

Wasson's Alternative Candidates for Soma†

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Abstract — Citing recently published challenges to R. Gordon Wasson's identification of Vedic soma as the psychoactive mushroom *Amanita muscaria* (fly-agaric), this article reviews unpublished letters by Wasson in which he considered and rejected other psychoactive plants as candidates, including the mint *Lagochilus inebrians*, Convolvulaceae (morning glory) seeds, the fungal parasite *Claviceps purpurea* (ergot), and especially the psilocybin mushroom *Stropharia cubensis*, known also as *Psilocybe cubensis*. Apart from their historical interest, these letters—from the Tina and Gordon Wasson Ethnomycological Collection at the Harvard Botanical Museum—demonstrate that Wasson remained open to refinements of his theory.

Keywords — *Amanita muscaria*, *Claviceps purpurea*, Convolvulaceae, ergot, fly-agaric, *Lagochilus inebrians*, mint, morning glory, muscimole, *Peganum harmala*, *Psilocybe cubensis*, Rig Veda, soma, *Stropharia cubensis*, Wasson

For hundreds of years, Western scholars have hotly debated the identity of soma, a sacramental substance that is frequently and prominently mentioned in the most ancient Hindu holy book, the Rig Veda. It is described there both as a god and as an intoxicating liquor that is crushed from the juice of a plant. Those who drank it rhapsodized, in many of the 1,028 hymns comprising the Rig Veda, that soma had made them immortal, transported them into the light, set them free in wide space and induced other mental effects reminiscent of plant hallucinogens. However, the botanical identity of soma has remained an unsolved mystery.

The Aryan priestly poets who wrote the Rig Veda did so at a time when they were migrating south from Afghanistan's mountainous Hindu Kush region to the vast fertile flatlands of northwestern India's Indo-Gangetic Plain. During this migration, which occurred between 1500 and 500 B.C., the original identity of soma was forgotten or perhaps suppressed in order to prevent its vulgarization

by the lower castes. Another possibility is that the soma of the mountains did not grow in the Indian plains and was abandoned as the Aryans moved south and east.

In any case, theories abound that the soma described in the Vedas was at some point replaced by a surrogate psychobotanical substance or alcoholic beverage. Wendy Doniger (O'Flaherty) — writing in Wasson (1968:95-147) — provided a summary of plants that in the past have been identified as soma by various scholars. Among them are species of *Sarcostemma*, *Ephedra* and *Periploca*, all climbers; the Syrian rue, *Peganum harmala*; a fermented mixture of clarified butter (ghee), barley and/or hops; the fermented juice of dates, palmyra palm or coconut palm (Egyptian beer); a rhubarb, *Rheum palmatum*, fermented with sugar or honey; and *Cannabis sativa*. Emboden's (1979) concise review of soma candidates is also recommended.

A full discussion and analysis of these and other soma theories is beyond the scope of this article. It is not intended to be a critique of the various theories, but rather an examination of the process by which one particular theory emerged from a field of several other candidates considered and rejected by its originator.

WASSON'S SOMA/AMANITA THEORY

The first to identify soma as a fungus was R. Gordon Wasson (1968), who proposed it was the psychoactive fly-agaric mushroom *Amanita muscaria*. His evidence came mainly from an analysis of soma's physical attributes, described in the Vedas, which he believed correspond to mor-

†This article quotes several sources verbatim. Within the context of these quotes, some words appear in different forms as variants, such as soma, Soma (correct when referring by name to the god, Soma, but unnecessarily capitalized when referring to the sacramental substance), ololiuhqui, ololiuhqui (with an h), Rg Veda, Rig Veda, Rigveda, Rigveda, Rig-Veda, and Rig-veda. Additionally, these variants are sometimes italicized. For the sake of accuracy, they have been left in the forms in which they appeared in the original source. However, in the body of the text, the author refers consistently to soma, Rig Veda and ololiuhqui, all in Roman type.

