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1957-04
The Bernard Price Institute for Palaeontological Research
http://hdl.handle.net/10539/15390

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ON THE USES OF GLYPTAL IN PALAEONTOLOGY

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Abstract

A variety of materials is normally used in different fields of technical palaeontology, such as in adhesive, reinforcement, preservative and protective capacities. This paper promotes the general use of one material, commercially known as "Glyptal" in all these fields, unless the solvent qualities of different materials are specifically needed.

In technical palaeontology much experimenting has been done to find the ideal materials for employment as an adhesive, as reinforcement, in preparation and reproduction, in acid techniques and for general preservation and protection. Several materials are commonly employed at present in these different roles, i.e.:

(1) As an adhesive — seccotine, gum arabic, jewelex, etc.
(2) For reinforcement — shellac, perspex, gelva, duco, etc.
(3) In preparation and reproduction — gum arabic, duco, gelva, etc.
(4) In acid techniques — perspex, lustrex, etc.
(5) For preservation and protection — shellac, duco, gum arabic, etc.

With ample experimenting and experience "Glyptal" proved not only to be a suitable material in all the above roles, but also superior in quality to most of the alternative materials and it requires no preparation, other than diluting when necessary, before it can be applied.

Glyptal is a light brownish, sometimes yellow-greenish, transparent syrupy substance, manufactured by the Canadian General Electric Coy. Ltd., Toronto, Canada. It is registered as G 1276 Cement — extensively used as a finish in electrical engineering and as general purpose cement for joining practically all materials except rubber. Resistant to oil, acid and moisture, it is satisfactory under heat up to 175°F. It is inflammable, even in a dried condition.

Glyptal is obtainable in quart tins and, for small scale applications, in lead tubes, when the texture is less fluid and less transparent.

As far as the author could establish, the value of glyptal in palaeontology was for the first time appreciated in 1947 by Mr. J. W. Kitching of the Bernard Price Institute. Those palaeontologists who have followed our example in exploiting this material are full of praise for its usefulness.

As a result of its diverse characteristics, its role is generally similar throughout, but each field is considered separately because, in each, different materials would otherwise be employed. It is possible that some additional uses in palaeontology, other than those described below, can be found for this material.

(1) *Adhesive.*

As stated above, glyptal is designed to join practically all materials except rubber. It is far superior to any other material when used in this role on porous articles, like fossil material, but is adheres to metal and glass with surprising strength as well. The author once repaired with glyptal the handle of a ceramic jug, broken in five

places, and could carry the jug filled with water, by the handle. The capacity of the jug is two quarts and the handle has a cross section of $\frac{1}{2}'' \times \frac{3}{4}''$.

A fracture in a fossil specimen, repaired with glyptal, will not break unless force of percussive nature is applied. It stands to reason, however, that there is a limit to the strength of such a repaired fracture when the weight of the specimen is out of proportion to the surface of the fracture. In such cases metal dowels penetrating the specimen on both sides are recommended.

A most favourable property of glyptal, not only in the present but in all roles, is that it dissolves very rapidly in acetone or commercial thinner (C.G.E. Thinner 3495). If structural details are to be studied in section a repaired fracture can therefore with ease be opened by submerging it in thinner. If one fracture is required to disarticulate in a specimen where numerous fractures have been repaired with glyptal, the specimen may be covered with a solution of perspex in chloroform, leaving only the required fracture open to solution.

A second favourable property is that it can be diluted with thinner and applied as such in any role. It does not become inferior in quality. Whether diluted or not, it sets very rapidly, depending on the quantity applied.

It is recommended that the following directions be followed in repairing fractures with the aid of glyptal:

(a) *A permanent repair.*

Wash both faces clean with thinner, applied with a not too soft paint brush of convenient size. Then soak both faces adequately with very thinly diluted glyptal. Apply a second coat of less diluted glyptal before the first coat is dry and, if necessary, continue with a third and more coats, progressively still less diluted, depending on how well the glyptal soaks into the specimen. Finally, apply the undiluted glyptal to both faces, again before the previous application is dry, then join the two surfaces and exert some pressure.

