UNIVERSITY OF YORK
CENTRE FOR CONSERVATION STUDIES
MA IN CONSERVATION OF HISTORIC BUILDINGS

ASSESSED ESSAY II: *UNDERSTANDING MATERIALS*

"WHAT IS YOUR UNDERSTANDING OF THE RELATIONSHIP BETWEEN THE PRACTICAL ISSUES OF USING APPROPRIATE MATERIALS IN THE REPAIR OF HISTORIC-LANDMARK BUILDINGS AND THE PHILOSOPHICAL ISSUES OF AUTHENTICITY?"

Submitted by Student no: **C82119**

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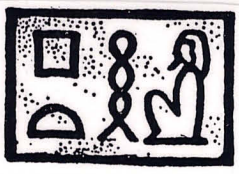
The cartouche of the god Ptah



Patron of all Egyptian crafts

Some quotes from 'A Crafts Anthology' by J.T.Baily:

"The hand has its place of honour equal to language in elevating mankind above the brute."
- G. Herbert (1593-1633)

"As is the workman, so is the work." - Old Proverb

"If a man loves the labour of any trade, apart from any question of success or fame, the gods have called him." - R.L. Stevenson, 1856-1894

"Three stone masons were asked what they were doing.
The first replied: 'Earning my wages.'
The second replied: 'Cutting a stone.'
The third replied: 'Building a Cathedral.'"
- Anonymous

"Train well the hand and teach the eye to see,
Firm grows the will, sound shall the judgment be."
- Inscription over Manual Training School, Leipzig

"Every rise in the quality of the work men do is followed, swiftly and inevitably, by a rise in the quality of the men who do it." - L.P. Jacks

A. *INTRODUCTION*

Much theory and philosophy are made on the ways to conserve historic buildings, which depend on the right implementation of ideas in the actual, physical context. From the most well-read doctor of letters to the most elementary bricklayer, a single flow of vision and purpose unites all the activity that takes place: to ensure the survival of the structures in which we invest our interest, be it cultural, functional, or any other significance. Going down the line of flow, it is natural that the emphasis and frame of operation changes, which can make cooperation and mutual understanding difficult. One of these instances is the meeting of the *craftsman* and the *conservator*.

A brief description of the personalities at hand can help to launch the arguments in this essay. The craftsman works the material media into functional, and to the best of his ability, aesthetic artefacts of everyday life. (Although politically incorrect, the term craft*sman* and the male address form are used for practical reasons, and are probably historically correct...) Applied to historic structures, the elements of which they are composed can also be viewed as functional and aesthetic objects, as architecture often is. The historical evolution of crafts mainly as guilds, which were powerful social institutions, reflects the important role the crafts played in industry. The decline of this role in the twentieth century can make one ask, "have the crafts reached the end of their lifespan?". The current efforts in maximising the craft input in conservation suggest otherwise, and that the "historical traditions of the time when this work was regarded as one of the tasks of everyday life" (Cesari 1981, 6) are still an active subject matter, not least because there must be constant supply of all manufactured products and materials in keeping with specific characteristics of historical heritage necessary for maintenance.

The field of the conservator is a newer subject, or even premature in some aspects. A profession as young as two hundred years or so cannot yet be as well-established as thousands of years of craft traditions. The architect in charge of a building project may have existed alongside the ancient worker, but the conservation aspect brings other disciplines into the scope of the architect's work, and a 'new world order' to their relationship.

The relevance of materials here is as an interface and a common working ground. The same subject, which is an inherent factor in studying and treating buildings, is approached from different directions of the wider 'flow' of conservation.

B. *MATERIALS' BEHAVIOUR OVER TIME AND DURING REPAIR*

"What is your understanding of the relationship between the practical issues of using appropriate materials in the repair of historic/landmark buildings and the philosophical issues of authenticity?"

In trying to answer this question, it may be a good idea to take as the point of departure, the nature and behaviour of materials in relevance to repairing traditional structures, and the way this is perceived by the two professions in question.

