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Palaeontological Casts in Collections and Museums in England: Materials - A History Of Use

- Bente Loudon

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This appendix is based on secondary literary sources reviewed for the main part of the dissertation and is included to give detail of some of the early materials used in preparation and casting. As there appears to have been considerable overlap and transfer of materials is seems to be important to examine all evidence and not artificially separate these two fields of operation.

The earliest reference to a material associated with casting that I have been able to trace is from Kurtz [1]: in the second century AD Lucian described a statue "all covered with pitch from the casts taken (*ekmattomenos*) every day by workers in bronze for sculptors", possibly the pitch could have been used as a separator. She also details what is commonly referred to as 'plaster': "Today the terms plaster and stucco (The Macmillan Dictionary of art, 1996) are often not distinguished". Stucco is a harder, slow-setting substance based on lime, whereas plaster, also known as *gesso*, is a quick-setting substance based on gypsum. Less durable than stucco it could be spread, "as in the medical practice of stabilising a fractured bone, or cast. Spreading over the face of the dead created the death-mask, over the face of the living a form of realistic portraiture. Casting the plaster in an elaborate system of piece-moulds created an accurate reproduction of a three-dimensional object. In Greece piece-moulds were also developed for casting large statues in bronze from the sixth century BC…The physical properties of gypsum (*gesso*) which made its powdered form ideal for mould-making are thought to have been 'rediscovered' in northern Italy, possibly in Padua, early in the fourteenth century." [1]

Chase gives a most thorough description of the casting process, and also recounts the prolonged use of plaster, as well as explaining how easily its setting properties can be controlled by adding commonly available chemicals such as potassium alum, borax and potassium sulphate, and colloids such as carpenter's glue, casein or citric, boric, and phosphoric acids and their salts. "Plaster of Paris has long been one of the most commonly used moulding and casting materials. Its use dates back to the early Egyptians who used it to mould and cast parts of the human body and statuary. Even today it plays some role in nearly every moulding and casting method described in this paper. Plaster is inexpensive, quick-setting, dimensionally stable, and universally available in a wide range of grades and formulations". "Occasionally it is necessary to prepare a water-soluble plaster which may be dissolved away after serving as a temporary mould. The addition of one part corn or potato starch to three parts plaster yields a plaster that will disintegrate in hot water." [2] Dextrin, purified corn starch, acts as a retardant and hardener when mixed with plaster. [3]

A more fragile, but highly detailed mould could be made using alginate powders made from algae or seaweed (originally developed for dentistry), here the primary concern was for the specimen on which the impact was minimal. "Plaster performs well with alginates for casting."[4] Plaster has then been used as a medium for both mould-making and for producing the cast. In 1884 Mr Budden (Curator of Saffron Walden Museum from 1880 to 1904) that he had found the most highly recommended casting material [I believe he specifically means mould here] for delicate structures to be …"a mixture of the finest gelatine dissolved in water thickened to the required consistency with whiting and zinc white." This he suggests using for fungi casts, and it could be used an infinite number of times by simply re-melting. [5] Many unstable materials such as glue, gelatin, and agar, were once used extensively for moulding purposes. [6] Up until the late 1940's there were only two materials in common use for mould-making, plaster of Paris and gelatine in some form, with occasional references to the use of gutta percha; glycerol, sorbitol and laundry soap being included in some formulae. Since heat is generated as the plaster set, although the gelatine was coated with oil before the plaster was poured, both the water and the heat tended to blunt very sharp detail, ornamentation was lost, thus making it seldom possible to get more than one or two casts which were up to the standard required by scientists from a gelatine mould. Clove oil, or a few drops phenol in water would inhibit the growth of mould. [7]

One early method of casting used on highly carbonaceous, and hence highly conductive, coal shales was galvanoplating, in which the coal shale and its contained mould was electroplated with a thin veneer of cop-

per. This method eroded the surface of the specimen being cast so badly that it limited the number of casts that could be made from the original.[8] Here the specimen was considered dispensable.

Separators are necessary to enable the cast to be removed from the mould: separators for plasteline or potter's clay can be a separating medium such as petroleum jelly dissolved in a small amount of methylene chloride, soap lathered in a small amount of water, or stearine (stearic acid dissolved in kerosene). This can be brushed on the surface of the rigid object and will keep the plaster from sticking.[9] Goodwin and Chaney recommend the best waxes for mold release are those containing carnauba wax. For the replication of a cave a plaster cast was made of the cavity which was the natural mould of and extinct rhinoceros and jellied soap was applied to the rock as a separator, followed by burlap strips dipped in plaster as a casting medium.[10] Rixon mentions that almost any type of oil or grease, commonly olive oil, but also chemicals used in the tanning process such as alum or potassium dichromate, were used between the alginate mould which took an excellent impression of fine detail and the casting plaster.