Do not apply the glyptal excessively. Spread it as evenly and as thinly as possible to obtain a close fit and to avoid catching bubbles. Allow to dry thoroughly for 24 hours. Glyptal dries within a few minutes so that little difficulty will be encountered in holding a piece in position or mounting the specimen very carefully in a suitable attitude, but it sets provisionally to a dry but flexible texture and, after many hours (depending on the size of the fracture) to a hard solid substance.

(b) *A temporary repair.*

Apply undiluted glyptal directly to one face and in patches only around the margin, so that, on solution, thinner can penetrate with ease to the central area of the fracture. It is not necessary to endeavour to obtain a perfect close fit — the fracture surfaces may only become damaged.

On opening the fracture, submerge the specimen in thinner and leave it till it disarticulates by itself. If force is applied, pieces of the fractured surfaces may be torn off.

(2) *Reinforcement.*

Glyptal is the ideal material for treating badly weathered specimens, especially in the field. It is greatly superior to shellac. When applied in very dilute form, it penetrates the specimen, especially when very porous from weathering, and strengthens it so substantially that additional plaster reinforcement is necessary only when clumsy shape and bulk warrant it.

The more the glyptal is diluted, the better it penetrates, and successive applications are necessary to achieve great strength, especially when it is required to form a protective film over the surface. To achieve this, the final application may be less diluted.

In the course of preparation, excessive glyptal covering the exposed surfaces of the specimen may be removed by solution in thinner, accelerated with gentle brushing if necessary. Thus the genuine surface of the specimen can be freed of glyptal and, if arrested in time, the glyptal that penetrated the specimen can be left undisturbed.

When dealing with large specimens in situ in the field, diluted glyptal can be applied with a spray gun. Specimens so brittle that they disintegrate on the most gentle touch, should be lightly sprayed from a distance, left to dry, carefully turned over and sprayed again. If the specimen is not very porous and of compact shape, it is not necessary to reinforce with newspaper before applying plaster and burlap, because glyptal gives the specimen a glossy finish to which plaster does not adhere strongly.

(3) *Preparation and reproduction.*

In the process of preparation glyptal is most useful for strengthening portions of the specimen as they are exposed. Should a delicate fracture occur, where splinters are dislocated, so delicate that they cannot be manipulated, they need merely be moved into their correct positions with the aid of a needle, and a drop of diluted glyptal allowed to run over them. The glyptal will penetrate along the fracture surfaces and secure the fragments in position. Excess glyptal over the surface can be washed off with a brush dipped in thinner, while the penetrated glyptal will not be removed so readily as to cause the fragments to become dislocated again.

If a tiny splinter is lost, defacing an otherwise beautifully preserved specimen, the cavity can be filled with a paste made up of diluted glyptal and talcum powder, coloured if necessary with artists' oil paint to match the rest of the specimen. The recommended procedure is to colour a small quantity of fairly well diluted glyptal to an extent where, after mixing with talcum powder, it will simulate the colour of the specimen. A sample should therefore be prepared first. Use an artist's paint brush, dip it into the coloured diluted glyptal, and then, with the wetted brush, pick up a quantity of powder and apply to the cavity. Add thinner either to the tinted glyptal, or to the cavity, if drying is too rapid. The paste can be modelled into proper shape in the cavity with the aid of the brush. Often the natural glyptal, mixed with talcum powder, produces a colour not unlike the average colour of fossilized bone, so that colouring is not always necessary. Such restorations should not be undertaken

if structural details are thereby obscured. This method of restoration is strongly recommended in cases where missing fragments render a delicate arch, process or lamina most vulnerable to subsequent additional damage.

