dominance and whether male dominance *per se* affected male mating success. Male dominance is probably strongly correlated to territory ownership[3]. Territorial changes are rare; we have not observed any enforced territorial take-overs in the study area.

Savalli takes the 'low', but significant, correlation (r^2=0.10) between female territory quality and the number of chicks hatched as an indication that our quality index is not valid. This conclusion seems premature. Data reported in ref. 6 reveal that independent variables explaining more than 10 per cent of female annual reproductive success in birds are rare.

Our new analysis, based on territories which had the same location, but were occupied by different males during successive years, reveals that the former territorial owner's attraction of females[1] did not predict that of the newcomer as would have been the case if male attractiveness was a function mainly of territory quality. Male spur length was a significant predictor of both former and newcoming territory owner's attraction of females in this sample of males (see figure).

We agree that it is surprising that the variation in male territory quality does not seem to affect female choice significantly in our study[1]. But the overwhelming majority of studies reporting that territory quality is the main factor for female choice are based on altricial species[5] where the need for central place foraging makes territorial resources crucial for female reproductive success. Territory quality may be less variable for precocial birds because parents can freely lead their chicks to places where food is abundant.

Unfortunately, Savalli's arguments are based on a lack of expected correlations in our data[1] and when correlations occur, as opposed to what is "well known in other birds", the variables are "unreliable". We note that neither reference quoted by Savalli has quantified the relationship between harem size and territory quality or between male spur length and outcome of territorial combat. Although data do not support Savalli's points, we do not exclude the possibility that female mate choice in pheasants is affected by territory quality or that male spur length affects intrasexual conflicts. Field experiments, rather than arguments, will tell whether these effects are of any significance.

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1. von Schantz, T. *et al. Nature* **337**, 166–169 (1989).
2. Snedecor, G.W. & Cochran, W.G. *Statistical Methods* 7th edn (Iowa State Univ. Press, Ames, 1980).
3. Collias, N.E. & Taber, R.D. *Condor* **53**, 265–275 (1951).
4. Glutz von Blotzheim, U.N. *Handbuch der Vögel Mitteleuropas* Vol. 5 (Akademische, Frankfurt, 1973).
5. Read, A.F. *Trends Ecol. Evol.* **1**, 85 (1986).
6. Clutton Brock, T.H. (ed.) *Reproductive Success* (University of Chicago Press, 1988).
7. Dixon, K.R. & Chapman, J.A. *Ecology* **61**, 1040 (1980).

Three's company for stereo viewing

SIR—Vance Tucker[1] clearly describes an under-appreciated ambiguity associated with stereo diagrams: a stereo-pair can give the proper three-dimensional image or a 'backwards' one depending on whether it is viewed with crossed or uncrossed visual axes. The standard arrangement for publication requires uncrossed visual axes as is appropriate for conventional stereoscopes. As Tucker points out, however, many people do not keep a stereoscope handy and use direct, 'naked-eye' viewing instead.

Unfortunately, as direct viewing is easier to learn using crossed visual axes[2], many people end up looking at backwards images. In the case of 'wire' models, the resulting front-to-back reversal simply changes the handedness, but in solid models it produces an unintelligible (pseudoscopic) image, as shown in the figure (which is taken from ref. 3 which contains a detailed description of the format together with a step-by-step method for learning direct viewing).

No arrangement of stereo-pairs can satisfy both methods of viewing but, as Tucker illustrates so nicely, three side-by-side diagrams is a universal format that can be viewed by any method. Why not publish all pictures in that format so that everyone can see a correct image using whatever means is at hand? The large page size of most journals would make this feasible; indeed, the space adjacent to stereo-pairs is usually blank. This triplet format has been used in both book[3] and journal[4] illustrations and is the standard format in the journal *Protein Engineering*.

For the triplet format it is important to note that the perceived depth differs with the method of viewing: uncrossed viewing gives rise to a larger percept with more apparent depth than the same figure viewed with crossed axes. To compensate, the individual images in the figure are rotated to different extents about their vertical axes. The pairs of images on the left (for uncrossed viewing) differ by a 4-degree rotation; the pairs on the right (for crossed viewing) differ by an 8-degree rotation. The apparent depth in the two correct three-dimensional images is about the same.

Two additional — but inessential — features are incorporated into the stereo-triplet in the figure. First, a surrounding grid is included to make it easier to scan from image to image by direct viewing. Second, the central image is placed slightly to the left of centre so that the correct three-dimensional image appears to float just above the page, as defined by the grid. (Putting the adjacent pseudoscopic image below the plane of the page.) A universal stereo format that combines our technical and human capabilities might greatly improve the appreciation of three-dimensional structure in biology.

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1. Tucker, V. *Nature* **337**, 605 (1989).
2. Hamori, E., Broad, R. & Reed, C. *Perception* **11**; 297 (1982).
3. Wood, W.B. *et al. Biochemistry: A Problems Approach* (Benjamin/Cummings, Menlo Park, 1981).
4. Wilson, J.H. *Proc. natn. Acad. Sci. U.S.A.* **76**; 3641 (1979).