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phological characteristics of *A. muscaria*. For example, citing several Vedic references to soma as the "mainstay of the sky" and the "foundation of the earth," Wasson (1968:48) observed that "the sturdy stanchion with its resplendent [white-flecked, brilliant red] capital that is the fly-agaric lends itself well to this poetic conceit." He specifically dismissed "a creeper, a climber, any vine—some species of *Sarcostemma* or *Ephedra*" as viable alternatives, because in his opinion no poet would use the same language to represent these plants. Also, noting that the Rig Veda mentions no root, leaves, blossom or seed of the soma plant, he pointed out that mushrooms have none of these features, while higher plants, such as *Peganum harmala*, *Rheum palmatum* and *Cannabis sativa*, do (pp. 18-24). And he believed that the Rig Veda's frequent allusions to soma growing high in the mountains is significant, since *A. muscaria* grows in mycorrhizal relationship with conifer and birch trees, which in India "are found only at a great height in the mountains, around 8,000 to 16,000 feet" (pp. 22-23). Finally, Wasson (pp. 15-17) rejected "with assurance" all theories that soma was an alcoholic beverage because, among other reasons, the Rig Veda reports that soma's stalks were pressed "as a liturgical act and before the liturgy was finished the juice was drunk. Three sacramental offerings could be made in one day." In his opinion, "fermentation could not have advanced far in a religious rite repeated thrice a day. Moreover, those who know the fermenting process must find it hard, indeed impossible, to imagine anyone . . . waxing lyrical, even ecstatic, over a drink in active fermentation." For Wasson, the rapturous tone of the soma hymns was proof enough "for those of any literary discrimination or psychological insight" that the sacrament could not have been an alcoholic beverage.

Especially convincing to some scholars (e.g., Schultes 1990) was Wasson's observation that of all the numerous plant candidates proposed for soma, only one, *A. muscaria*, has a psychoactive chemical constituent, muscimole, that passes unmetabolized through the human digestive system and emerges still psychoactive in urine (Schultes & Hofmann 1980). Though muscimole's psychoactivity still is not fully understood,¹ the anecdotal evidence for *A. muscaria*'s "second form" psychoactivity in urine is well represented in historical, eyewitness testimonies cited by Wasson (1968). These consistently report that Koryaks and other indigenous peoples of Siberia who ate *A. muscaria* for intoxication passed their urine to others who, upon drinking it, also became intoxicated. Wasson interpreted certain passages in the Rig Veda, Mahabharata, and Avesta as alluding to similar practices by participants in the ancient soma ceremony. He was alerted to these passages when, recalled Wasson (1968:176), "... in July [1962], I engaged Wendy Doniger to write a *précis* of the Soma question, and she submitted her report on February 16, 1963. . . . In it she called my special attention to . . . [Rig

Veda 9.74.4], where the priests urinate Soma. This had astonished her and left her nonplussed: little did she suspect what it would mean for me, with my Siberian background."

CHALLENGES TO THE SOMA/AMANITA THEORY

Not all of Wasson's supporters agreed in entirety with his theory. For example, though convinced that Wasson had correctly identified soma as *A. muscaria*, Ingalls (1971) disputed the urine connection:

Where Wasson errs is in supposing that the Vedic soma was drunk in the same way [as the Siberian urine]. To justify such a thesis he is forced to suppose that Vedic priests impersonated their gods: that when the text says, "I offer soma to you, Indra; drink of the good soma," someone was offering amanita juice to a priest.

Actually, there is no shred of evidence for priestly impersonations in the Rigveda. Where priests do act *in persona dei* (as they do in some forms of Hinduism and Buddhism) the procedure is clearly revealed by the language of the ritual and litany. Wasson finds one out of the 35,000 lines of the Rigveda that seems to say the priests are micturating diluted soma. I interpret the line . . . to mean that bearers of the soma pots are pouring the fluid down into the filter-covered trough. One cannot hang the explanation of a major cult on a single image, which may be metaphorical, taken out of context.

