



**T**he blue tit is a small European songbird that is very abundant and readily uses nestboxes for breeding. This makes it an ideal study species for field biologists. Photospectrometry revealed that especially the blue feathers have strong reflectance peaks in the UV.

The most important aims of my research were to test if plumage UV reflectance is inherited from parents to offspring, to provide a confirmation of the intriguing effect of male UV coloration on brood sex ratio that was previously found, and to further investigate the role of UV coloration in mate choice and competition.

The inheritance of attractiveness — in this case UV reflectance — from parents to offspring is a key assumption of the theoretical models predicting brood sex ratio adjustment by females in response to the attractiveness of their male. Based on data of all blue tits breeding in the study area between 2001–2004, I was able to show that offspring do indeed significantly resemble their parents in the UV coloration of the head feathers. This result presents the first evidence for inheritance of UV coloration from parents to offspring in birds and fulfils one of the main conditions for sex ratio adjustment to evolve. To test if females adjust their brood's sex ratio in response to their male's UV coloration also in our study population I carried out the following experiment. I reduced the UV reflectance of one group of males by smearing a mix of natural feather wax and UV absorbent chemicals used in sun block on the head feathers. Another group of males was treated with wax only as a control. The UV reflectance of the males was measured immediately before and after the experimental treatment. Thereafter, we monitored the proportion of male and female offspring produced by their female mates. The experiment was carried out in two breeding seasons: in 2002 and 2003. In contrast to the straightforward theoretical prediction, females paired to UV-reduced — unattractive — males did not produce a lower proportion of sons. Instead, in one of the two years, the positive correlation between offspring sex ratio and natural male UV reflectance (after control treatment) disappeared.

### Measuring plumage coloration

We used a spectrophotometer with illumination by a deuterium-halogen light source (both of Avantes). Both the spectrometer and light source were connected to a bifurcated measuring probe, thus enabling illumination and spectral recording at the measuring spot. All spectral measurements were stored on a standard laptop computer connected to the spectrometer. The set-up provided us with recordings of the spectral re-

## Ultraviolet Signals in Blue Tits

Peter Korsten, Avantes, Inc.



**Figure 1:** Close-up of male blue tit immediately after UV reduction treatment. The head feathers appear naturally blue to the human eye, but lack their natural UV reflectance.



**Figure 2:** Plumage measurement of the blue tit.

flectance of the birds' plumage for the entire bird visual spectrum (320–700 nm), which includes both the human visual spectrum (400–700) and the UV (down to 320 nm).

**Avantes, Inc.**

9769 W. 119th Dr. STE 4

Tel. (866) 678-4248, Fax (303) 410-8669

infoUSA@avantes.com, www.avantes.com