Roots: the earliest history of the essential oil industry

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The savor of an aperitif, the fulsome rose bouquet of an expensive perfume, or even the taste of your day-to-day toothpaste, all have something in common. They all contain essential oils, those volatile constituents of plants which, when distilled, register on the human organism as fragrance and flavor. The industry that has provided humanity with these important and delightful products is certainly among the most ancient and most cosmopolitan of all industries. Its roots reach deeply into mankind's first efforts to create civilized life. But the process of re-creating this history is not a simple one. It must be discovered by looking into the origins of many disciplines—religion, philosophy, commerce, chemistry, botany, and pharmacy. The further one desires to look, the more complex the story becomes. Modern technology, from the time of Robert Boyle (1627-91), father of modern chemistry, is relatively familiar. But the fifteen centuries from the first century A.D. until Boyle, when many of the first efforts were made to develop the science and tools used today, tell a story that is unfamiliar, though fascinating. Many personalities, ideas, and cultures played a unique part in the birth and youth of modern sciences upon which we now draw for familiar products.

Let us descend into those distant but critical times, to meet the ideas and personalities that have made the history of technology. The narrative must open in the city of Alexandria. This was a Greek city, built on the ancient soil of Egypt. Here Greeks and Romans, Egyptians, Persians, Jews, and Syrians met, lived, mingled, quarreled, and traded. In the first century of our era, this city, a cultural crucible, was in a period of restlessness and malaise. Greek culture was everywhere. But it was being challenged. The creative philosophers of Greece seemed to have come and gone: the New Academy, which continued the work of Plato, was known for its cynicism and scepticism. Athens had produced no new Socrates and the official schools turned out only manuals and popularizations; few works of original merit. Philosophers sought to establish their orthodoxy and buttressed their arguments with abundant references to dead authorities. Perhaps Greek culture had turned in on itself and become hardened as a defense against the enormous territory and variety of cultures to which it had opened itself. The Greek cosmos was something that was examined by means of formal arguments and deductive reasoning, but rarely by experiment. The official pantheon of gods and goddesses, with their human foibles, was looked upon as unworthy of belief or as merely a symbol of Imperial authority. Lucian (second century A.D.) adopted an attitude of irony; Sextus Empiricus, another philosopher of the period, an attitude of negativism.

The cosmic horizon for the common man and woman was little brighter. An inexorable fate was believed to determine everything. This darkening of the intellectual sky, however, proved to be only the background for a tremendous explosion of new thought. At about the time of Christ, a new wave of thought forms sprang up among the Eastern cultures dominated by Hellenistic culture and swept over the world of the time. Christianity, gnosticism, the mystery religions, the Jewish philosophies of the Alexandrines, Stoicism, and finally the mystical philosophy of Plotinus were all varied and interrelated expressions of this revival.

Festugière, the historian of this period exclaims, "*Curieuse et passionante* époque!"

> The world seems to be entirely Greek: monuments conceived according to the Greek orders cover the towns of the Empire. In these towns, Greek teachers, or at least, teachers formed by the Greek sciences instruct their students in the accepted curriculum. . . . And yet, how fragile this veneer! Reason, dialectics, humanism is cracking everywhere, and from below, in a great storm, all the irrational powers are at work, all those spirits which call forth the art of the prophet, the mage, the alchemist, the necromancer. People are searching for unknown truths, forms of new life. It is a time of new knowledge, of apocalypse, and of hidden oracles.[1]

In the words of Asclepius, one of the writers of the time:

> The Greeks, O King, have nothing but empty discourses, serving to make demonstrations. Indeed, the whole of Greek philosophy is nothing else than a lot of wordy chatter. But for us (Egyptians) we employ only simple words, but they are utterances filled with power.[2]

Egyptian wisdom literature had (because of the Greek invasion) shorn itself of the official cult of the Pharaohs, and evolved a personal religion, with direct experience of what Arnobius called "the more interior arts." The priesthood of Egypt, with its direct transmission of wisdom from father to son, was regarded as

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superior to the Greek philosophers in its grasp of the meaning of life. Hippolytus said that his contemporaries were "knocked out" by the wisdom of the Egyptians. There was a general feeling that what was needed was less a sage who could describe reality, than a magus, or personality charged with power, who could change reality.