Other, recent critics of the soma/*Amanita* theory have echoed and extended Ingalls's objection to Wasson's crucial interpretation of Rig Veda 9.74.4, which O'Flaherty (1981:122-123) translated as follows: "Butter and milk are milked from the living cloud; the navel of Order, the ambrosia is born. Together those who bring fine gifts satisfy him; the swollen men piss down the fluid set in motion." Arguing rather that soma was *Peganum harmala* L. (Zygophyllaceae), also known as harmel or wild rue or Syrian rue, Flattery and Schwartz (1989:6) contended that "even interpreting this literally (and supposing the 'men' to refer to priests, which is not at all certain), there is still nothing to suggest the *drinking* of such urine. . . . [N]one of the data presented by Wasson on the subject of urine drinking has any relevance for *soma*." They also dispute the significance of Wasson's observation that nowhere in the Rig Veda is soma described as having roots, leaves, blossoms or seeds, since, according to them (p. 5), "the *soma* referred to in the RgVeda and adduced by Wasson as pertaining to the mushroom is the liquid extract (*soma pavamana*) or the deity Soma, and hence not the *soma* plant at all." Maintaining that "Vedic descriptions of *soma* are so general that they cannot be used to prove or disprove [Wasson's] or any other hypothesis," they concluded that "any probative evidence for the botanical identification of *sauma* [*soma*] must have its basis outside of this text" (p. 6). Thus, the evidence they marshal in identifying soma as *Peganum harmala* comes primarily from the Avesta and other ancient Iranian literature, which, in their opinion, shares a common "Proto-

Indo-Iranian" ancestry with the Rig Veda. Their stated reason for believing the Avesta to be more reliable is "a scholarly consensus that in general the Avesta is the more conservative text, that is, it more faithfully reflects archaic realia than does the RgVeda, which is prone to extensive poetic elaboration" (p. 10).

Recently, McKenna (1992:105) has endorsed Flattery and Schwartz's theory as "very persuasive," disputing Wasson's identification of soma as *A. muscaria* for the same reasons they do. The following reflects his greatest objection (pp. 108-109):

... Genetically and chemically *Amanita muscaria* is extremely variable; many kinds of fly agaric do not provide a reliable ecstatic experience. Soil conditions and geographic and seasonal factors also affect its hallucinogenic properties. ... Wasson himself was aware that *Amanita [muscaria]* was unreliable, as he himself never had an ecstatic experience from eating *Amanita [muscaria]*.^[2]

Instead of realizing that *Amanita muscaria* was an unlikely candidate for Vedic Soma, Wasson became convinced that some method of preparation must have been involved. But no ingredient or procedure has ever been found that reliably transforms the often uncomfortable subtoxic experience of *Amanita [muscaria]* into visionary journeying to a magical paradise.

The chemical compounds active in *Amanita muscaria* are muscarine and muscimol [var. muscimole]. Muscarine is highly toxic and like most cholinergic poisons, its activity is reversed by injection of atropine sulfate. Muscimol, the likely candidate for the psychoactivity of the mushroom, has been described as merely an emetic and a sedative. Human exposure to muscimol is not described in the literature. (Incredibly, the obvious step of giving muscimol to human beings to determine its psychedelic potential, if any, has not been undertaken. This fact again points out the queasy illogic that overtakes the academic mentality in the presence of questions revolving around self-induced changes in consciousness.)

Note that in discussing the toxicity of muscarine, McKenna does not mean to suggest that this compound produces psychological effects. As reported by Schultes and Hofmann (1979:85), "The active principle of *Amanita muscaria* was thought once, a century ago, to have been muscarine. ... This belief has been proven erroneous. Recently Eugster in Switzerland and Takemoto in Japan isolated ibotenic acid and the alkaloid muscimole. The mushroom is usually taken dried. The drying process induces the chemical transformation of ibotenic acid to muscimole, the most active constituent."

Thus, drying *A. muscaria* before eating or expressing it would seem to be a necessary step in "releasing" its psychoactivity. This is consistent with Wasson's suspicion, as reported by McKenna, that if *A. muscaria* were soma "some method of preparation must have been involved." Wasson (1968:155) himself ate *A. muscaria* and failed to experience profound psychoactive effects during two expeditions to Japan, in 1965 and 1966, later blaming the fact he had eaten them fresh instead of first drying or toasting them. Only one of several people who ate fresh *A. mus-*

