Bennet-Clark, H.C. University of Edinburgh, Scotland. Microphone and pre-amplifier for recording courtship song of Drosophila.

The sound produced during wing vibration is a valuable specific character in Drosophila (1). This has been recorded by using elaborately sound insulated pressure sensitive microphones but this technique requires quiet conditions and makes observation very difficult.

In the course of an analysis of the acoustics of the song, it became apparent to me that with very small acoustic sources, the particle velocity in the sound wave was far larger than the pressure at very short ranges (2). The female fly's receptor, the antennal arista, responds to particle displacement. With this appreciation of the acoustic situation, I started using a displacement sensitive ribbon microphone to record courtship song.

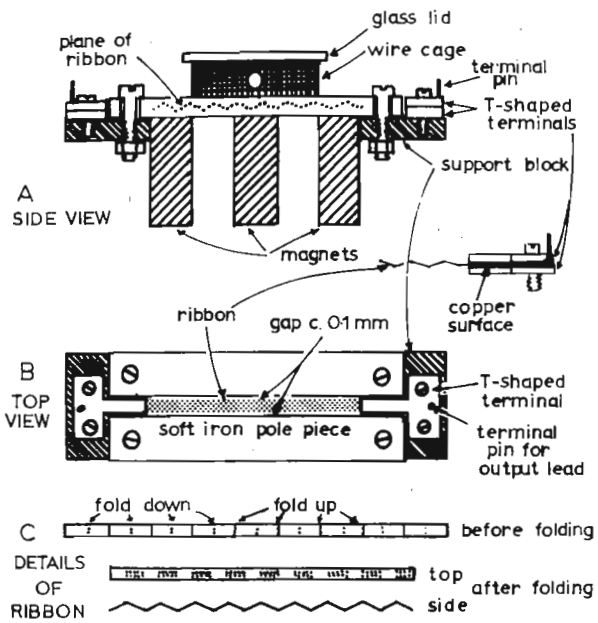

fig.1. 50mm

RIBBON MICROPHONE CONSTRUCTION

One microphone used at Edinburgh is the Reslo ribbon, made by Reslosound, Spring Gardens, London, London Road, Romford, Essex England. This is unfortunately no longer in production though some stocks of the 30-50 ohm model remain at a price around $50.00. The outer protective grille is removed and the flies are placed in a wire cage 20 mm long, 10 mm wide and 10 mm high directly on top of the inner protective gauze about 2 mm above the ribbon diaphragm. Flies can be inserted if a hole is made in the side of the cage and observed if the top is made of glass (Fig. 1.A). Ribbon microphones are very sensitive to wind blast and care must be taken to avoid blowing out the ribbon when the flies are inserted.

If funds are low, an adequate ribbon microphone can be made for a few cents using horseshoe magnets and foil from a capacitor. The components are a pair of soft iron pole pieces about 50 mm long drilled at each end, a pair of Paxolin support blocks drilled and tapped to hold the pole pieces about 3 mm apart, four T shaped pieces of copper plated printed board held in pairs by screws to the support blocks, two or three small horseshoe magnets and a ribbon cut from the foil of a paper-foil capacitor.

The general assembly is shown in Fig. 1.A & B. The size of the pole pieces will depend on the size of the magnets but should not exceed 10 mm width. The ribbon is cut 3 mm wide from 5 µm thick aluminium foil and is concertinaed as in Fig. 1.C. After folding, the ribbon is held between the copper faces of the T shaped terminal clamps in the roughly aligned frame formed of the pole pieces and support blocks. The poles can then be adjusted to the minimum gap consistent with free movement of the ribbon. The top of the ribbon should be protected by a wire gauze. After assembly, the magnets are attached to the underside of the pole pieces with their north poles all on one and south poles all on the other pole piece.

