in Georgia in their pursuit of the Bob-white. He went along not to shoot but to enjoy the walk, the dogs, and the birds. He had much to do in 1923 with the organization and early planning of the Quail Investigation in Georgia under the Biological Survey, which had for its aim a thorough and complete study of this gamebird.

In his early years of bird-banding, Dr. Baldwin was coming more and more to concentrate on a special life-history study of his own on the well-known little House Wren. In his first paper in 1919, he includes an illustration of a box with a trapdoor useful for studying and banding wrens and Bluebirds, and in 1914, twelve wrens were banded. Later, hundreds of these boxes were erected on his own estate and on neighboring estates within a mile's radius, and the daily life of many birds was observed.

In later years the Ohio House Wren was recognized as a distinct subspecies and in recognition of his interests was fittingly designated *Troglodytes aëdon baldwini.*

One of the earliest things he discovered about the House Wren was the prevalence of 'divorce' and mating with other individuals for second broods or following years. This was reported in his first paper and later expanded into a special article on the 'marriage relations' of the House Wren, perhaps the first serious study of this sort undertaken on wild birds where, of course, the identity of individuals first had to be established. The similarity of this behavior as well as other intimate details in the life history of this bird to human behavior struck the fancy of the layman and received considerable newspaper publicity.

In order to extend his banding work at Thomasville, Georgia, over a longer period and to expand its scope, Dr. Baldwin arranged for an assistant to operate his traps there during the spring months of 1922, 1923, and 1924. Each year a different person held this position and was given the opportunity to publish his results. In 1924, this work was terminated because of a serious illness from which he required several months to regain full health. Thereafter, his scientific endeavors were confined to 'Hillcrest Farm' at Gates Mills.

Because of his convalescence and his desire not to interrupt the banding operations and life-history study of the House Wren, he decided to employ an assistant for the season of 1925. The assistant engaged was a nature photographer of ability, and as Dr. Baldwin had long been interested in photography, he conceived the idea of making a motion picture showing all phases in the life of the House Wren. This turned his attention to the development of the motion picture in ornithological exposition, and with the aid of the other assistants during the next five years, he obtained several additional reels of film showing bird-banding and other research methods. These films were all well done and edited with complete titles and raised the standard of this art in the field of ornithology. As a special feature of this development was his association with Bradley M. Patten, then associate professor of embryology at Western Reserve University, in conceiving and devising an apparatus for taking motion pictures through the microscope, one of the first such instruments built in this country. This brought forth several reels of pictures showing the development of the bird in the egg, details concerning the first beginning of heart beat and blood circulation, and is being carried on in the study of other related problems.

My own association with Dr. Baldwin began in 1925 when I was also employed during the summer as an assistant. Each summer thereafter two or more assistants were regularly present; during some years there were as many as five. Dr. Baldwin was always very good and generous to his

assistants, aiding them in many ways in their training both in science and in the ways of life. He tried always to develop the best in their character and ability. His assistants both valued his deep interest and respected him highly for his excellence as a man.

With this acquiring of a staff of research assistants, the Baldwin Bird Research Laboratory was definitely born, a suitable building was erected, and a research library started. Up to the present time and including publications that appeared before 1925, a total of thirty-four contributions to ornithological science has appeared. Research notes fill forty-four large typewritten volumes. Four copies of each year's field and laboratory notes were always made and distributed in different places as insurance against fire and loss. There remains to be prepared, however, a monograph summarizing all this work, especially with the House Wren, a good share of which has never been published and which should make a complete life story of this bird.

The development of apparatus and methods has been an important function of this laboratory and continually engaged Dr. Baldwin's attention. Aside from bird-banding, trapping, and the photomicrographic outfit discussed, instruments for recording nest activity and temperature have been most important. Their use has had an interesting development as one research led to another. Very early in the study it seemed desirable to know whether and how often the adult birds spent the night in the nest box, or if the male spent the night in one of his supernumerary nests. The latter supposition is not true but it was found that the female stayed in the nest box during the egg-laying period and often before any eggs were laid. The question then arose as to the amount of incubation the first eggs of a set received before the last ones were laid. Some method was desired to obtain nest temperatures without disturbing the adult birds. At this point, Dr. Baldwin Sawyer, a nephew of Dr. Baldwin and director of the Brush Laboratories of Cleveland specializing in research in physics, suggested the use of a thermo-couple. This consists of a thin wire that could easily be strung through the nest over or under the eggs and carried to a recording potentiometer in the laboratory. In 1926, this apparatus was obtained and the recording of nest temperatures was begun. Immediately it was evident that much interesting information regarding periods of attentiveness and inattentiveness or time on and off the eggs could be obtained from the changes in nest temperature that occurred. This led to the publication in 1927 of a paper describing the periods and the method of recording. Since then much additional information has been obtained on many species and this is in process of compilation.