caria on these expeditions "had satisfactory results, insistently declaring that this was nothing like alcohol, that this was far superior, in fact in a different world." Wasson concluded that "alone among us all, he has known ... the ambrosia of the Immortals." His friend Albert Hofmann (1965) described it as "a paradoxical reaction," in other words idiosyncratic. Neither Wasson nor his colleagues could repeat it even once, though repetition of predictable effects is required to prove a scientific theory. McKenna (1992:107), who has ingested both dried and fresh *A. muscaria*, believes that the mushroom's unpleasant effects, mainly nausea, salivation, blurred vision and stomach cramps, fall far short of soma's storied reputation as a "visionary intoxicant of tremendous power and an unparalleled hallucinogen." Yet in Wasson's (1986a) last published words on the subject in his final book, *Persephone's Quest*, he persisted in describing *A. muscaria* as "the entheogen [hallucinogen] of the ancient world" (p. 33) and, in its alleged role as soma, "the supreme mushroom" (p. 78). He must have accepted these characterizations "on faith," notes McKenna (1992:110), "since he admitted it was disappointing and only reported attaining shamanic ecstasy by using psilocybin, which he never introduces into the Soma puzzle." Then McKenna cites what he calls an interesting caveat by Wasson (1986b:134-135) that appears in *Persephone's Quest*:

Other fungal entheogens grow at the lower levels. They come in cattle dung, are easily identified and gathered, and are effective. But they fail to conform to Brahmin practices: they are known to tribals and sudras [untouchables]. Soma on the other hand exacts self-discipline of the priests, a long initiation and training: it is, for proper exploitation, an affair of a priestly elite. But the possible role of *Stropharia cubensis*^[3] growing in the dung of cattle in the lives of the lower orders remains to this day wholly unexplored. Is *S. cubensis* responsible for the elevation of the cow to a sacred status? And for the inclusion of the urine and dung of cows in the *pañcagavya*? And was that a contributing reason for abandoning Soma? Given the ecological conditions prevailing in the Indus Valley and Kashmir, only a few of the Aryans could know by personal experience the secrets of the Divine Herb. The cult of Soma must have been shaped by the peculiar circumstances prevailing in the area, but ultimately those circumstances must have doomed that cult. Today it lives on in India only as an intense and glowing memory of an ancient rite.

McKenna (1992:111) also cites Wasson's (1986b:133-134) discussion of a prohibition, established in the late Vedic period, against Brahmins eating mushrooms: "We still do not know — we will probably never know — when the proscription came into force, perhaps over centuries while the Vedic hymns were being composed, or possibly when the hierarchs among the Brahmins learned of the entheogenic virtues of *Stropharia cubensis* as known to the lower orders living in India. ..."

In these passages, McKenna (1992:111-112) concludes that Wasson "... dismisses, ignores, and passes over ample

evidence that the mushroom that lay behind the mystery of Soma was the psilocybin-rich *Stropharia cubensis*. He calls it 'easily identified' and 'effective' but cannot conceive that it could be the Soma he seeks. He asks himself whether *Stropharia cubensis* could have been 'a contributing reason for abandoning Soma.' Then he ignores his own question."

Admittedly impressed by Flattery and Schwartz's theory that soma was *Peganum harmala*, McKenna (1992:113) proposes his own theory implicating *Psilocybe* (*Stropharia*) *cubensis*:

In fairness to Wasson it must be said that he assumed that *Stropharia cubensis* was first encountered by the Indo-Europeans when they reached India — and thus that it entered the Soma equation rather late. My own contention is that *Stropharia cubensis*, or a conspecific coprophilic species, was well established in Africa, Anatolia, and perhaps the Iranian plateau millennia before the coming of the Indo-Europeans. This assumption changes the picture in important ways. It means that the invading Indo-European tribes encountered old mushroom-using cultures already in place on the Anatolian and Iranian plateaus.

The increasing dryness of the region could possibly have prompted a search for mushroom substitutes long before the Indo-European invasions. . . . It certainly would be true that *Peganum harmala* in combination with psilocybin in any form would synergize and enhance the effects of psilocybin. Perhaps when mushroom supplies ran low, this combination was used. Gradually, *Peganum harmala* might have come to supplant the ever-rarer mushroom altogether.

