

Religion, Spirituality, and the Chemical World

The human condition cannot be examined without giving attention to the spiritual realm. Since the dawn of human experience, spirituality and religion have played an overwhelming role in how we understand, interact, and familiarize the world around us. “Spirituality seems to emerge from within an empathic felt sense of something; and intuitive and emotive feeling within ‘self’, an interconnection and interdependence of sorts related with everything else”¹.

Compared to our contemporary world, ancient societies were more intimately connected with the natural world; they were immersed with it in all aspects of their daily lives. There was no separation between nature and the human experience—be it spiritual, social, or institutional. As conscious beings in the natural world amongst the lesser minds of animals and plants, early man approached the metaphysical world with intense anxiety and curiosity. In an attempt to define our existence and indeed the value of existence in general, early spiritual beliefs were keystone to giving purpose to daily life.

As people became more and more aware of the natural properties of objects encountered in daily life. The role of chemistry in spiritual practices has been important because it has allowed human beings to manipulate our environment and to develop substances with predictable qualities. As a result, throughout history, there has been a close relationship between chemistry and spiritual practices.

¹ <http://www.natureiq.com>

The earliest known human burial rituals tied to spirituality were discovered in Skhul and Qafzeh in Israel, dating back to over 100,000 years ago. The skeletons discovered there were purposefully stained by Red Ochre, a non-toxic clay used to make an oil-based paint (Fe_2O_3) and heated for increased pigmentation. These skeletons were ritualistically stained by red ochre, and because red ochre is of little use to hunter gatherers for practical (especially burial) purposes, archaeologists believe that the religious mind goes back at least 100,000 years. The oldest record of organized mining activity occurred at the “Lion Cave” in Swaziland, a 43,000-year-old ocre mine. Germanic rune lore were used by ancient Germanics and Scandinavians for thousands of years as magickal tools used for writing and record-keeping. In this tradition, runes were reddened by red ochre instead of traditional blood for ceremonial and spiritual purposes—following prehistoric religious tradition. Other ochre pigmentations were in standard use as well; the primary types were yellow ochre, chemically the same as red ochre except not heated; purple ochre, also chemically identical to red ochre except that it has a different hue due to light-diffraction properties that follow from a greater average particle size; and brown ochre (goethite), partially hydrated iron oxide (rust). The uses of ochre in early prehistoric spiritual practices are found all over the world.

The earliest discovered artwork is the Venus of Tan-Tan, dated between 300,000 and 500,000 BCE, found in Morocco. This small 6-centimeter-long statuette was made from quartzite, a metamorphic rock formed from sandstone through heating and pressure. Although it may be that the figurine was naturally made, it was undoubtedly intentionally painted with red ochre, indicating symbolic or ceremonial importance. At its conception, the figure probably better- resembled a more humanoid shape, accentuated by a stone-wedge carving with artificial smudge (iron and manganese) blemishes signifying direct pigmentation.

Other similar statuettes from prehistoric times have been discovered. A common motif is the bloated stomach and emphasis on the breasts, often understood to signify fertility or genesis, which coincides with the symbolic representation of red ochre as blood.

A magnificent example of how chemistry is related to religion is provided by prehistoric cave paintings that date back to the Cro-Magnon period, 40,000 years ago. The cave of Lascaux in southwestern France displays 2000 figures, with almost 600 animal depictions of horses, cattle, goats, and bison, also bears and felines, and one human representation. The cave paintings also show mystical creatures such as a half-human, half-bird figure, which give rise to speculation of early shamanism, a religious system that accepts the existence of a supernatural spirit world and animism, the belief that all things, animate and inanimate, are spiritually significant through individual souls. To reach the cave, ancient artists trekked for days with ample provisions—lamps of limestone or sandstone and wooden torches covered with animal fats. The images were created with an acute understanding of primitive chemistry, used to create paints with specific pigmentation. The pigments used included ochre, charcoal, iron oxide, hematite, manganese, and other minerals used to produce brown, black, red, and gray paints. These components were most likely ground into powder using stone mortars and pestels, with a binder to stabilize the paint and promote adhesion to the stone wall. Although the binders have by now evaporated, archaeologists believe that the paints were dispersed in water or oil. The paints were applied by brushes, fingers, and blowing them through a straw. Some of the figures were outlined by primitive crayons, created by flushing solid binders with specific pigmentation, molding to shape, and drying. Although we can never be sure, the prehistoric cave paintings in Lascaux were used for ritualistic purposes and that the cave functioned as a religious sanctuary.

