The Conservation Laboratory: Technology and Conservation

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This year's series of Members' Lectures on ancient technology, covering topics such as glassmaking, the coming of iron, mining and metallurgy, and pyrotechnology brought those in attendance up to date on the current extent of our knowledge in these areas. Although scientists and historians are able to reconstruct much in the methods and in the sequence of developments of early manufacturing processes in ancient Mesopotamia and Egypt, there are still many gaps to fill in. The information that we do have has been gathered from archaeological excavations: it is based on the study of those few objects and structures that have survived the vicissitudes of time, on Egyptian wall paintings and tomb models showing craftsmen and laborers at work, and on the few literary references to trade and manufacturing processes found in cunieform tablets and Egyptian papyrii—texts which cannot always be fully translated, and thus not completely understood.

Through the careful examination of objects prior to treatment and the choice of an appropriate conservation treatment that preserves for future study all evidence of a technological nature, the conservator can play an important role in contributing basic information to the history of technology. Before conservation, an object is examined not only to ascertain its condition but also to determine the material from which it is made and the method used to fabricate it. We want to know the wood from which a bowl or chair leg was carved, the fiber—wool or linen—from which a textile was woven, the identity of an orange residue left in a ceramic jar, the identification of an inlay—is it ivory or bone?, or the fabrication technique and composition of a bronze

X-RAY OF A DAGGER EXCAVATED AT KHAFAJE, IRAQ, DATED TO 2700 B.C. The blade and handle are both covered with green copper corrosion products and appear to be of the same metal. The x-ray reveals large cracks within the body made of the blade and complete corrosion of the metal. The handle (also completely corroded) appears as a darker image on the x-ray and is made of silver.

bowl—was it cast or hammered into shape? is it made from a tin bronze or an arsenical bronze? In addition, we examine the object for such things as tool or wear marks, ancient repairs, surface coatings, and traces of pigment or resin.

Identification of materials, composition, and method of fabrication frequently involves the removal of a small sample. The wood, fiber, bone and ivory, and leather samples can be examined under the microscope, and the type of tree, plant, or animal from which it comes can be identified by its structure. Metal, too, has a microstructure revealed by mounting, polishing and etching a small piece; through this structure one can tell if the metal is relatively pure or alloyed and the method used to form the artifact. In addition, a sample of both organic

and inorganic materials may be submitted for chemical analysis to determine qualitatively and quantitatively which elements are present.

There are other examination techniques used that are non-destructive and do not require removal of a sample: Ultra-violet light, infrared radiation, and x-rays penetrate in varying degrees into an object and are often indispensable for a thorough examination. X-rays are used chiefly on metal artifacts to penetrate deep into the interior through the dense layers of dirt and corrosion that obscure shape and any detail that may be present. Revealed are ancient repairs, joins between various pieces, the presence of different metals, inlays, and the extent of corrosion within the metal.

Infrared photography is useful for revealing faded markings that may remain on materials but are no longer visible to the naked eye. The photograph can record faint traces of ink or pigment that remain just below the object's surface and has been helpful in bringing out inscriptions and drawings no longer visible on papyri and stone reliefs. Ultraviolet light works on the surface of an object causing different substances to fluoresce different colors. Patches, resinous surface coatings, and the use of different materials in construction can often be seen under ultraviolet illumination.

The information gathered from the examination of objects is recorded and photographed and the objects conserved in a manner that does not alter this information. For these objects provide a record not only of man's artistic expression, but his technical achievements as well.