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Aesthetic Curiosity—The Root Of Invention

By Cyril Stanley Smith

Necessity is not the mother of invention—only of improvement. A man desperately in search of a weapon or food is in no mood for discovery; he can only exploit what is already known to exist. Innovation and discovery require aesthetically motivated curiosity; they do not arise under the pressure of need, although of course once new properties of matter or new mechanisms become known they are available for any use.

This may sound strange, coming from a technologist, but the fact is that down through history, most of man's inventions have first appeared in decorative rather than practical applications.

Metallurgy began with the making of necklace beads and ornaments in hammered naturally occurring copper long before "useful" knives and weapons were made. The improvement of metals by alloying and heat treatment as well as most methods of shaping them started in jewelry and sculpture. Casting in complicated moulds began in the manufacture of statuettes. Welding was first used to join parts of *bronze* sculpture together—none but the smallest bronze statues of Greece or ceremonial vessels of Shang China could have been fabricated without the technique.

Ceramics began with fire-hardening of fertility figurines molded of clay; glass came through attempts to glaze quartz and steatite beads. Most minerals and many organic and inorganic compounds were discovered for use as pigments. Indeed, the first record that man knew of iron and manganese ores is found in the prehistoric cave

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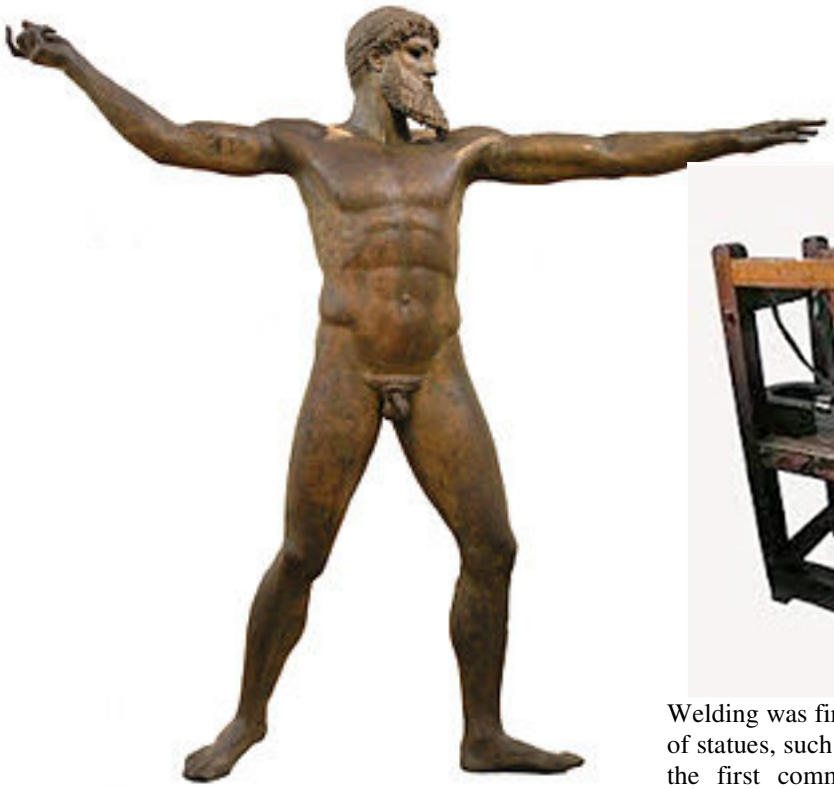

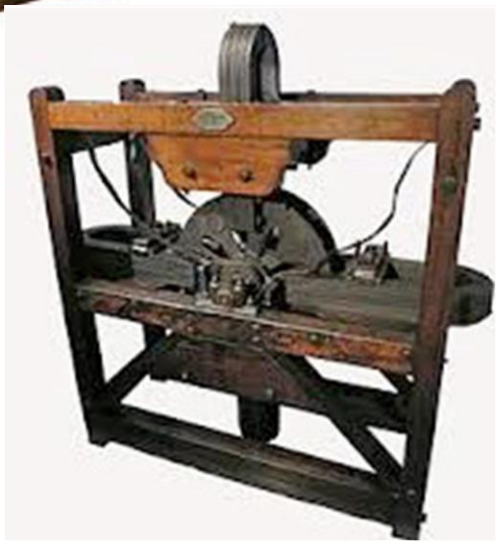

Welding was first employed in the construction of statues, such as this 475 B.C. Greek Bronze; the first commercial electric generator was built to plate a work of art.

paintings where these ores provided the glorious reds, browns and blacks.

In other fields, archaeologists have shown that the transplanting and cultivation of flowers for enjoyment long preceded practical agriculture, while playing with pets perhaps gave the knowledge that was needed for purposeful animal husbandry. To go back even earlier, it is hardly possible that human beings could have decided logically that they needed to develop language in order to communicate with each other before they had experienced pleasurable interactive communal activities like singing and dancing. Selection via aesthetic curiosity has been central to both genetic and cultural evolution.