The oldest systems for burying a corpse involved stone tools and animal parts, placing the corpse either in holes in the ground or in specially protected graveyards. These special burial sites give the impression that people's afterlives were given consideration. This means that ancient people believed in individual souls.

The search for evidence of prehistoric spiritual belief systems has been almost exclusively in the hands of archaeologists, because written texts and oral traditions from that time are non-existent. In the light of these difficulties, a variety of scientific methods have been used to uncover the earliest forms of religion. Radiometric dating is a method for comparing the abundance of radioactive isotopes and their decay rates to reveal the age of rocks and sediment. The most popular technique of radiometric dating include potassium-argon dating and uranium-lead dating. Potassium-argon dating measures the radioactive decay of potassium and the ratio of potassium and argon is directly related to the age of the material. Uranium-lead dating relies on radiation damage associated with alpha decay and the movement of lead isotopes through these small cracks. Another popular method of dating is fission track dating—a radiometric dating method that analyses the left-over tracks of fission fragments in uranium-bearing minerals and glasses. The fragments emanated by Uranium-238's spontaneous fission decay fatigue the crystal structure of the minerals that hold the uranium. Etching the polished surfaces of these crystals uncovers spontaneous fission tracks, which can be counted and correlated with the age of the sample and its uranium content. As our understanding of the chemical properties of natural substances grows, we're able to look farther down the human timeline and learn more about our ancient ancestors and their perspective of the world.

Although we might not fully understand the developments of early prehistoric religious and spiritual practices, we are well aware of the impact and extent of spirituality in the modern world. Religious institutions have come to play a powerful political role throughout the world—from local, to national, to international systems of belief. The most prevalent modern religious systems include Islam, Christianity, Hinduism, Buddhism, Sikhism, and Judaism. Much like earlier spiritual belief systems, these religions also maintain ties with chemistry.

For example, various Eastern and Western religions practice the burning of incense for ceremonial purposes. Incense is generally made from raw materials such as frankincense, pine needles or resin, myrrh, juniper, benzoin, sandalwood, copal, cedar, rose petals, thyme, bay, basil, cinnamon, or rosemary, but can also be made from the oils and extracts of these materials. Incense is generally made of woods and barks, seeds and fruits, gums, leaves, roots and rhizomes, or flowers and buds. The spiritual importance of incense can be seen in the New Testament legend of the birth of Jesus, when two of the three wise men from the east bear gifts of frankincense and myrrh, exotic materials used in incense. Incense is also featured as one of eight offerings on the shrines of Buddhist practitioners as a gift used to please the sense of smell. Its burning is also used to purify negative energies. The burning of a stick of incense is also used for meditative purposes, as it drowns away other unpleasant smells and allows the practitioner to develop greater focus.

The effects and goals of meditation provide another bridge between chemistry and religion. This ancient mode of contemplation has become a keystone pillar in several modern religions. Hindu meditation includes Yoga, a part of Hindu philosophy, geared towards physiological and spiritual mastery. Meditation is the focus and center of Buddhist philosophy, a mode of training in conjuncture with virtue and wisdom. Meditation is also the core of Muslim

mystical traditions through Tafakkur and Tadabbur, which literally translate to ‘reflection upon the universe’, and Sufi meditation of Muraqaba (to acquire knowledge about the soul, its surroundings, and its creator) and Tamarkoz, or concentration of personal abilities. Meditation is also used for Catholic monastic practices and prayers such as rosary or Adoration, meditation on the prayers Lord’s Prayer, Hail Mary, and Glory Be to the Father. Judaic practices use meditation create a metaphysical realm in which the soul navigates to reach specific ends. In Sikhism, the meditative practice of Simran and Nam Japo promote self and universal contemplation; it is practiced to emanate love to all life and God.