It was out of the turbulence of this revival that alchemy was born. Alchemy, the remote ancestor of modern chemistry, shared the same impetus that brought so many "salvations" to birth at once. Like gnosticism, Christianity, and Jewish and Egyptian mysticism, it sought to break the intellectual barriers of a static and closed world-system. It sought personal experience and freedom. "Think things out for yourself," reads one alchemical text, "and you will never go astray." In another text, the adept describes himself as passing through all the seven spheres of the traditional Greek cosmos. But then he enters into an unheard of eighth sphere where he comes "into possession of his own power" and "becomes a god."[4] With a new-found sense of power over the inner and outer world, the alchemist exclaims, "That which I want, I become!"[5]

The alchemist, however, unlike others who shared in this new thought, did not leave his or her enthusiasm in the psychological realm alone. He or she (for many of the important Alexandrian alchemists of whom we have record are women) felt that the material world was just as important as the psychic world as a place from which to derive salvation. The alchemist felt that in all of matter, there were trapped essences, spirits, waiting to be discovered. "God will come forth to meet you, everywhere," read the alchemical texts.[6]

This is the enthusiasm that sent the Alexandrian alchemists to their stills, furnaces, cauldrons of chemical combinations, and kept them observing and describing the transformations they observed. By the end of the seventh century A.D., these men and women had brought chemistry far beyond where it had been before.

Alchemy in Alexandria can be divided into four chronological periods. The first dates from the first and second centuries A.D., and comprises the works of Bolos of Mendes, the author of *Physika kai mystika* ("Of Things Both Physical and Mystical"), Ostanes the Persian, Iamblichos, and the woman alchemist, Isis.

The second period includes a number of writers whose works were collected in the *Corpus Hermeticum* of the second or third centuries. These workers include Maria the Jewess, the person generally credited with the invention of the still, Cleopatra, Agathodaimon, and the anonymous author of *The Chemistry of Moses*. The late third and early fourth centuries produced the great researcher and prolific writer Zosimus of Panoplis and his intellectual coworker, Theosebeia.

The final period, by which time most of the alchemists were Christians, extends from the fourth century into well into the period of the Arab conquest (after 640 A.D.). The prominent writers of this period are Olympiodorus, Stephanus, Christianus, and Theodorus. The Arab general 'Amr evinced a rather surprising clemency when he conquered Alexandria, and despite the fact that most of the alchemists were Christian, he had an enthusiasm and encouragement for their efforts. Thus Alexandria was a very real bridge linking the culture of the Greco-Roman world with the early middle ages.

The teachings of the alchemists are not always easy to understand. Many of the texts were lost or destroyed by those who, in later ages, were the guardians of orthodoxy. The authors themselves made use of symbolism, partially as a chemical short-hand and partially to guard their secrets. In modern times, it has been through the efforts of a great French chemist Marcellin Berthelot, that their works have been collected and studied once more.[7]

In broad outline, the conceptual model framed by the Alexandrians went as follows. Matter, despite its multiplicity of forms, was unitary. Latent in it was a divine spark that could be liberated by the worker. This spark was most commonly represented by the mineral gold, but the end product could by any desideratum that led to happiness, prosperity, or psychic wellbeing. The still was the alchemist's tool *par excellence*. It represented the entire cosmos. What happened within the still was a miniaturization and an intensification of the processes that went on in Nature. Zosimus' book is called *The Book of Omega* because omega was both the last letter of the Greek alphabet and thus comprised materials, as it were from A to Z, and the first letter of the word for *ocean (okeanos)*. Like the ocean, the still was "the origin of both men and gods."[8] What fascinated early technologists was how from the salt water of the ocean nature could drop down sweet water in the form of rain. The still was termed, also, "a world, within the world."[9]

Matter was thought to appear in the four forms of air, earth, fire, and water. But the fifth form ("the quintessence") was what was sought either by processing base metals or crude botanicals in the still. This was the intellectual framework that later led to the designation of *essential* oils, those that could be released in the still as an essence from gross matter; thus also alcohol, chained to crude wine "as Prometheus had been chained by Zeus," could be released as a spirit. (Our modern word *gas* most likely evolved from the Old German *geist*, an exact translation of Zosimus' expression *pneuma* (spirit)).