General Characteristics of Materials

Historic materials have been chosen for construction depending on wide-ranging factors. The motives behind material choice can be more abstract- to do with aesthetics, social status, spirituality, and symbolism- or more pragmatic- economics, functionality and physical properties among others. The quality of the material depends on these, as does the type. Their different characteristics and behaviour, especially over long periods of time, are fundamental to methods of conserving them.

Dwelling a little on the second group of factors pointed out, one could emphasise that the context of the building culture, mainly the climate, geology and transport affordances, dictates availability. For example, the amount of rainfall and thus the abundance of woodlands results in the wide use of timber, not just in frames, but in masonry and infill as well, as in the Anatolian-Balkan tradition. The long-term economics of a building maintaining itself has also been considered and found to lie in harmonious nature management. Materials wish to return to their original form; earth demonstrates this sharply. An earth building can recycle itself, eventually disappearing into nature. The need to place stones according to natural bedding orientation, and to cut timber along grain directions for more durability, stability and waterproofness, reflect this tendency. Sacrificial systems for managing water, as opposed to rigid systems fighting the environment, indicate the reasons for condemning the use of cement in conservation.

To be furthering the performance issue, sound and heat insulation, ventilation, accommodation of seismic and other structural forces are some more factors of nature management. Weathering is an issue with bearings on both pragmatic and aesthetic concerns, the latter seeming to have gained its present weight due to the conservator's advent. The reactions that materials show to alteration indicate the approaches to take toward compatibility with other materials. On a more cultural level, the ease of construction- i.e. speed and required levels of skill and craftsmanship- becomes important in the industrial and managerial senses.

Earth and Timber

Earth (unprocessed) and timber are observed a little more closely in this essay to illustrate issues. In expansive regions of the world, vernacular building culture combines these two elements, in the usual form of timber frame and mud-related infills, as well as mud and stud, and wattle-and-daub. The World Health Organisation (WHO) statistics reveal 35% of the world population using earth in 1965 and 30% in 1995, and 22% use of wood and related materials, which went down to 9% by 1995. Wood and earth have been the most important building materials up to the twentieth century. Other materials have gradually gained ground over wood after the seventeenth century due to shrinking woodlands and socio-political changes in agriculture (Cseri 1994, 46), and mud has lost popularity with the industrial revolution, in Victorian Britain as well as other countries. There is an ill-deserved prejudice against these two materials, regarding them as insanitary and degrading, resulting in much demolition. Earth structures can be monolithic, without supporting structures like timber or stone. Understanding this ability to stand upright on its own, and refraining from putting in unnecessary, distrustful props is an achievement in itself. The structures built of timber and earth are generally of low status, with no churches and many agricultural buildings. Contrary examples do exist, though, such as the helical tower in Samara, Iraq, a monumental use of adobe. Sculptural qualities of earth are not much used in Britain, but in countries where only mud is available, extraordinary shapes are built, and they have survived well over centuries. The earth-building tradition has never disappeared totally, repair work still taking place. It was consciously revived in Britain by Ernest Ginson, in a large Arts & Crafts building in 1910, and Alfred Howard brought the survival of the tradition back to the public's notice (Child 1994, 7).

Earth is a cheap, available material, able to balance relative humidities more than any other natural or industrial building material (Minke 1994, 60), can adjust to movement, and requires no special labour skill. However, it is easily eroded by water, frost, animals and insects, and needs protection with good roofing and well-projecting eaves.

Timber also has problems in the face of moisture. Mechanical damage is the easiest to repair, but decay by fungal and insect attack is difficult. Rot caused by wood-worms and dry rot (nourishment to certain fungi) are exacerbated by alternate periods of wet and dry. Timber frames are always prone to movement due to contracting when dry and expanding when wet. Wattle and daub are good to accommodate this flexibility. Such relations between different components of timber structures need to be accounted for in repair.