Separators between bone and latex have involved vegetable cooking oil, and Vaseline has been used as a separator between polysulphide rubber and plaster, and between plaster and plaster.[11] Slettebak used polysulfide rubber for moulds for plaster casts, the separator being a mixture of petroleum jelly and kerosene. If the original model was made from plasteline clay or wax this could be coated with shellac or lacquer to prevent oil from reacting with the mould rubber and causing distortion. [12]

One should be aware that until recently many recipies for modelling specimens and producing surface detail called for the use of powdered recipies for modelling specimens and producing surface detail called for the use of powdered asbestos (to add strength) which was mixed in with plaster of Paris' in 50% puantity along with other ingredients such as ground dextrine paste (British gum), finely ground perlite (a volcanic ash), or white casein glue. Paper pulp mixed with water, carpenter's glue, and plaster of Paris formed a commonly used maché which could be coated shellac to seal the pores and then airbrushed with lacquer paint. A final coat of (brown) paste was, buffed to a high polish, would give the surface a translucent, leathery appearance. [13]

During the nineteenth century plaster or lime, or a mortar with granules of charcoal and straw or horsehair was used to hold Ichthyosaur specimens in their mounting box. Nails would be hammered in for the plaster to grip on the internal sides, with wooden laths or wires strung between the nails at the back of the mount, and the specimen placed in the box which was then packed to the required height and position using wood, brick, horse hair or straw. Plaster, mortar or cement was then poured in. A final coat of plaster mixed with powdered matrix was then applied to match the colour of the surrounding sediment and to give a uniform background around the specimen.[14] On removal of plaster from fossil marine reptiles mounted in hardwood frames a variety of materials which included wood, string, hemp, cotton, horse hair, newspaper, iron nails, sulphur, sand, pebbles, and wax were found in association with the specimens, possibly as supports or gap fillers.[15] A mastodon skeleton was found to be restored with wood and plaster with thick lacquer applied to their surfaces. The wooden framework of the skull was built up with plaster and papier maché sealed with animal glue, and wads of coarse fiber used to give a rounded shape. The exterior had been modelled in thick layers of putty composed of powdered chalk and water-soluble glue, probably gum Arabic, the inner surface was covered with pink plaster with a 1881 newspaper underneath. The tusks were covered in a thin layer of plaster and their proximal ends had been covered in bitumen.[16]

Many different kinds of consolidant were also in use: "Until the 1940's the consolidants and adhesives used for the preserving and repairing fossils were mainly natural products plus early synthetic plastics. Many had their origins in contemporary trade techniques used for preserving antiquities during the seventeenth to nineteenth centuries; eg. linseed oil and litharge (used by sculptors) for the consolidation of fossil bone, shellac, various gums, gelatine and wax- based formulations as coating varnishes and adhesives (used by cabinet makers) were applied to fossil shells." [17] "Up until the Second World War, the materials used to harden bones in the field were invariably animal or vegetable glue". "In the United States, the earlier use of thin solutions of gum Arabic or acacia gum as consolidants was superseded by shellac dissolved in alcohol." [18] "To harden soft fossils … Bones found in gravel pits etc. are often in a very fragile state. In order to harden them they should be washed over frequently with a mixture of common glue and whitening…" [19] Paraffin wax was also used for stabilization of delamination of dry blocks of shale, but waxes have now proved to be unsuitable for geological material.[20] Shellac has also been applied in the misguided treatment of pyrite decay. [21] Bernard Ashmole (1894-1988), and his technician Mohamed Saleh, whilst working at the Ashmolean Museum in Oxford perfected a process of cleaning casts with potato starch, by pasting this over

the surface of the statues, leaving it for twelve hours or so to dry, and then peeling it off. If the cast had been in untreated plaster this solution would remove dirt and dust, "the result could be amazing". However, most of the older casts were treated with shellac immediately after being made, which partially sealed the pores and these could be sponged with detergent. [22] Another traditional sealant was asphalt and gutta-percha. [23] Other materials of repair included brown organic glue, shellac, celluloid, coloured sealing wax, tallow, paraffin wax, beeswax, and bituminous compounds, which were all used by early collectors as adhesives. [24] In the 1860's these ingredients were called for for cementing "large and pondrous specimens": "1 part beeswax, 4 parts resin, 5 parts powdered plaster of Paris. Warm the edges of the specimen and use the cement warm". Dr F. T. Buckland's "Cement for mending shells used at Paris gum Arabic one third, Sugar candy two thirds, White lead." [25] The jet workers glue used in Yorkshire was called Ockamatutt and was a mixture of marine glue, shellac, and lamp black. [26]