Finally, McKenna (1992:117) shares a letter he received from Wasson in 1977, in response to an inquiry:

Your question about *Str[opharia] cubensis* has also bothered me. When Roger Heim and I went to India in 1967, in the Simlipal Hills of Orissa, I was given an account of a mushroom growing in cow's dung that tallied perfectly with *Str. cubensis* even to its psychoactive powers. My informant said that everyone avoided it. He seemed not to be withholding anything. He said he would deliver the mushroom to us, but though we stayed there a couple more days, I saw no more of him. Our purpose in going to India was altogether different. It will be necessary to pursue *Str. cubensis* further not only in India but elsewhere in the world. Of course *Str. cubensis* must flourish in India. Did it play a part in the abandonment of Soma? Inebriation from *Str. cubensis* and the other psilocybin species is clearly, in my opinion, superior to *A[manita] muscaria*. I may develop this as one of several ideas that I propose to include in my next book after this one, which I am now drawing to a close.

ALTERNATIVE SOMA THEORIES DISCUSSED IN WASSON'S CORRESPONDENCE

Wasson later chose to defend his *A. muscaria* theory in *Persephone's Quest*, where he declared *A. muscaria* "supreme" among mushrooms. However, after reviewing correspondence that Wasson exchanged with a number of people at the time he was initially developing his soma the-

ory (these letters are retained in the Tina and Gordon Wasson Ethnomycological Collection donated by Wasson to the Harvard Botanical Museum) one finds that Wasson considered alternative candidates for soma among psychoactive plants, primarily *Stropharia cubensis* Earle, known also as *Psilocybe cubensis* (Earle) Singer.

Lagochilus inebrians

In his landmark book *Soma: Divine Mushroom of Immortality*, Wasson (1968:175) recalls "tossing off the fanciful suggestion that Soma might prove to be the fly-agaric" while conversing with Aldous Huxley in the late 1950s. However, he later reported, in an unpublished draft of a paper he read before the 1971 International Congress of Orientalists (Wasson 1970), that a psychoactive mint was his first candidate for soma: "First I harbored the secret notion that Soma would turn out to be a member of the mint family, *Lagochilus inebrians* Bunge, growing in Bactria and there used as an hallucinogen as far back as we can trace its history. This mint, strangely, had never been suggested as Soma." His reasons for considering *Lagochilus inebrians* are not given in the paper nor in any of his books, and he mentions it but seldom, as "a mint," in his correspondence. This suggests he abandoned it quickly in favor of Convolvulaceae (morning glory) seeds, his second candidate for soma.

Morning glory seeds

In a joint letter to his friends Albert Hofmann and Richard Evans Schultes, Wasson (1962a) reported having met with Abram Hoffer on 11 April 1962. Following Hofmann's discovery, announced in 1960, that Mexican morning glory seeds (ololiuqui) contain lysergic acid amides closely related to *d*-lysergic acid diethylamide (LSD), Hoffer's research team had "succeeded in finding LA [lysergic acid] not only in the seeds, but also in the leaves and stems of the plant, in amounts roughly comparable to the amounts in the seed. Furthermore . . . he thinks it is in all morning glories," Wasson told Schultes and Hofmann, adding: "Since presumably the morning-glory genus is to be found in Persia and India, it means that if Dr. Hoffer and his group are right, we have found the first plausible explanation of the source of *soma*, so eloquently described in the Vedas and elsewhere, the *homa* or the *haoma* of the old Persian writers. . . . In the Vedas all that we know, as I understand it, is that *soma* was derived from a climber or creeper. How surprising and odd it would be if ololiuqui held the answer to the secret of the primary hallucinogen in world literature, which has defied all the research workers up to now!"

In their replies, Schultes (1962) encouraged Wasson to pursue the "thrilling possibilities" he had raised about soma, but Hofmann (1962) apparently caused him some disappointment by reporting that analysis of forty-two "various species and genera of the family of the Convolvu-

laceae" had found psychoactive alkaloids in only three of them, including the Mexican morning glories *Rivea (Turbina) corymbosa* and *Ipomoea violacea*.

A few weeks later, in his letter dated 21 May 1962, to Mrs. Arthur Gudwin (Wendy Doniger), Wasson (1962b) welcomed her agreement to "engage in certain Sanskrit studies on my behalf," and revealed the general thrust of his research: "With as complete a knowledge of the hallucinogenic plants of Mexico as anyone has had, I believe that a way is open to me, in collaboration with a Sanskrit scholar, to study the *soma* problem as it has not been studied before. What we need to do is examine all the texts where *soma* is mentioned for botanical information about the plant. (To reveal my ignorance, I do not even know whether *soma* is exclusively a drink or also the plant from which the drink is made!) I have no reason to think *soma* came from a mushroom, although this possibility should not be ruled out a priori. I seem to recall from long ago having heard that the plant was a climber or creeper."