Zosimus credits Maria the Jewess with the invention of the still. No record of such an apparatus comes to us from earlier classical culture; the first representation known to history appears in an Alexandrian text known as *The Gold-Making of Cleopatra* (2nd or 3rd

century A.D.). In a picture in this text is shown an unmistakable still, one, in this case, with two lead-off spouts for the distillate, accompanied by other diagrams of stills, some chemical symbols, and some conceptual premises. The Serpent Uroborus appears, grasping his tail, symbolising the unitary nature of matter. It was a symbol strikingly similar to the snakes in Kekule's famous dream sixteen centuries later, who when they suddenly turned in upon themselves and caught hold of their tails, led him to conceive a way to express the structure of the benzene molecule.

Common to all Alexandrians was the premise that, in order to effect a transformation of a base material into one more desirable, on had to have something of the one in the other. We might say the transformation requires a catalyst:

> One nature is charmed by another (like it),
> One nature is overcome by another,
> One nature rules another.[10]

Under the heat of the furnace, the matter in the still volatilized upwards. But great skill must be placed on the downward phase, whereby the vapor condensed and flowed back down into the receiver. Otherwise the process would only re-flux: "Unless you can de-body physical things, and em-body spiritual things, your work will amount to nothing."[11] This was why good sealing of the retort was important. The modern expression, "hermetic seal" comes from the Greek word *Hermes* that the Alexandrian alchemists used to denote Thoth, the Egyptian god of the intellectuals. The word does not refer to the Greek god of that name.

Given the mystical *élan* that gave the Alexandrians their enthusiasm, plus the Greek legacy of logic, they were also in a privileged place as far as praxis went. The craft tradition of Egypt was particularly rich, and the alchemists drew upon it heavily. Their furnaces were re-creations of the Egyptian baker's oven; their metallurgy drew from the experience of the smith and the jeweler; and their frequent references to "tincturing" and "tinctures" recall the dyer's art.[12]

As we have noted, Arab science grew naturally out of Alexandrian. The earliest phase of Arab science was centered in that city, but later was focussed near the Syrian city of Harran and in Persia. Some of the great personalities of Arabian science are al-Razi (850-925 A.D.), 'Ali Ibn 'Abbas (d. 994 A.D.), and Ibn Sina (980-1037), known in Europe as Avicenna—"Prince of Pharmacists." The latter is the first to have introduced the rose (*Rosa damascena*) into the still. The flower was a happy choice, for unlike most flowers, it can withstand the great heat of distillation and yield an essential oil remarkably true to the fragrance of the fresh flower. Arab pharmacy was soon making abundant use of this delightful essence, and rose-water (oil of rose in distilled water) became an important industry in the Muslim world. A whole village devoted itself to its production, and the Arab cosmographer al-Dimashki described this Syrian Grasse as "al-Munazzah" (the incomparable).[13] Arab industrial technologists devised multiple stills for rose-water production, and Arab traders carried this commodity westward to Spain and Morocco, and eastward to China.[14]

Certainly the many anonymous Arab traders of this period were also significant contributors to the modern essential oil industry. They scoured the East, and brought back products hitherto unknown or very little known, but today very important: musk; sandalwood; cloves; saffron; the orange, lemon, and other citruses; camphor; jasmine; cassia; ambergris; and nutmeg. Once the trader brought in these products, Arab medical botanists quickly catalogued them and researched their properties. Arab alchemists also worked on many of the inorganic substances in their stills: "spirits" such as mercury, sulfur, the arsenic sulfides, and sal ammoniac, and "bodies" such as the metals, boraxes, salts, and vitriols. Their exposure to Chinese alchemy tempted them to suggest many such substances for medicinal use, in the same way that the botanists had expanded the herbal pharmacopoeia.

