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Sir Julian S. Huxley (1887–1975) was a major player in the Modern Synthesis of the 1930s and 1940s, when most scientists realized that Mendelian genetics explained Darwinian natural selection. He championed Darwin's ideas concerning natural selection, and, as was typical of the time, wrote a book, *Evolution: The Modern Synthesis* (1942), which gave that movement its name. Some claimed that it was the most influential book published on evolution during the last century. He was knighted in 1958, 100 years after Charles Darwin and Alfred Russel Wallace jointly announced their theory of natural selection.

Few probably remember that Huxley left Britain in 1913 to start the Department of Biology at the fledgling Rice Institute, now Rice University (Figure 1). (You have to love a university that has an owl as its mascot.) One certainly has to wonder what his career would have been like if he had stayed in the United States, but the start of World War I caused him to return to Britain in the fall of 1916 to serve in the war. He did stay in touch with colleagues at Rice, and many of his papers were obtained by Rice University (Boothe 2004).

Huxley was interested in ornithology and bird behavior in particular, and he had published a major work on the courtship behavior of the Great Crested Grebe (*Podiceps cristatus*) (Huxley 1914). In 1916, he published a two-part essay on "Bird-watching and biological science" in *The Auk* (33:142–161, 256–270). His main thesis was that amateur birdwatchers and bird lovers and professional ornithologists could work together to significantly move the field forward.

His essay began with his assessment of the current situation:

> There is to-day, most unhappily, too often a gap between the amateur naturalists and the pure field-workers on the one side and the trained biologists on the other. The blame, as usual, cannot be laid to the account of either, for both are guilty. On the one hand the professional fights shy of amateurish methods and failure to see principles behind facts, while the amateur dislikes (often with justice) the other's dogmatism and his reliance on purely laboratory methods. (*The Auk* 33:142)

To him, three things were necessary: a knowledge of what to search for, a method to guide one's searching, and instruments to use in the search. With regard to instruments, Huxley was way ahead of his time. The first piece of equipment needed was a pair of prismatic binoculars, but not just any pair of binoculars. First, they should be of high magnification—anything below 6× is useless, with 8× or 10× recommended. Second, both eyepieces need to focus simultaneously, not independently like many glasses of that time. A leading manufacturer of binoculars early last century was the German company Goerz-Triede, and Huxley recommended their longitudinal focusing method (wheel perpendicular to barrels like we use today) as opposed to the transversely focusing method (wheel parallel to barrels) as was commonly being used around that time (Figure 2). Thirdly, the binoculars must have high light-gathering and definition capabilities, or the usefulness of high magnification will be greatly reduced. In addition, the serious student should invest in a spotting scope, with 25× being the recommended magnification. Rather than hand-holding these instruments, Huxley recommended a method for attaching binoculars to a Kodak camera tripod and purchasing a telescope tripod. Having your binoculars and spotting scope on tripods freed up your hands to take field notes!

Before discussing the other two necessities, Huxley felt that courtship in birds was a burning question that needed to be addressed, but that necessitated having a working knowledge of evolution, sex theories, and animal mind theory. Here he digressed for several pages on mating systems and the role of each sex in breeding. Returning to courtship, the first necessary things were facts, and here the professional scientist could turn to naturalists and birdwatchers for help. Huxley then presented a detailed description of the courtship behavior of the Great Crested Grebe, since he was "sure of every fact."

Huxley cited few other works about courtship, but he was also impressed with the work of Edmund Selous (1857–1934). His reports of the breeding behavior of the Black Grouse (*Tetrao tetrix*) started in 1909 (Selous 1909) and continued with 4 more pieces in 1910 (*Zoologist* 14:23–29, 51–56, 176–182, 248–265). Selous was a recluse

FIGURE 1. Portrait of Julian Huxley when he was an assistant professor at Rice Institute in Houston, Texas.

FIGURE 2. An example of the type of binocular that Huxley thought was too complicated to be used to watch birds. This is a Goerz 9×20 Trieder binocle no. 94158, manufactured in 1906. The lower wheel was for adjusting the distance between the eye cups and the upper two wheels were for focusing each eye piece independently. Photo copyrighted by Anna Vacani; used with her permission.

who preferred solitude to companionship. He refused to read anything written by other authors concerning animal behavior, relying solely on his detailed observations. Nonetheless, he was a prolific researcher, publishing many books and articles (Nice 1935).

The other research that Huxley mentioned was that of Henry Eliot Howard (1873–1940) on the Old World warblers (Sylviidae). Howard was an amateur who was the first to elaborate on territoriality in birds during the breeding season. He began his series on warblers in 1907 (Howard 1907) and published part 9 in 1914.

From his study and the two others, Huxley concluded that there are two kinds of courtships, although he wished he had more "facts." The first he termed "Darwinian courtship," where one member of the pair (usually the male) was the more aggressive. The second he termed "mutual courtship," where both sexes participate equally in courtship behavior, like his grebes. This second kind of courtship deserved further study and had been ignored by Darwin.

The next stage after observations was interpretation. To Huxley, there are two important points: What is the meaning today, and what has been the origin in the past? He concluded this part of the essay with the following:

> Such a discussion will make it easier to comprehend that it is possible to answer in various ways that question "why does such-and-such a species of bird perform such-and-such an action?" "Why do the Grebes shake their heads at each other?" The Evolutionist answers that the cause lies in Mutual Selection, which has developed the action for the good of the race. The Physiologist sees the reason in the activity of the gonads; these exert by chemical means a stimulus on the nervous system, which in its turn is arranged in such a way as to cause the stimulus to run down and set the appropriate muscles to working. The Psychologist sees in it a self-exhausting psychological process accompanied by a pleasurable expression of emotion—the bird does it because it enjoys doing it. In reality, all are right—in their degree; and it is from a failure to get a sufficiently broad point of view, a failure to distinguish between ultimate cause, immediate cause, and mere necessary machinery, that so much of the barren disputes of biology are due. (33:161)

The second part of his essay was concerned with logistics and his observations of birds since his arrival in the United States. He advocated for a system whereby observations were recorded on index cards and color-coded for species within a genus. Observations were further subdivided by season and species were delineated by tabs following the AOU species number code. He then gave a detailed account of what behaviors could be recorded throughout the year.

Finally, Huxley gave an account of the behaviors he had already observed since his arrival in the United States and gave a list of research projects that had already come to mind based on his short time in the States. At the end of his piece, Huxley stated his intention to remain in the States for a protracted period of time and asked for other people to start corresponding with him. Too bad that did not work out.

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