The output is taken from the terminals either by a brass lug or a pin soldered to one of the copper foils. The shortest possible leads are used to connect to an

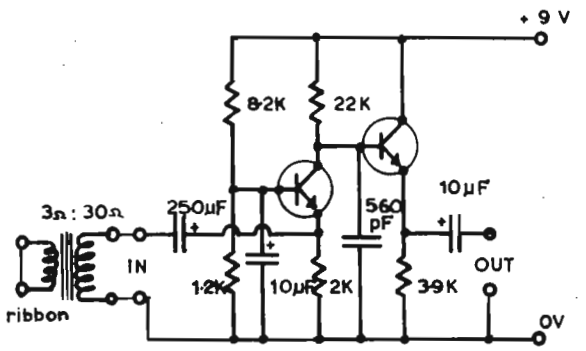

fig.2. LOW IMPEDANCE PRE-AMPLIFIER

impedance matching transformer. The transformers used to couple the output transistors to the speaker in a personal radio are ideal.

The ratio should be from 1:3 and 1:10 step-up or to match 3 ohms and 30 to 300 ohms. The transformer is used to step down in the radio so the ribbon should be connected to the speaker or secondary winding and the primary to the pre-amplifier (Fig. 2).

The microphone can be tested by feeding from a signal generator when it will radiate sound or by feeding it into a high sensitivity oscilloscope, when it should respond to sound.

The output from a ribbon microphone is at low impedance and very low level. A suitable pre-amplifier with a gain of 200 and output impedance of 200 ohms is shown in Fig. 2 and will give an output compatible with most transistorised tape recorders. The first stage operates in the grounded base condition with low input impedance, high gain and high output impedance. This drives an emitter follower to give a low output impedance. Suitable transistors in Europe are BC 109 and in North America, types 2N 3904, 2N 3906, 2N 5087 etc. As current drain is about 1 mA, small 9 V batteries can be used.

The frequency response of the microphone is substantially flat between 50 to 70 Hz and about 5 to 7 kHz. The response of the pre-amplifier is flat within 1 dB over this band and falls at 6 dB per octave at the extremes. The background noise of microphone and pre-amplifier is equivalent to a sound of less than 40 dB so adequate signal to noise ratios can be obtained with many species of flies which produce sounds whose particle velocity is 70 to 100 dB at a range of 2 to 5 mm (2).

A detailed account of the theory and construction of ribbon microphones is given by Olson (3).

References: 1. Ewing, A.W. and H.C. Bennet-Clark 1968, Behaviour 31:288-301; 2. Bennet-Clark, H.C. 1971, Nature (London) 234:255-259; 3. Olson, H.F. 1957, Acoustical Engineering, xix+718, Van Nostrand, Princeton, N.Y.

Tartof, K.D., D. Tartof and M. Jones. Institute for Cancer Research, Philadelphia, Pennsylvania. A fly trap.

When fruit flies escape their culture bottles, they become a nuisance. Indeed, they are a danger to experiments involving sucrose gradients, cell cultures or sophisticated enzymology and can threaten the amicable relations between neighboring laboratories. Therefore, we sought to find a convenient trap for fruit flies that we could dispense to our neighboring cell culture and biochemical colleagues. It was imperative that the trap contain no yeast since yeast, like fruit flies, is anathema to those working with cell cultures. For reasons that we consider imprudent, we shall not discuss those events which led to our discovery of the ideal fly trap. Suffice is to say that a little (10-20 ml) Mogen David Concord Grape Wine in a half-pint bottle containing a Kleenex tissue and capped with a cardboard disc perforated with a 1-2 mm hole makes an extraordinarily efficient fly trap. The effectiveness of various vineyards and vintages awaits further exploration.

Novitski, E. University of Oregon, Eugene, Oregon. Instant triploids.

For many purposes the triploid condition is a convenient tool, as for the insertion of mutants into attached X's and other compound chromosomes. One convenient way of achieving this result quickly is to mate attached X females to males carrying compounds for both the second and third chromosomes. Since the males produce some small fraction of sperm that are essentially diploid with respect to the autosomes, along with a single X and a single fourth chromosome, a new triploid zygote may be produced when such a sperm fertilizes an egg with the attached X.

In a test of about 7000 C(1) females mated to C(2);C(3) males, 57 triploids were produced and the desired genetic change was achieved; i.e., the Bar locus (which had previously been attached to the tip of 2L, see DIS 47:91) was added to the tip of 2L on C(2L). It should be noted that 3N ♀♀ with compound autosomes are quite infertile and a stock is difficult to keep going, even for a few generations, so that this technique is useful only in a hit-and-run type of experiment, where the 3N condition is needed only ephemerally.