However, periods on and off and number of times the young birds were fed could not be determined by changes in the temperature of the nest after

the eggs hatched. A new method was required. About this time, while in Massachusetts on vacation, Dr. Baldwin obtained an idea that birds may be weighed as they come to their nest by stepping on a specially prepared perch. From this the concept developed that perhaps as the House Wrens came to their boxes, their weight could be made to press down the perches on the front of the boxes sufficiently to make an electrical contact, thus registering their visits. However, it would not tell whether the bird had simply alighted on the perch and flown away or had entered the nest. This would be remedied by having two perches, one just inside the entrance, so that the outer perch when it made its electric contact would throw the pen one way, the inner perch would throw it the other way, thus telling the direction of the bird's moving. Hence came the 'wrenograph,' a name which was later changed to 'itograph,' a word of Dr. Baldwin's own invention, for more general application. Since this time, the itograph has been successfully applied to several species with open nests not in boxes and has also been used to record activity of mammals and reptiles.

To return to the temperature-recording instrument, the thermo-couple at various times was inserted below the eggs to get nest temperatures, inside the egg to obtain the temperature of incubation, and just above the eggs so that when incubating, the female adult bird was compelled to sit directly on it so that her skin temperature was recorded. Many measurements of daily rhythm in temperature of adult birds on their nests were obtained in this way as well as effect of various activities. From this the step was natural to study temperature relations of birds in the laboratory under controlled conditions where the effect of all sorts of factors could be determined. Even more accurate temperature-reading instruments were obtained. Limits of tolerance of birds to extremes of environmental temperature were determined. An attempt was made to correlate an understanding of the temperature reactions of birds obtained in this way with their limitation of distribution in Nature, with the cause of their migration and variations in their abundance. Dr. Baldwin's idea always was to correlate controlled laboratory experimentation with careful determinations of bird activities in Nature. Both physiological and ecological studies profit from an interchange of methods and results. Actually these studies are in the borderline between these fields. Should we not give Dr. Baldwin recognition for helping to invigorate another new field of ornithological research in the physiological ecology of birds?

This study of bird temperatures did not end here. Very early it was discovered that newly hatched wrens were essentially cold-blooded in their temperature responses and an attempt was made to trace the changes from this poikilothermic state to the later homoiothermic one. Two reports have appeared analyzing the ontogeny of the temperature-regulating mechanism

in great detail. A better understanding of temperature regulation in adult birds can be obtained if a knowledge is available of how it develops in the young bird and the various factors concerned.

Involved in the development of a constant body temperature are not only a control over the rate at which heat is lost from the body but also a control over its production. To understand this latter control, measurements of the rate of metabolism or heat production in young birds was undertaken, and is being reported on in one of the papers referred to above. Naturally, this leads into similar studies with adult birds, which had just been started at the time of Dr. Baldwin's death. Various aspects involved in the metabolic responses of adult birds have been investigated, however. Rapidity of food digestion and daily requirements have been studied. A detailed analysis of variations in weight has been made, and relation of energy resources to amount of breeding has been investigated.

Another related study, well begun, is the study of rate of heart beat in birds. At least eight-years' time has been devoted to developing a method of recording this rate with the bird as little disturbed as possible. Here again, as with other instrumental technique, the Brush Laboratories have given invaluable aid, and an apparatus has been worked out, a description of which will soon be published, that records the heart rate of adult birds sitting undisturbed on their nests. This study of rate of heart beat will prove of special value if it can be shown to be an index of the rate of energy metabolism going on in the bird. The aim inherent in all these researches is to discover the mechanics of living in the wild, active animal.

Dr. Baldwin took a leading part in the development of all of these instruments and methods. His ideas were often the most useful and original ones. His various assistants contributed their special talents and trained abilities in various ways, but Dr. Baldwin's creative sense and resourcefulness of ideas often more than offset the training of his assistants in modern formal laboratory and research techniques. Without question Dr. Baldwin's place in the history of ornithology is an important one and it seems almost certain that the methods and ideas that he contributed will assume greater importance in the light of future ornithological knowledge. Doubtless his name will go down as one of the noteworthy ornithologists of all time.

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