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Techniques for the observation of spider behaviour

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One of the main problems encountered in the study of spider behaviour is that caused by the small size of the subjects. In addition, field observations are usually complicated by the presence of visual distractions that can cause loss of attention at critical moments. Ideally it is necessary to concentrate the field of vision on a subject which is enlarged several times.

One solution to this problem is to film or telerecord behaviour sequences and then analyse the film or tape on suitable playback equipment. This technique is very useful, particularly when behaviour sequences are rapid and need to be analysed step-by-step, in slow motion. It has, however, a number of serious drawbacks. Film is expensive, liable to run out at critical moments, and the anticipation of behavioural events often results in the operator filming long runs of non-events. In field conditions the delay between the filming and receipt of processed film for analysis can be critical, and sometimes disasterous. Telerecording solves some of these problems since it provides for instant replay and the subsequent re-use of useless tape sequences. On the other hand the initial capital outlay is great and the resolving powers of the playback equipment are not entirely satisfactory.

We have found that watching through the optical system of a suitably equipped Super 8mm cine camera provides an excellent method of observing the complex behaviour of small animals. It concentrates the field of vision, thereby eliminating peripheral and irrelevant visual stimulation, and can provide variable enlargement of the subject. In studying the mating behaviour of araneids in New Guinea we were thus able to observe in detail, the insertion of the long, very narrow embolus of a male *Nephila maculata* (Fabricius), only 8mm in length. In this case the magnification of the lens system of the camera was adjusted so that the portion of the female opisthosoma on which the male was standing filled the field of vision of the observer. The camera had a 9.5 to 47.5mm zoom lens fitted with the manufacturer's close-up adaptor. By present day standards this is a relatively small range zoom lens, even for amateur equipment.

The use of zoom optics enables adjustment of the field of view without moving the camera on the very necessary tripod. Figure 1 shows the lower limits of the visual field covered by the camera that we used. Viewing through the camera does impose the strain of monocular concentration which can be annoying and we have therefore experimented with a pair of binoculars to adapt them for viewing small objects. A pair of 8 x 30 binoculars fitted with 1 or 2 dioptre close-up lenses provide a good view of most medium sized spiders. The fields covered by close up attachments on this system are also shown in Figure 1.

Close-up attachments for cameras are inexpensive and easily obtainable. Some types will push on to the front element of a binocular, others may have to be taped in position. Such an adaptation does not give the zoom effect but is restful to the eyes. Using binoculars is most convenient if they are mounted on a tripod; a simple but effective mount is illustrated in Figure 2. Variable magnification close-up attachments are now available for cameras and we find them very satisfactory. They do necessitate moving the binoculars in relation to the subject when magnification is changed, but this can be accomplished without moving the tripod if they are attached to a rack-and-pinion focussing mount.

In our opinion, the use of either the zoom optics of a movie camera or modified binoculars is preferable to the use of magnifying spectacles, since the latter necessitates a very close subject to observer distance. Suitable monocular spider watching equipment could be built from the zoom optics of mechanically defective, or obsolete, movie cameras. We suspect that many such cameras must now exist and that they would be valueless to the average camera dealer.