Issues in the Use of Materials in Repair

Materials today are faced with the twin needs of structural repair and conservation, which in essence

means ensuring the necessity and aesthetics of the repair (Powys 1995, 4). The primary purpose is to restrain decay without damaging character, altering features, or unnecessarily disturbing or destroying historic fabric. The guiding methodology is minimum intervention and ensuring long-term survival as a sound structure. In an attempt to unravel the meaning of 'survival', a *'spectrum of the survival of buildings'* has been identified, in ascending order of the magnitude of change:

- Survival of fabric through durability of the physical material
- Replacement of physical material with new pieces of same kind
- Evolution through substitution of other materials: Non-structural materials (infill, cladding, etc.) might change, while structural materials remain.
- Alterations and extensions: Main body or core remains, while subsidiary parts and embellishments evolve. This may be accompanied by a function change.
- Survival of function, but removal and rebuilding the structure

If we are to restrict ourselves to materials, then the first three cases will be relevant to the retention of sound original fabric. This time, the question arises, of what 'sound' covers... The definitions from this point on demand much sensitivity, because there can be no standard specification for repair, necessitating a case-by-case approach. In different parts of structures, too, priorities change. Rate and extent of decay vary within the fabric, roofing and protective needing more frequent maintenance, framing and masonry needing less frequent and more selective.(English Heritage)

Understanding the holistic behaviour of buildings, focusing on the causes and not the symptoms, is a good principle, frequently ushering in an analogy between medicine and architecture. Surveying structural defects, and the causes and processes of decay is a kind of medical diagnosis. Holism is important also because replacing some parts causes changes in a building's overall structural performance.

Some of the most general and basic issues related to the repair of materials in historic buildings have been highlighted below:

- <u>Introducing new materials</u>

Some common problems in earth repair involve repair across vertical backing, joining new earth to existing, making a bond across vertical cracking between cob and masonry, and filling out hollows before rendering. This points to the constantly reoccurring challenge to do with adding newer material to old.

The interface at repair points is critical in ensuring the repair's success. In introducing the same material,

freshly-made cob cannot adhere easily to old cob, due to differences in ramming pressure and shrinkage. The interface of timber joints is also susceptible to water and weather. Consolidating with epoxy resin is a newer method used to overcome this, although some dislike it and continue to do dry repair. Criticisms of using timber for patch repairs read as potential further damage in the future, destruction to sound original fabric, and non-reversibility, which is probably the most unsettling aspect.

Introducing different materials is yet more challenging. The problematic nature of this is illustrated in cases such as an existing render having to be removed despite being only thirty years old, because of the cement rich mix it contained. Using materials like brick or stone, it is difficult to get a good bond into existing cob, and cracking seems to continue, again, at the interface of the two materials. Tiles of cob, with the same essential make-up as cob blocks, have been tried following a SPAB technique. The benefit of using thin elements like tiles is similar to plywood over timber, because the layering allows flexibility with strength.(Bedford 1994, 42-45)

The binding force of earth and the weather resistance of mud plaster can be increased by very low-cost natural additives, but much more effectively by some synthetic agents. (Minke 1994, 60) After testing and depending on results, strengthening agents (stabilisers) like lime and cement can be added to earth. Adding cement or lime does not always increase the structural strength, but may decrease it, depending on the dominant clay minerals.

Matching existing materials and construction methods, and the longevity of the repair, should be the aim. However, there are risks in introducing new techniques and materials incompatible with the old, with many unsuitable modern building products around. Modern timber growing techniques are so different now that it can be problematic to insert new timber into medieval structures. The conditions of the materials market is a large issue to tackle in this respect. Traditional materials' and techniques' use is more and more confined to conservation work, but the industry is not interested in conservation because of the unreliability of the market, and the wide range of sizes and construction systems preventing standardisation. At present, the industry does not make products expressly for conservation, so must be adapted to it, which may be at the expense of quality and compatibility. Conservation must seek precise agreements with the building industry. The industry's influence in the area of maintenance is particularly great, because of the lack of legislative control over it. I believe this is a point where the need for craftsmen's cooperation becomes magnified, as an accessible regulating agent.