The Arab world learned much from the Chinese, and so Chinese science must also be factored into the equation. The earliest Chinese alchemist had been a contemporary of Zosimus, one Ko Hung (283-343 A.D.). But Chinese alchemy developed in a parallel fashion, without any direct contact with the West until the time of the Arabs. The most famous alchemist after Ko was Sun Ssu-miao (581-674 A.D.), author of *The Great Secrets of Alchemy,* a compilation of botanical and inorganic elixirs. Chinese alchemy had a markedly physiological bent. Chinese philosophy gave no assurances of personal immortality (unlike the spiritualities of Western Asia) and so Chinese adepts had to pursue "immortality" or "long life" by means of potions. These Taoists (a catch-all phrase that includes most of the free spirits in Chinese life who managed to stay outside the Confucian civil service) ransacked every imaginable botanical and mineral in their search for an elixir. Many valuable cures were discovered and duly noted. *The Great Herbal (Pen Tsau Kang Mu)* of Li Shih-chen, published in 1578, includes most of these botanical and chemical remedies as they had come down from his predecessors. Of course, no science is without its martyrs. The historian of Chinese science, Joseph Needham, has collected a list of Chinese emperors whose untimely demise was almost certainly due to quaffing some dubious elixir of immortality. But the Chinese conviction that what could be produced in the lab would not only be of intrinsic worth, but contribute to physical well-being as well, played an important part in setting the mold of Arabian science. And this was the mold that was to be passed on to Europe.

Where had Europe been in these centuries? Technologically, in the dark. But by the eleventh cen-

tury, the Europeans began to look with lively interest at the materials and technical processes of the Eastern world. Arab literature and commodities steadily percolated into the continent. The entryways were Spain, Sicily, and southern Italy. Salerno, south of Rome, was the center of this process. Salerno long had a Benedictine monastery note for its interest in pharmacy. By 1090 the abbey school received university status. Tradition ascribes this step to four men: Salernus, an Italian, Pontus, a Greek, Adale, an Arab, and Elinus, a Jew. To this university came Constantinus Africanus, a Baghdad-educated Moslem from North Africa who ended his days as a Christian monk at Monte Cassino. One of the earliest of the Western medical herbals, *Circa Instans*, is thought to represent a compilation by the university staff of his medical lore.

Europe was not only swift to learn from Arab medicine, botany, and science, but soon developed real contributions of its own. At Salerno the still received its final perfection. The greatest weakness of the still of the time had been the atmospheric cooling of the vapors. The ambient air at the top of the still was simply not cold enough to cool all the gases, and many recondensed and dropped back into the body of the still. Some Salernitan, exactly who is not known for sure, devised the use of water to cool the vapors. This was an extremely important step in the history of humanity, because it allowed for the continuous and reliable production of alcohol. Wine or beer could be put in the still, and ethyl alcohol drawn out.

Alcohol is so taken for granted by us today that it is hard to imagine the effect of this wonder drug when it first appeared in regular and large quantities. Since it looked like water it was first called *aqua* (water) but an *aqua* that instead of quenching fire would augment it, hence, *aqua ardens*. Since its antiseptic virtues were noted, it was sometimes called *aqua vitae* (water of life). Those great medieval thinkers and experimenters, Albert the Great (1193-1280) and Raimundo Llul (1235-1294) busied themselves with experiments on its qualities and propagandizing its medical uses. Albert used earlier knowledge to elucidate the manufacture of alcohol: "Sublime wine, like rose water, and thus often an inflammable liquid."[15]

Arnold of Villanova (1240-1313) is the first to use the term *alcohol*. It is a borrowing from the Arabic, *al kohl*, the name for antimony sulfide, used by Arab women to darken their lashes. By the middle ages it has come to mean anything finely ground or refined. The word was first used with a genitive: "the alcohol (or finest essence) of wine." Later, "of wine" was dropped.