Endnotes:

1 Kurtz 2000:2
2 Chase 1979: 230-233, 249
3 Burke, Anderson, Weld and Gaffney 1983
4 Goodwin and Chaney 1984: 244
5 Entwistle 2001
6 Chase 1979: 26
7 Rixon 1976: 193- 195
8 Heaton 1980: 95, 96
9 Chase 1979: 232
10 Slettebak 1981: 90
11 Burke *et al*. 1983
12 Chase 1979: 234
13 Chase 1979: 225- 227
14 Riley 1991: 33, 35, 36
15 Cornish, Doyle, and Swannell 1995
16 Lindsay 1991
17 Howie 1995
18 Whybrow 1985: 19
19 Entwistle 2001: 5
20 Collins 1995: 55, 57
21 Cornish, Doyle and Swannell 1995
22 Kurtz 2000: 309
23 Mathias 1994: 137
24 Doughty 1992: 514
25 Entwistle 2001: 4, 5
26 Whitby Museum, pers. obs.

References:

Burke, A.C., Anderson, M., Weld, A., Gaffney, E.S., 1983. 'The reconstruction and casting of a large extinct turtle, *Meiolania*', *Curator* **26/**1: 5-25

Chase, T.L., 1979. 'Methods for the preparation of palaeontological models' in: Bassett, M.G. (ed.) *Curation of Palaeontological Collections*, Special Papers in Palaeontology No. 22, pp. 225-267, The Palaeontological Association, London

Chase, T.L., 1979. 'Methods for the preparation of palaeontological models' in: Bassett, M.G. (ed.) *Curation of Palaeontological Collections*, Special Papers in Palaeontology No. 22, pp. 225-267, The Palaeontological Association, London

Collins, C., 1995. Preface, and 'Stability of shale and other mudrocks' pp53-58 in: Collins, C. (ed.) *The Care and Conservation of Palaeontological Material*, Butterworth-Heinemann

Cornish, L., Doyle, A.M., Swannell, J., 1995. 'The Gallery 30 Project: conservation of a collection of fossil marine reptiles', *The Conservator* **19**: 20- 27

Doughty, P.S., 1992. 'Researching geological collections'. Pp 513-521 in: Thompson, J.M.A. *et al. Manual of Curatorship: a Guide to Museum Practice,* Museums Association/ Butterworth-Heinemann

Entwistle, Bob, 2001. 'The receipt book of G. N. Maynard 1829 to 1904' in: *Natural Science Conservation Group Newsletter* **16**, 4-13

Goodwin, M.B. and Chaney, D.S., 1984. 'Molding, casting and painting', pp. 235—271 in: Leiggy, P., May, P. (eds.). *Vertebrate Paleontological Techniques,* Vol. 1, Cambridge University Press

Heaton, M.J., 1980. 'New advances in latex casting techniques', *Curator* **23/**2: 95-100

Howie, Francis M., 1995. 'Development of treatments', pp. 1-4 in: Collins, C. (ed.) *The Care and Conservation of Palaeontological Material*, Butterworth-Heinemann

Kurtz, Donna, 2000. *The Reception of Classical Art in Britain- An Oxford story of plaster casts from the Antique,* British Archaeological Reports (BAR) British Series 308, Studies in the History of Collections 1

Lindsay, W., 1991. '"Mammoth" task', *Curator* **34/**4: 261-272

Mathias, John, 1994. 'Housing and maintenance of collections', in: Stansfield, Geoff, Mathias, John and Reid, Gordon (eds.) *Manual of Natural History Curatorship*, HMSO

Riley, S., 1991. *Marine Reptiles, Collectors, Science and Museums*. M.Sc. Dissertation (Museum Studies), Leicester

Rixon, A.E., 1976. *Fossil Animal Remains: their preparation and conservation*, The Athlone Press

Slettebak, A., 1981. 'Recreating the Blue Lake rhino cave', *Curator* **24/**2: 89-95

Whybrow, Peter J., 1985. 'A history of fossil collecting and preparation techniques', *Curator* **28/**1: 5- 25