GLASS FIBRE RESIN CASTS OF FOSSILS

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ALMOST every worker with macrofossils must, at some time, have had cause to regret the vulnerability of plaster casts. After months of negotiation a much-needed cast may arrive broken in transit: or having survived the hazards of modern transport, it is dropped and has to be mended. A repaired cast is never satisfactory, for one is never sure how much of it exists only in the imagination of the person making the repair. Various methods have been devised for strengthening plaster, but none of them seems to be very efficient. In an attempt to overcome this problem the authors, with the assistance of Mr. E. Balog, have been experimenting with glass fibre resin casting. The method evolved is rather more difficult and more costly than plaster casting, but the trouble and expense are justified by the great strength, resistance to abrasion, and lightness of the finished product.

It is well known that glass fibre casts can be taken from suitably treated plaster moulds, and since the technique for doing this with fossils is only a variation of that used in industry it is not discussed here. It is not, however, generally appreciated that such casts can be made using flexible polyvinyl chloride moulds, and it is this method with which we propose to deal.

There are two types of object met with in casting. The fossil which is still partly embedded in the matrix, and that which occurs in the round. Each requires a different moulding technique. The first case being the simpler it is dealt with first.

A mould of the fossil, using polyvinyl chloride or rubber is first prepared in the manner previously described by us (Rixon and Meade 1956). The surface of the mould is now painted over with undiluted Silicone Fluid M.S. 200/350cs, and the excess is carefully wiped off with a fluff-free tissue. Very little silicone need remain, and it is important to see that it does not collect in the depressed ornament of the mould. The resin we have used is Crystic 189, and the formula recommended by the makers is:

Crystic resin 189	60 parts by weight
Crystic Pregel 17	40 ,, ,, ,,
Catalyst paste H	4 ,, ,, ,,
Accelerator E	4 ,, ,, ,,
Titanium dioxode	3 ,, ,, ,,

A rough estimate is made of the amount of resin required to cover the surface of the mould thinly and the ingredients mixed in the following order. Since the Catalyst paste H must be fully dissolved this is added to the Crystic resin first and stirred well. The solution of this substance is accelerated if the resin is now warmed, to about 29° C. This must be done with care as the mixture is inflammable, and if the heating is overdone the resin will set prematurely. When all the catalyst has dissolved the titanium dioxide is added. It is best made into a lump-free paste with a little of the resin before being added to the main mix. Now the Pregel 17, which is a thixotropic paste, is thoroughly stirred in. Finally the accelerator E is poured in while stirring. This must be well dispered through the mixture.

The vessel containing the prepared resin is now tapped to make the air rise to the surface, where the bubbles can be removed. The mixture is painted into the mould until the whole is covered with a thin coat. It will not matter if this is very thin in places. This coat is left to harden for about half an hour. This time varies with local conditions and can be made longer or shorter by varying the accelerator content. Brushes and glassware should be cleaned immediately with acetone followed by hot water, a detergent, and some scouring powder. While the resin is setting chopped stranded glass mat is cut into convenient pieces. If the contours of the mould

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are complicated the pieces should be about half an inch wide and an inch and a half long; for less complex shapes larger pieces can be used. It will readily be seen that if the pieces are too large there is a danger that they will be pulled out of one place by the mere action of pushing them into another.

A further batch of resin is now prepared, but this time the Pregel 17 is left out and the weight of accelerator reduced by half. Some of the strips of glass mat are placed in a flat dish and the resin poured on to them and pressed well in with a palate knife. If large pieces of mat are used the resin will have to be painted on to them and then rolled in between two pieces of cellophane. The resin-soaked glass is lifted with the palate knife and placed in the mould over the pregel coat which by then should have set hard. The whole surface of each piece of glass mat should not come into contact with the mould at once, but should be pressed on gradually to avoid trapping air, and each piece should be slightly overlapped by the next. The mat must be pushed down into the mould with a stiff brush, care being taken to work it into hollows and over ridges, and to see that it is flat to the mould in all places. When the mould is completely covered the casting is left for two hours to set and harden. If greater thickness is required another application can be made provided that it is done within a few hours. A smoother backing can be obtained by finishing with a layer of surgical cellulose soaked in resin. Whole castings can be made using this instead of glass, but they have nothing like the same strength and require much more resin.

Using single-piece moulds we have produced successful glass fibre casts of the antiarchan fish *Bothriolepsis*, a complicated shape with deep relief and a mass of fine detail. One of these was repeatedly walked on by a 14½ stone man and sustained no damage. Simpler subjects are fossils preserved in the flat fissile flags of the Scottish Middle Old Red Sandstone. A glass fibre cast of the osteolepid fish *Thursius* from this formation, measuring 27×16 cm., weighs 87 grammes, and is about 3 mm. thick. One is tempted to write an address on the back, stamp it, and send it through the post. Such casts could be stored in a filing cabinet. A coloured cast sometimes shows ornamentation and relief better than a white one. These casts can be painted with ease using dry colours with shellac as a binding medium. Basic colours other than white can be obtained by replacing the titanium dioxide by burnt sienna, burnt umber, and raw umber in powder form.

Making glass fibre casts in the round from a double mould is much more difficult. A visible joint line is hard to avoid, but this is a problem which can be solved by improved technique. Both halves of the mould are treated as described above, but care is taken to avoid building the glass above the edges of the mould halves. This is not easy and it may be necessary to trim the edge with scissors after the resin is set. When the two halves have set some resin mixture is painted on the edges and a little is poured into one half of the mould, and the whole is closed and secured. It is then rotated so that the liquid resin will flow continually round the joint line until it sets. This point is indicated by a control sample of the resin setting on the bench. The mould is left for a further hour after this before it is opened.

It is hoped to improve results by experimenting with different types of glass mat and with synthetic fibre flocks. Since submitting this article we have made very successful casts using Fibreglass Chopped Strands H.P.A. 1 inch long. These are cheaper and easier to use than the mat.

Those who wish to try these methods are recommended to start with glass fibre chopped strand mat Type H.P.A. from Messrs. Fibreglass Ltd., St. Helens, Lancs. Crystic resin 189 is made by Scott Bader Ltd., 109 Kingsway, London, W.C.2, and Silicone Fluid M.S. 200/350cs can be obtained from Messrs. Hopkins and Williams, Chadwell Heath, Essex. The moulds we have used are made from I.C.I.'s Welvic paste from I.C.I. Plastics Division, Welwyn Garden City, Herts.; or from Vinamould H.M.C. 1028 of Vinyl Plastics Ltd., Butterhill, Carshalton, Surrey; or from Revultex rubber latex from Revertex Ltd., Harlow, Essex.

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