Studies regarding Transcendental Meditation show that regular practice of meditation can result in “an increase in the areas of the [cerebral] cortex taking part in perception of specific information and an increase in the functional relationship between the two hemispheres.” some meditation practitioners are able to lower their respiration rates from twelve to fifteen breaths per minute to only three, faster information transfer within the brain, lower baseline respiration rates, reinforced stability of the automatic nervous system, faster recovery from stress, quicker reactions, and faster reflexes. Western medicine is beginning to look towards meditation to reduce stress-related ailments; nearly 60-90% of doctors’ visits are caused by stress. New research is beginning to allude to the idea that the neurochemical effects of meditation directly oppose the “fight-or-flight” mechanism via chemical impact on the automatic nervous system. According to this medical theory, meditation or prayer creates a sort of “relaxation response”, which is controlled by the amygdale, a part of the limbic system. The amygdale is closely associated with religious faith—when it is stimulated during surgery, patients often report experiencing visions of religious motifs such as angels or devils.

One of the most vivid relationships between spiritual belief systems and chemistry exists in the use of mind-altering substances, or drugs. Psychotropic substances are chemical extracts that affect the central nervous system and affect behavior, consciousness, mood, and perception. They are used for recreational, medicinal, and spiritual purposes. Entheogens, or psychoactive substances used for religious or spiritual purposes, are found in spiritual and religious systems all over the world. In Africa, entheogenic mushrooms and various natural herbs are used to induce mind-altering states. The most common herbs are *Silene capensis*, sacred to the Xhosa in the Eastern Cape of South Africa, which induces lucid and prophetic dreams; *Nymphaea caerulea*, a blue lily native to the Nile River, an anti-spasmodic narcotic, with purifying and calming properties. In Asia, indigenous Siberians used the *Amanita muscaria* mushroom, a psychoactive basidiomycete fungus that contains several psychoactive ingredients such as Ibotenic acid, Muscazone, and Muscarine, which chemically affect the cerebral cortex, hippocampus, and cerebellum. Early Judeo-Christian cultic practices also relied on *Amanita muscaria*, although the tradition was quickly forgotten. Historically, Europe has been a hub for the use of wine as an entheogen, dating back to the Aegean civilization from the Bronze Age to Judaic traditions. Middle Eastern Islamic traditions widely used marijuana and hashish for ceremonial purposes. In the Americas, the role of *Lophophora williamsii*, or the peyote cactus, has played a central role in many Native American spiritual practices as a gateway to the metaphysical world. Indigenous South Americans used a variety of entheogens including ayahuasca, native to the Amazon Rainforest, used by various tribal cultures that practice shamanism. Ayahuasca has been associated with various medical remedies from the disappearance of cancerous cells to relieving cocaine addiction, and the ability to help the body better-absorb serotonin to effectively remedy long-term depression.

Although religion is often seen as something separate from science and from the ‘rational’ world, it is closely related to how we perceive the physical world and its ‘natural’ laws. Religion and spiritual beliefs have the ability to affect our neurochemistry, the fundamental building blocks of the experience we understand to be life. In turn, we incorporate our understandings of the physical world into our understandings of the metaphysical or spiritual world. We use chemistry to master the physical environment, and we use spirituality to make holistic sense of it all. As our knowledge of chemistry grows, the interconnectedness between the sciences and religion will continue to grow until this ‘felt sense’ within oneself is satisfied.

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