However, some products *can* be used more appropriately for conservation. When iron straps, nailed to clay lump walls for fixing brick and flint facades, start to fail, they can be replaced with ties designed for modern cavity wall repair. Iron, steel and other metals are recommended in certain cases to strengthen joints between old and new or for reinforcement of whole frameworks, although the priority is for repair with like material. But where to use such materials and products of our time... The answer

is related to the cultural significance to protect, and the state of adding value without destroying it. This is more of a conservator's concern, and his expertise becomes focal. Powys talks of the use of metals "where very much of the old work can be preserved without unsightliness and where the size of timbers to be repaired makes cost of using oak prohibitive." The duality in this statement calls for the dual help of the craftsman and the conservator.

- Knowing the material well

Clay preparation involves knowing the right 'feel', i.e. the pliability and stickiness of the mixture. The tactile training of the craftsman has relevance here. Seasonal influences and knowing how to make use of the changing environmental conditions, for example weather testing, are another aspect that needs intimate familiarity with the medium. Some discrete elements also need a knowing search to be discovered. Much clay lump is disguised behind brick and flint facades, some added later, but some designed that way from the start.

The natural properties within earth's composition- such as the straw that helps binding, drying and insulation, and the stones and pebbles which form a natural aggregate- need to be well-understood and respected, as does the danger that introducing extra thermal insulation to the inherently high insulating quality of earth structures can damage their natural function.

- Degree of damage

Cracks in clay walls can be stitched by piecing in clay-lumps or timber or concrete bars, but this is only necessary where the walls on either side of a crack are required to act in unison such as at a corner. Where the crack has little structural effect, it may merely be pointed. (Bouwen 1994,17) Minor damage can be patched with new or salvaged clay, and deeper damage can be cut out, with replacement pieces fitted in. There is an assessment to make here, whether to patch, or piece in, which can be difficult to make for the benefit of the building.

- Variations among climates, countries

In Britain, it is wind and water which are the major sources, and fungal and insect-related decay major forms of damage. In hot countries, dung is a good ingredient, for durability in low moisture. However, because dung introduces free nitrogen, it is ideal for rots in wet climates. Much work is still to be done to identify particular mixes and find ways to replace washed-out clay mortar. Such differences are likely to be more directly influential to craftsmen, because of the more local character they have, as opposed to conservators, whose knowledge is based on the texts of academic authorities not necessarily originating in their own local contexts.

'Practical Issues' and the Craftsman

The last link in the 'conservation chain' or the 'flow' mentioned in the introduction, the craftsman has the most intimate relationship with the material, directly contacting it. Examining his character can provide insight into understanding his 'conservation agenda'. Remembering the popular analogy with medicine, craftsmen can perhaps be likened to the midwives and the nurses, as they deal with more mundane things but ultimately become more intimate with the physical person of the patient.

The craftsman has the advantage of time and history behind him. His traditions are ancient, and communicated through generations. We have seen in our course the example of Trumpers Ltd, which emphasises its family connection, sense of continuity, and resulting good reputation within the plastering trade. The sense of 'a good work' and the crafts' own professional ethics is part of this, as must be rituals. When they lay the final timber on the roof, Anatolian builders put up a flag and pray for the building, sometimes stretching a rope from house to house, over which presents are brought to the builders by members of the community. Time also works in the patient trials of the craft trades to test the performance of traditional materials and techniques over long periods, something not as well established in new combinations of materials.

Practical solutions and intuition are part of the craftsman's character, in the empirical 'solutions' he has created.. Powys informs that the Medieval timber builders left an enormous margin of safety in timbers, so that enough of fabric would be left to maintain structural equilibrium. As a precaution against rain damage, the Tudor carpenter devised the method of upper storeys overhanging lower storeys, supported by floor joists. The solutions are inherent in design, and in the process also become aesthetic. The craftsman has long been conserving!... In a way, the conservator can be seen as the forerunner of the conservator.

craftsman!