The early distillers usually prepared alcohol by making first distillation, yielding a 60% alcohol, and then submitting the liquid to a redistillation, bringing the alcohol content to 96% or 192 proof. Alcohol production was centered in the Italian city of Modena, and thence spread to Germany and France. Monasteries made alcoholic extracts (tinctures) incorporating local herbs and some of the "spices of Araby" obtained through trade with the East. Alcohol made modern perfumery possible, as a perfume is about 20% of essential oil in 80% alcohol. The first perfume as such was called *Aqua Hungarica:* an alcoholic "water" with oil of rosemary. At an early date, eleven stills were at work at Dijon, producing fragrant "waters," principally from lavender and rose.[17] By 1420, European technologists had devised the "worm" condenser. This serpentine cooling coil first appears in the work of Johannes Wenod de Veteri Castro.[16]

By the Renaissance an abundant literature of distillation was being turned out in Europe. The most illustrious of these manuals is by Hieronymus Brunschwig (1450-1534), the physician of Strasbourg. A great number of botanicals went into his still. He mentions an oil of lavender, turpentine, oil, of juniper and rosemary, and a composite fragrant mixture of cloves, gum mastic, cinnamon, galbanum, olibanum, and opopanax.[18] Philipp Ulstad and Walter Reiff, later in the same century, added guaiacwood, storax, myrrh, benzoin, and several balsams. Reiff noted that then, as now, fragrances were imported from France "in small bottles, and sold at a high price."[19] Valerius Cordus (1515-1544) clearly differentiated between the fatty oils, such as olive oil *(oleum terrestre)* and the spiritous essential oils *(aerea)*. He also observed the properties of oil of anise and fennel to congeal into a butyraceous mass, and the properties of oil of clove and cinnamon to sink under water, in the Florentine flask.

Agricola (1490-1555) extended the use of distillation in metallurgy, but indirectly advanced the technique when applied to consumable substances. Paracelsus (1493-1541) was another great technologist who espoused many alchemical processes, but rejected slavish imitation of any authority. "Let him belong to none other, who may be his own" was his rule. He praised the pharmacists who

> do not chatter in the presence of the sick and praise their own remedies. They perceive that the work should glorify the workman and not the workman the work. They devote themselves diligently to their labors, sweating whole nights and days over fiery furnaces.[20]

Giambattista Porta (1537-1615) devoted a chapter of his *Magia Naturalis* to distillation, and one to the making of perfumes. Porta was a gifted technologist; his books today are hard to find, and when obtainable are often full of spill-marks. Much of the progress in distilling of alcohol and essential oils in the seventeenth century was made by practical pharmacists and perfumers in the clutter and mess of their workshops.

Paracelsus' alchemy was not only empirical, but also rife with imagery. One consequence of his work was the mystical alchemy of Jakob Boehme (1575-1624), who drew inspiration from Paracelsus. He applied the transformations described by Paracelsus

as stages in the perfection of the personality. Boehme's optimistic outlook was a great influence on Blake. Freud, in his youth, was familiar with his writings, and ascribed his doctrine of free association to his influence ("sublimation" of the "spirits"). Paracelsus' influence, by devious routes, contributed to the empirical chemistry of Boyle and the rise of modern science. By the time of Boyle or Blake, however, we can see the emergence of that great division between modern science and the world of the humanities, Lord Snow's "two cultures." Much of the interest and appeal of the study of the very earliest science is that for those men and women, the life of feeling and the life of technology were one. Their interest in the world of matter was real and sustained, but it was also full of mythic and emotional sap.

So, the next time you sip your aperitif, that distilled alcoholic spirit, flavored with essential oils culled from all over the world, perhaps you might see a shade or a shadow flit by your glass. Is it Avicenna, the Prince of Pharmacists? Maria the Jewess? Some turbaned caravan-leader? Paracelsus? All of these, and others, helped produce the means by which we can enjoy so many useful and important products.

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