Glyptal should not be applied too readily where delicate surface details are of importance, such as in plant and certain invertebrate specimens. However, very diluted glyptal will penetrate and secure such surface details without forming a film of any appreciable thickness over them, if it is necessary to preserve the details in cases of bad preservation. It should only be applied when there will be no necessity for removing it subsequently. The glyptal should also be applied rather by submerging the specimen briefly in diluted glyptal than by painting it on with a brush.

When the preparation technique employed is that in which one side of the specimen is first thoroughly cleaned, then covered with plaster for protection while the other side is cleaned, the difficulty often arises that the specimen ultimately becomes so delicate that the plaster cannot readily be removed without risk of damage. If such a situation is anticipated, cover the surface first cleaned thoroughly with a substantial layer of glyptal. Then cast the plaster bed in the form of a piece mould, avoiding undercuts for each section, and separating each section from its neighbours with a substantial layer of glyptal. The total plaster bed will be strong enough to serve its purpose while the other side is being cleaned. If not, as in cases where the bed consists of very numerous sections and continued preparation requires not-too-delicate percussion, a total outer cast covering all the sections may be added, again avoiding undercuts, and again separated with a thick layer of glyptal. When the other side is finally cleaned, submerge the specimen in a bath of thinner to dislodge the plaster bed. The different sections will disarticulate on solution. If this method is employed, incidental fracture reparations should not be done with a material soluble in thinner. Use undiluted glyptal to avoid unnecessary penetration into the plaster sections.

Glyptal has a significant use in preparing casts with latex moulds — especially in cases where surface details are required to show up accurately and where the specimen is very porous and brittle. The standard method is to apply talcum powder to the surface to allow the latex to be removed with ease. If talcum powder is applied too thickly, it is obvious that delicate surface details will not show up accurately. If applied too sparsely, the latex will not separate with ease and may damage the specimen.

Soak the specimen thoroughly by submerging it in well diluted glyptal. Transfer it directly for a brief moment to a thinner bath to wash off the excess glyptal covering the surface, and allow to dry. The specimen will now have great internal strength, but the surface will be very little affected by the thin film of glyptal covering it. The glossy surface of the specimen will not require talcum powder. The latex will peel free of the specimen with ease and with little danger of damaging the specimen. This takes advantage of glyptal's admirable characteristic that it joins all materials except rubber. Glyptal also behaves perfectly in preparing latex piece moulds or latex casts, where latex is required to separate from latex. Apply a very thin coat of

highly diluted glyptal to the latex surfaces before painting on fresh latex for making a different section of the mould, or for preparing a latex cast itself. Liquid latex spreads readily over a glyptal surface, unlike a surface covered with talcum powder, and is consequently less inclined to form bubbles.

The author has also very recently discovered that glyptal strengthens plaster casts most substantially. Plaster casts should be submerged in a diluted glyptal solution until air bubbles cease to be emitted, up to 24 hours if necessary. Allow the cast to dry properly for a day or two and submerge it again for a short period of about a quarter hour, to allow more glyptal to be absorbed. This can be repeated a third and fourth time, for even shorter intervals, otherwise more glyptal may be dissolved out of the cast than the amount required to be absorbed. The longer the intervals are between emersions, the less will be the amount of glyptal dissolved from the cast. Casts treated in this way will survive much rougher handling than is normally the case.

(4) *Acid Techniques.*

Glyptal appears to be the ideal protective material in acid techniques. Materials commonly used either isolate the specimen against acid attack (different materials for different acids) or they merely hold the specimen together, or they prevent the acid from penetrating cracks. Glyptal is more efficient in each of these roles and is resistant to all acids normally used. It is superior in that it penetrates the specimen and gives it internal strength. It has the further advantage that it has some penetrative potentialities depending on the thickness of the superficial layer. Exposed portions of the specimen can be thickly covered while the matrix is left open; areas where the matrix is very thin and danger exists that the acid may penetrate too rapidly and attack the specimen below, can be covered with a thin layer. The acid will penetrate the thin layer and gradually attack the matrix below, to lesser depths than in the matrix left uncovered. With experience a formula can be devised for every specimen and for the acid and glyptal concentrations used, differing numbers of glyptal applications being designed to allow certain degrees of penetration.