Intuition brings 'tricks of the trade', and a perceptiveness toward the implicit things not easily noticeable without experience. The craftsman's oral communication is said to be more accurate and explicit than his written, because craftsmen like to talk, but not write about it. Much information conveyed by Adela Wright in her book is derived from interviews with such craftsmen, with the intention of compensating the insufficient documentation and publication.

Perhaps the conservatism of craftsmen can be criticised, seeing that they are not conversant with new technologies and materials that may be used to enhance the effectiveness of the techniques they have learned, as apprentices in an earlier generation. But they are quick learners, perhaps as a result of a dexterity that practical work requires, and this is encouraging for opening centres to train craftsmen for short periods to contribute to the effectiveness of their work; academic students and staff can learn from the hard-won practical observations and solutions of the workman. (Erder 1975, 8)

As with the case of materials mentioned earlier, it is a similar problem with the labour force being alienated from the conservation circle. Traditional crafts and trades can no longer compete on the market. At the same time, craftsmen's skills are in demand in modern construction and industry. Oncethey accept such permanent employment, conservation projects can no longer draw them back. (Erder 1975, 9) The craftsman needs to be coaxed back in, perhaps by being more respected.

The above said, one should perhaps remember that while the use of earth in industrialised countries may have regressed, in many developing countries it has continued. The survival of local societies' lifestyles dictated the continual use of locally available solutions, materials and knowledge. Problems related to the extinction of craftwork conditions are not on the same scale in every country, and the factors enabling such lifestyles may inspire new solutions to problems elsewhere. The track that one country has gone down may be sooner foreseen in another, and the unreliable modern technologies overtaking developing countries' cultures may be better controlled.

'Philosophical Issues' and the Conservator

Authenticity

Authenticity is a certain value that is sought in a historic building, related to the design and integrity of the fabric, which is tried to be passed onto posterity, because it is a direct bond between the past and the present. It is a kind of message to be passed along; this is what the survival of the building is expected to achieve. The preserved authenticity and the survival of the building are very similar, but not identical concepts. From what I understand, the former is tried to be brought into perfect alignment with the latter, and the linking piece is repair that is primarily done for survival of the building, while ensuring the survival of the 'authenticity'. How authenticity is filtered down successfully during the life span of a historic building has tried to be addressed via the 'spectrum of survival' mentioned earlier. What is encouraged, accepted and avoided for this end are the ethics of conservation.

'Conservative repair', as opposed to 'conjectural restoration' is a popular motto in conservation philosophy. Replacement of weathering fabric in a historic building overpowering its repair results in loss of historic integrity, despite accurate copying of details, which is accepted to be inferior to the actual, older fabric. It also causes loss in authenticity and value as a source of historical information. More of the cultural interest of a damaged wall may be sacrificed by disturbing it than is worthwhile for the sake of freeing from moisture. A delicate balance needs to be guarded constantly. Thus, very selective replacement is tried to be made, restricted to decaying stones, and selective reinstatement of lost features in accordance with photographic evidence, and provided no historic fabric is lost.

Evidence is a keyword also in the recording of repairs for future reference, the intention here being honesty, through the legibility of repairs. The emphasis on recording is linked to the understanding of historical development in the building, and the information that materials offer. Early roofing of turf, straw, heather, sandstone flags or slate that may be surviving under corrugated iron sheets, the fair face of timber being placed against the dias end and the spatial hierarchy created by the use of arches in medieval open halls are examples of such information. It is important to understand that clues to past lifestyles and the products of what fashion dictates are also part of the authenticity, as well as archaeological evidence. Carved 'witchposts' said to have magical powers are yet another example. On the deduction that folkloric traditions include craft traditions, such information would be known to craftsmen. The historical understanding that craftsmen possess may not have developed in the scientific sense a conservator would think, but in an unexpected, more empirical from. Research can also help craftsmen understand the secret recipes of their ancient colleagues, for example, the subtle admixes found to contain substances which prevent washing away of rendering. I would say the craftsman does not really dwell as much on systematic recording like the conservator does, but he could greatly benefit from it for his own special reasons, as pointed out above.

