COMMENTARIES

Fourteen Years of Pigeon Homing Data

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The topic of avian orientation has long fascinated amateur birdwatcher and professional ornithologist alike. Major advances in our understanding of this field have occurred in the past decade, creating a greater appreciation of the complexities of the navigation process. No longer does the researcher focus upon obvious stimuli as the sole orientational cues; no longer does he assume that he can create a definitive model from a few isolated variables. Instead, he now contends with a host of possible cues and with the numerous ways they interact and become calibrated one with the other. One person who contributed heavily to these new concepts and attitudes was the late William T. Keeton of Cornell University.

On 17 August 1980, William T. Keeton died of a heart attack. He left behind him a legacy of published works on homing pigeon (*Columba livia*) orientation. He also left behind a vast amount of unpublished data representing the results of numerous unfinished projects that spanned his 14 years of intensive work on pigeon homing. William Keeton was an open man, always eager to discuss his latest ideas and unpublished results and hopeful of encouraging or stimulating others to pick up and continue various threads of the complex fabric of navigation. In keeping with his attitude of open exchange of ideas and data, we committed ourselves to organizing and indexing this database in order to make it available to interested researchers throughout the world.

The purpose of this commentary is to introduce ornithological readers to this database and to announce the availability of these data to the public.

The William T. Keeton database.—The scope of Keeton's research was immense. From 1967 onwards, his facilities at Cornell were the site of intense and diverse activity. They not only accommodated the resident staff and a number of graduate and undergraduate students but also served as a center for visiting scientists from Canada, England, Germany, Switzerland, Italy, and Bulgaria. No fewer than 60 undergraduates assisted in collecting data from 2,500 releases conducted over 14 years.

There were tests of pigeons' sensory capabilities in the laboratory, of the orientation of walking birds and of birds in cages, but the major focus was on flying birds. As he flew them under overcast skies and under sunny skies, from 250 sites scattered around New York and Pennsylvania, he explored almost every imaginable topic—the effect on pigeons of bar magnets and Helmholz coils, rotating wheels and contact lenses, cochlea removal and olfactory nerve section, Faraday cages and iron boxes, direct routes and circuitous detours, as well as the roles of magnetic storms and cycles of the moon. There were also lofts that blocked out daylight, shifted the geomagnetic field, or altered wind directions—and even this is an incomplete list.

The Keeton bibliography is impressive: over 40 papers in 14 yr (see Emlen 1981). Some posthumous papers will be published soon, and some tests will be continued, but this public information reflects only a portion of the data in the Cornell files.

In keeping with Bill Keeton's belief in encouraging others, all of his data, published and unpublished, are now being made available in a comprehensive database.

We are offering further information in two stages. An interested person should first request an Operator's Manual. This manual describes in further detail the extent and variety of the database and explains how to use the software that has been written to search it. There are sections dealing with test protocols, telling how many of each type of test were done and in which years, and describing the bird-training procedures. Other sections list the locations of all the release sites and define the abbreviations and treatment codes used. Finally, a description of each of the experiment types is provided, giving some of the rationale for why the experiment was conducted. We hope this material will provide an adequate basis for a person to decide whether to go on to the next stage of actually obtaining the database.

The second stage is the database itself, which has been implemented in Apple Pascal 1.1 and requires an Apple II micro-computer with a Pascal System and one disk drive. A printer is optional. An 80-column board is not absolutely necessary but is strongly recommended. The decision to store the database on mini-floppy-disks was made in the hope of maximizing its availability to potential users. In these times of rapidly changing computer technology, no decision is without its drawbacks, but Apple II microcomputers were believed to be more widely distributed and easily available than any specific brand of main-frame computer.

The 2,500 releases of test pigeons comprising the Keeton database are stored on a total of 14 disks. They are arranged chronologically, with one disk incorporating the results from a single year. There is also a software disk, containing a program that may be

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used to search and list the data. After a person has studied the Operator's Manual, he may request copies of disks for any one or all of the years. Data must be requested by year, however. It is not possible to obtain disks for just one test category, or site, or any other subset.

Prospective users wishing to obtain copies of the Operator's Manual or the database should contact Dr. Charles Walcott, Director, Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850. Requests for the database must be accompanied by (1) the necessary number of Pascal-formatted disks (one disk for each year desired), (2) instructions about which years of results are being requested, and (3) a check payable to Cornell University in the amount of $10.00 for each disk requested (to cover the costs of handling, copying, and mailing the data disks).

With so many different cues apparently playing roles in highly redundant navigation systems, Bill Keeton's many diversified investigations will be stepping stones along the path to future discoveries. It is our hope that by making the Keeton database available to the scientific community, we will hasten the progress of others along this path. If the use of his unpublished data is valuable to others in stimulating them to further research, in helping them in the design of their own methodologies, or, indirectly, in leading them to new discoveries about animal orientation, then making these data available will have been worthwhile. Keeton would not have wanted it any other way.

LITERATURE CITED

EMLEN, S. T. 1981. In memoriam: William T. Keeton. Auk 98: 167–172.

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Depositing Sound Specimens

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As the curator of an animal-sounds collection, the Bioacoustic Archives of the Florida State Museum, I have become increasingly concerned that no published guidelines exist for the making of scientifically valuable sound recordings, their proper storage, and their use in published reports. This commentary deals briefly, but I hope constructively, with each of these topics.

Making sound recordings in the field.—At the Florida State Museum, we welcome collections of sounds made by amateur recordists and by professional scientists who have made recordings incidentally to their primary studies. Often, however, because such recordings are made first for strictly personal enjoyment or use in identification, much work is necessary in the sound laboratory to make these collections useful as permanent specimen materials in our archives. I do not wish to discourage contributions, but I wish to encourage anyone making field recordings to take just a little time to establish a slightly more formal routine in recording that will save hours for the laboratory technician later.

The collection of sound specimens should be as disciplined as the collection of any other kind of scientifically useful specimens. An attempt should be made to observe the following protocol, although field circumstances may not always allow perfect adherence to the scheme. First, begin a tape with an introductory announcement including tape number, your name, locality, date, time, weather, habitat, and kind of recording equipment being used. Then, let a few seconds of blank tape run. Now, try to make each recording a distinct unit or "cut" on the tape. If possible, quickly record on tape a very brief announcement of a species about to be recorded or rewind later and insert this information. Then, record the bird. Try to adjust the record level and then *avoid* changing the level during the cut. Also, stand as rigidly as possible, and try to avoid making sounds with your feet or with your hand moving on the microphone. If the bird is singing, try to record an uninterrupted sequence of at least 1 min before moving or making any commentary. Of course, if you are studying a particular species' song on a formal basis, you may wish to record much more! The suggestion of 1 min is arbitrary. The core of your specimen is a good, clean, uninterrupted sequence, however long you judge it desirable to be. Immediately after the recording, give the essential data right on the tape in your voice. Be sure to adjust the record level for your voice and to speak clearly. Give data *in full* so that this specimen can stand alone without reference to the rest of the tape, as it eventually may do in a well-curated sound archives.

What happens if another bird begins to sing just as your first one stops and you're afraid you won't get it on tape? It is best to run some blank tape quickly, thereby leaving space for you to fill in the above data later. Then, say the second species' name and record it. Continue to follow this procedure through-

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