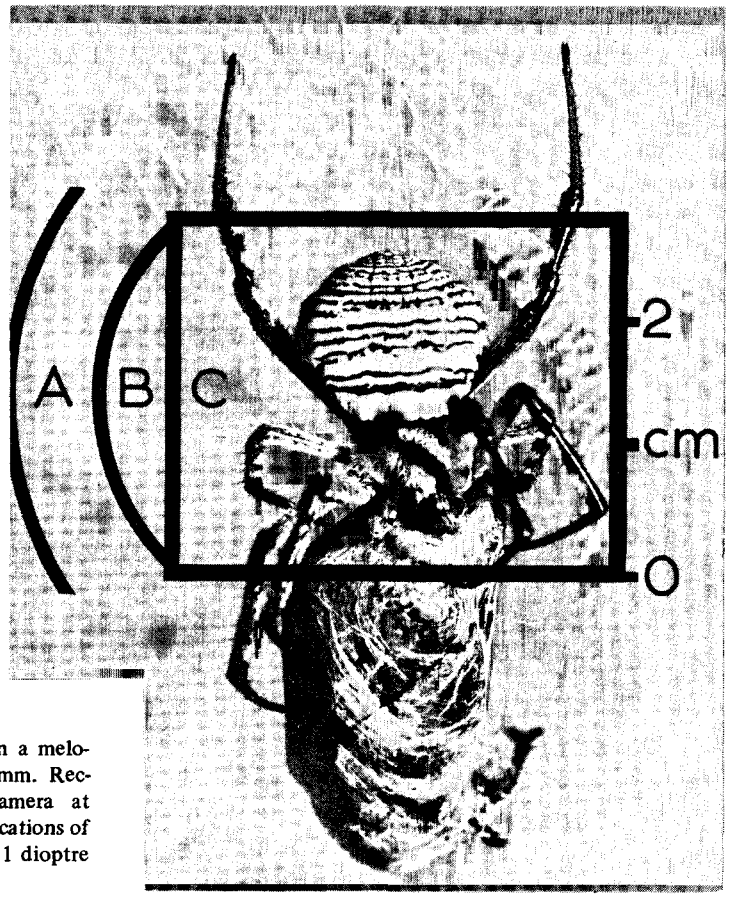

Figure 1. *Argiope aemula* (Walckenaer) feeding on a melolonthid beetle. Length of spider ca. 20mm. Rectangle shows field of view through movie camera at maximum magnification (See text). A & B are indications of the circular fields of binoculars fitted with 2 and 1 dioptre close-up lens.

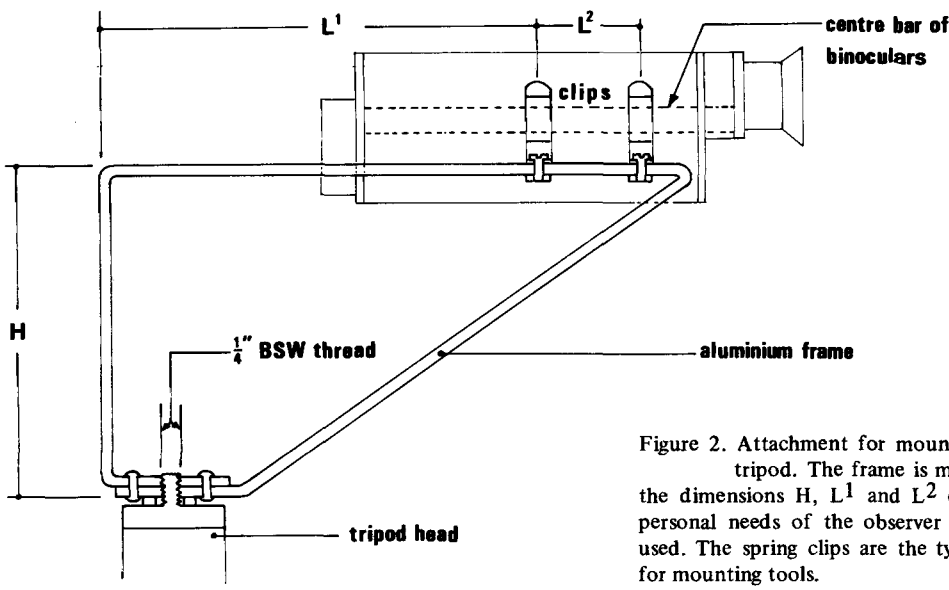

Figure 2. Attachment for mounting binoculars on a camera tripod. The frame is made of aluminium strip and the dimensions H, L^1 and L^2 can be adjusted to suit the personal needs of the observer and the type of binoculars used. The spring clips are the type sold in handicraft shops for mounting tools.