Reversibility is one final point which should be acknowledged, as conservation philosophy progresses along the "the more learned, the less known" approach, and professionals increasingly take a humble stance in intervening in historic buildings. It also seems that the more monumental the structure, the humbler and more tentative one becomes. The degree of reversibility that should be demanded of the craftsman can perhaps be decided with this in mind, and vernacular or 'lesser' architecture can be conserved with a more carefree attitude.

The Common Ground: How the 'Practical' and the 'Philosophical' Interrelate

The confrontation of the craftsman and conservator may not be such a new issue, considering that the playful, almost 'naive' style of some ornamental work of seventeenth century houses in Britain may have been the answer of the craftsman to the architects, in attempting to interpret their instructions. The title may not be 'conservator', but a personality with the same position must have operated in a similar way.

It all depends on the understanding of the architect at hand, who, if he does not understand the craftsmen's domain, can leave all the work at their hands, and fail to check whether they are doing the right things. At the other end of the scale, briefs specifying a guarantee of longevity in replaced materials can exceed reasonable estimates. Thus, a lack of understanding can be counterproductive both ways: both the conservator expecting the craftsman to do things beyond practical means, and the craftsman not taking into account conservation ethics and principles. (Brentnall) Specifications may turn into

painful points of contact, considering that craftsmen may avoid confrontation with authoritative bodies like English Heritage, which sometimes demand extremely hard work.

Constructing a 'versus list' can be helpful in defining the polarities between crafts and conservation:

- "Replacement versus retention": Craftsmen can prefer to replace pieces of little or no detail, and do this in a way quite unlike the SPAB manner, where "no work *which has to be renewed* should ever be put back in the form it had or in the material it was."
- Removing damaging alterations versus cumulative history
- Opposition to conjectural re-instatement of architectural features versus desire to see structure returned to working condition: It needs to be recognised that minimal intervention can sometimes be insufficient to ensure structural integrity.
- Old crafts methods versus newer technologies: Powys cites a builder, talking of wattle-and-daub construction, who does not advocate slavish adherence to old methods, but recommends it generally. Easier access through the import of materials, for example of Baltic wood to Britain, or Romanian wood to Turkey, means different properties must be understood and adaptation made to them by craftsmen. This is interesting and beneficial, in adding new skills to the existing body of traditional skills.
- Training versus education: It can be difficult to make the transition from training to education, and introducing conservation ethics, or principles of engineering.

Bridging the gap

Both craftsmen and conservators work for the benefit of buildings, even though they interpret it differently. Mutual help is possible, as a growth in skill base helps growth in interest in conservation, and the strengthening conservation movement lifts performance levels in skills. The absence of formal education in craftspeople, especially in developing countries, calls for innovative, informal ways of communicating. It is more difficult for the academic to shift mental gears than to instill in the craftsman a feeling for the value of the objects as unique historical documents. (Erder 1975, 8) This implies that in trying to reconcile differences of perception, more potential and thus more work lies at the hands of the craftsman. Making an additional craftsman out of the conservator is not as worthwhile as taking a craftsman as the subject matter and making an additional conservator out of him or her.

In deciding what substitutes to use for traditional materials that are declining in availability and quality, craftsmen do have aesthetic considerations and awareness of artistic value, using colour as an important criterion, but historically correct material may lose out to better quality ones.

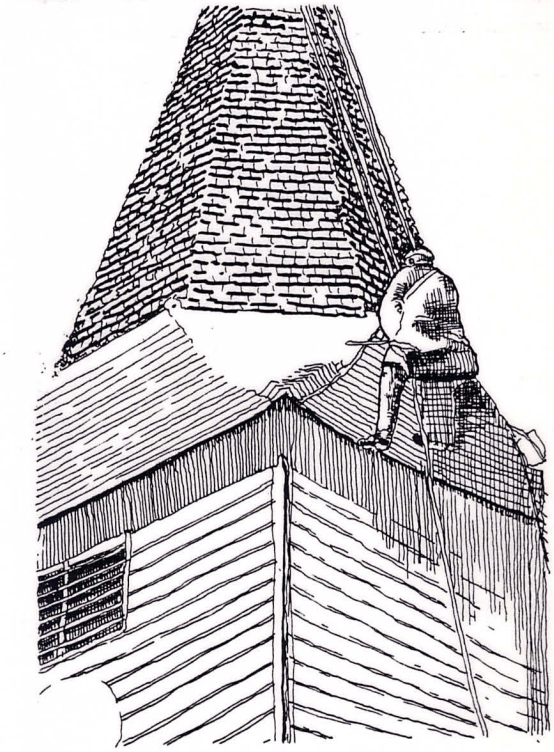
The choice of architect should be carefully made, based on his having shown the ability to repair without