Mechanical devices were not extensively developed in the ancient world, but note that wheels first appeared on toys and that the automata based on hydraulic and mechanical tricks that were used in Greek temples and theaters foreshadowed the waterwheel and the clock. The lathe reached an apex of ingenuity in turning guilloché snuff boxes a century before heavy industry used it. Blocks for printing pictures preceded purposeful type, and rockets for fun came before their military use or space travel. The techniques of casting bells, like the material of which they were made, were ready to be directed toward a different kind of sound and purpose when princes wanted cannon.

Enjoyment of color has inspired the development of many alloys—for example, the famous Mycenaean inlaid dagger in the National Museum in Athens and the exquisite colored metal inlay of Japanese sword furniture. The color changes in metals, oxides and sulphides discovered by early artisans permeate medieval alchemy—a dead end of delightful but unproductive theory. The marvelous golds and blues of medieval illuminated manuscripts came from pigments made by processes that foreshadow modern powder metallurgy and the flotation process of ore beneficiation. The desire for pigments, dyes and cosmetics inspired much mineralogical and botanical exploration, while precious stones, dyes and spices along with fancy jewelry formed the first base of commerce — for long-range trade did not start with necessities. Even bankers were once goldsmiths.

The chemical industry grew from the need for quantities of mordants, bleaches and alkalis for use in the finer textiles and glass. Geology, chemical analysis and high temperature research all took a leap forward in 18th Century Europe under the impact of the potter's need to duplicate the marvelous wares coming from the Orient and which had started the craze for chinoiserie. The great French scientist Reaumur made a cheap, crystalline "porcelain" by devitrifying glass, and he also developed malleable cast iron in his search for a cheaper substitute for the handsome chiseled wrought iron work on noblemen's gates.

In all of these cases, and many more, it was aesthetic curiosity that led to initial discovery of some useful property of matter or manner of shaping it for use. Up to the present century, it was nearly always the desire for beauty that led to advances in production techniques. Before he made steam engines with James Watt, Matthew Boulton was making silverware and shoe buckles in quantity. The desire to beautify the utilitarian has always stretched the ingenuity of the mechanic, who used complex devices to shape trinkets before turning to automobile parts or weapons. It is the same in building construction—temples and churches, not necessarily structures for the purpose of shelter, led to imaginative new building methods. Even railroad rails and the steel girders for today's skyscrapers needed a precursor in the form of the little mill for rolling lead cames used in medieval stained glass windows.

In the 19th century, the milieu of discovery began to expand. Science created a new environment in which imaginative curiosity could operate. Though the discovery of voltaic electricity came from an unaesthetic experiment on a frog's leg, it remained unused until 1837, when the electric telegraph and electrotyping were both seen to be useful. The utility of the latter, however, lay only in the arts, as a process for electrolytically duplicating coins, p1aques, statuary, and engraved or etched plates for the graphic artist.

All the great illustrated newspapers stem from this—the *Illustrated London News*, the *Scientific American*, *L'Illustration* and *Harper's Weekly*. Soon electrolytic baths were giving rise to monumental sculpture, some works weighing over 7500 pounds. Many of the "bronzes" in the Paris opera house are of electrodeposited copper, and a nice English example is the 10-1/2 foot high statue of Prince Albert behind Albert hall in London, made by the firm of Elkington in 1863.

Almost immediately an even larger use for "galvanism" developed—the production of metalware for middle-class tables having all the glitter of the rich man's silver and gold. Within a decade, Sheffield plate was supplanted by electrodeposited silverware, with a not always felicitous relaxation of restraint on design.

At first, the electric current for these

applications came from innumerable small batteries, but the growing need prompted the making (in 1842) of the first commercial electric generator driven by steam. The giant electric power industry of today started as an art industry.

All big things grow from little things, but new little things are destroyed by their environment unless they are cherished for reasons more like aesthetic appreciation than practical utility.

But how do the seeds of human achievement take form in the first place? Not just by taking logical thought, but rather by giving curiosity full rein and using all of a human being's capability, his holistic powers of understanding and aesthetic imagination as well as his analytical skills. I do not mean to imply that all technologists are sensitive aesthetes, but I do maintain that historical records—better those of things rather than words—show that the beginning of much useful technology occurred in an aesthetic milieu. The subsequent and more obvious stages of profitable development and social importance could occur only as a sequel to quite different dynamics.

The simple picture of origins outlined above, which applies so well to the early stages of many early technologies, seems hardly applicable to the 20th century. The experience of discovery in the laboratory is still an essentially aesthetic one (a fact rather thoroughly disguised by the accepted style of reporting the results), but the motivation is rarely a desire to create beauty. Why is this? Is it just that the patronage for creation has changed, or is it that most of what we notice today is not creation but merely a natural or unnatural refinement of the old, while the really new is around unnoticed awaiting its time for constructive interaction in an environment that does not yet exist? Whatever the truth may be, it should be at least clear that neither art nor history can be understood without paying attention to the role of technology; nor can technology be understood without history and art. ■