Glyptal has one disadvantage in the acid technique in that it is inclined after a while to become more and more porous and eventually crack, allowing the acid free passage to the specimen. This difficulty can be overcome by using highly diluted glyptal (which ensures better penetration) and applying it with a great number of successive coats. The cracking occurs as a result of the successive subjections to moisture, acid and drying. Before every submergence in acid, the specimen should be given a further coat of glyptal, newly exposed portions naturally getting the number of coats the balance of the specimen has. With every third or fourth subjection, depending on the type of acid and the glyptal concentration used, the specimen should first be submerged in thinner to dissolve excess glyptal and to allow the cracks in the glyptal to heal. Then apply two or more coats of fresh glyptal with still further coats over areas where solution of the glyptal was more severe.

In spite of this disadvantage, glyptal nevertheless proves to be so efficient that, with its use, acid techniques can safely be risked on specimens where the bone itself is appreciably more vulnerable to acid than the matrix. Glyptal should, however, not be used on specimens where plaster has been introduced for reinforcement or restoration, because the acid will penetrate the glyptal — even if only by chance through a casual crack — and soak the plaster, from which it cannot be removed.

(5) *Preservation, protection etc.*

When a specimen is satisfactorily cleaned, but fragile in nature, leave it submerged in diluted glyptal (provided no fractures were repaired with glyptal) to soak thoroughly. When dry the specimen will be substantial to handle and as strong as any similar well preserved fossil. Solid, well preserved specimens not liable to penetration may also be given a coat of diluted glyptal, applied with a brush, to protect the surface against wear, especially in cases where numbers of specimens or portions of one specimen are frequently handled and stored under circumstances where they are in contact with each other.

In numbering and annotating specimens, glyptal is most useful. A glyptal surface can take delicate writing with india ink as readily as any other surface. In numbering specimens it is recommended that a smooth surface be ground on a portion of matrix and this surface be covered with a layer of undiluted glyptal. Otherwise, paint a patch of glyptal on a convenient portion of the specimen. Introduce the number of the specimen on to this glyptal surface with india ink and cover the number, after it is dry, with another layer of glyptal. The ink will not blot, it will not deface the specimen and, if necessary, it can be removed with ease without spoiling the specimen. Otherwise the number will be as permanent as with any other method.

When a skull is coated with a film of glyptal, sutures can be drawn with india ink, as well as any other annotations. If this is to be of a permanent nature, another coat of diluted glyptal will preserve it indefinitely, however frequently and severely the specimen is handled. Brief submergence in thinner or washing with a paint brush dipped in thinner will erase such annotations immediately if no longer required, with no harmful effects on the specimen.

Glyptal is as efficient, if not better than, any other material, when employed in annotating slides. A very thin coat of glyptal across one end of the slide is sufficient to allow any writing to be done on this surface with india ink, and a subsequent coat will preserve this writing indefinitely. Glyptal adheres to glass with considerable strength and if the two coats are sufficiently thin and evenly enough spread, the annotations will appear as though directly inscribed on the glass.

In mounting specimens on glass, whether individual micropalaeontological specimens or sections, glyptal is considerably superior to Canada balsam. It adheres with greater strength, it sets to greater strength, it is most disinclined to form bubbles, and, if used undilted, it is not particularly inclined to became hazy if the specimen is moist when embedded. Furthermore, it is not necessary to heat the

slide in the process of drying while, when used in projection apparatus generating much heat, it is, as stated above, satisfactory under temperatures up to 175 °F.

Glyptal should not be used for mounting transparent rock slides where the mineral content is to be analysed by studying refractive indices; its refractive index differs from that of Canada Balsam whereas the latter's is the same as that of glass or quartz. Its use in the place of Canada Balsam is also not recommended for zoological microtome slides, because its preservative qualities and the possible chemical reactions between the components of glyptal and the colouring materials normally used have not been tested.