harming or losing the value of a building, through actual work done. The same criterion applies in choosing the craftsmen. The SPAB states two conditions for good work: firstly, the architect to be present at hand during work, and secondly, the working foreman and his subordinate workers to be intelligent and trained in the right tradition. They must have a true instinct for the treatment of materials, and deserve the title of the artist as well as the mechanic. It is quite a lot to ask of them! But it goes to show the level of care this kind of work requires. Some degree of faith can be argued to be put into their skills, because skill is not a very 'specifiable' quality.

The level of physical detail in craftsmanship is a good context to discuss and analyse authenticity. The treatment of the fabric is in tangible from, which may help demystify the discussions, reminding everyone of the practical basics and separating them from the subjectivity of taste.

Jeff Orton and Tim Ratcliffe, the architect-plasterer team who visited York, were an interesting example to the dialogue that can prevail between the two professions. They seemed able to keep hold of their identities throughout their communication, the tones of voice revealing some attitudes, but always the words respectful and constructive.

Fixing the shingles



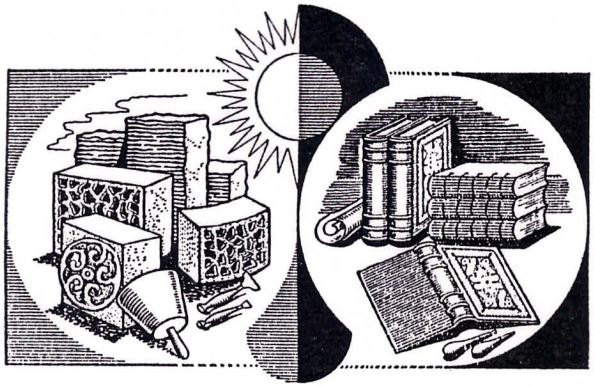
C. *CONCLUSION*

"Is there an irreconcilable gulf between the concerns of craftsman and the concerns of the conservator?"

Coming back to the original question, I would immediately like to say that there shouldn't be an 'irreconcilable gulf'. Practical and philosophical concerns overlap and complement each other in many ways, acting as organic parts of the same wider framework. It should not be a rigid boundary between the craftsman's and conservator's professions. And it should be remembered that the individual mentalities and qualities of persons involved make as much a difference.

Individuals become the keystone to a successful relationship. The willingness to work together must be fostered where the pure academic will listen to the immediate problems of the man in the field, while the practician will show an understanding for the scholar's preoccupation with method and minute detail. In the long run, it is individuals, not institutions which will ensure the communication. John Hurd is an example to the difference that individuals can play, as he travels in 'earth' regions to convince local people to appreciate their own building traditions.

Perhaps the soundest approach is to develop a 'basic attitude of mind', keeping educational programmes open to diverse fields and professions through their flexibility- York's own openness to craftsmen is well worth appreciating in this respect. In doing so, care should be taken not to get caught up in academics and leave the craftsmen behind, remembering that academics like to articulate their thoughts in words, while craftsmen express through manual creation. Capturing the common language, the common experience, and the opportunities for working together is sure to lead to more productive and fulfilling practice of conservation.



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Personal Communication

Charles Brentnall, Timber Framer, Carpenter Oak & Woodland Co.


ALLESKLEBER
ALL PURPOSE GLUE
KUVVETLİ YAPIŞTIRICI
COLLE UNIVERSELLE