Psilocybe (Stropharia) cubensis

In a letter he wrote to his friend Robert Graves on 5 June 1962, Wasson (1962c) expanded his theory to include a compelling new twist:

Whenever I go sluggish I say to myself, "What would Robert Graves say (or do) now?"

Have I discussed the *soma* problem with you? So far as I have yet learned, no one has even a suggestion as to what the plant was. Later, when it became scarce and finally non-existent in India, and when it was sought in distant lands where it was not consumed by the people of the locality, other plants more clearly defined in the writings were substituted for it. Apparently there is a free field for investigators like myself. One of the hallucinogenic mushrooms of Mexico is *Stropharia cubensis* Earle. It grows only in bovine dung. It grows all year 'round. As in pre-Columbian Mexico there was no bos [cattle], it must necessarily have come with the Spaniards. The Mazatecs of Huautla as a matter of fact call it el honguillo de San Isidro Labrador, having no Mazatec word for it. The *Stropharia* genus is closely related to the genus *Psilocybe*. It was probably introduced by the galleons of the Spaniards from Southeast Asia where it is common, — in Siam, Indo-China, the Philippines, where it is not eaten, the lands of the cow. Now mark! I suggest that the cow is sacred in India because their excrement carried the sacred mushroom, the mushroom of the Rig-veda hymns, of the Zend-Avesta. Unlike other mushrooms such as the cep and the rovelló, gathering the *Stropharia cubensis* from cowpads, if done diligently in response to a voracious demand, would (I think) wipe the species out, since it can only be spread by the dissemination of the mature spores. (Mushrooms like the cep live underground in the mycelium.) *Stropharia cubensis*, amazingly, has never been reported by mycologists as occurring in India, a country ideally adapted to it. I suggest that man exterminated it a few thousand years ago, in his quest for *soma*. Every cowpad was diligently sought out and watched, and the mushroom gathered fresh, before it dried up and before the spores flew away. This species has also certain toxic effects, not fatal, but causing vomiting and diarrhea in some people. The sacred Indic texts report these gastro-intestinal effects from *soma*.

Soon thereafter, in an interesting letter from Wasson (1962d) to Wendy Gudwin (Doniger) dated 20 June 1962, he not only introduced *A. muscaria* to their project but also clearly showed it was a passage from the Mahabharata, not the Rig Veda, that first suggested to him a relation between urine and soma, and that Doniger pointed it out to him eight months before he read her aforementioned précis on the Rig Veda:

... Our talk on Saturday was most exciting for me, especially your casual mentioning of the episode in the Mahabharata (is that the correct spelling?) of Indra offering his urine to the gathering that was looking for *soma*, and when they rejected it his telling them that that was *soma*.

How could I have foreseen such an episode and warned you to be on the lookout for it? ... Prompted by the episode in the Mahabharata, I now suggest that you keep your ears attuned to trees that are particularly sacred, with *soma* possibly linked to them. The *soma* is not derived from the trees, but [is] in some way associated with them. In particular, the birch tree and the conifers are relevant: the *Amanita muscaria* of the Paleosiberian tribesmen grows adjacent to these and only these. There is a symbiotic relationship between the birch (or conifer) and the mushroom. These trees do not grow in the Indian plain but at an altitude; in Siberia they grow at sea level. ... If our findings should (against all probability) prove that *soma* was a mushroom or a morning glory or a mint, this finding would be sensational.

In another letter sent that day, to Graves, Wasson (1962e) further detailed his theory that *Psilocybe (Stropharia) cubensis* had been adopted by the Hindus as a post-Vedic surrogate for soma, a possibility he claimed to have been "toying with ... for a long time, — since before we saw each other ... in London last year."

[T]he Aryan composers of the Rig-Veda hymns, especially Book IX, composed them in their original homeland in the mountains, c. 3000 B.C., where *soma* grew. Later, down in the Indian plains, they did not find *soma* there and various substitutes were used. In the time of the Zend-Avesta *haoma* had become a mere cliché, like nectar or ambrosia in our conversation today, its identity being wholly unknown. The original *soma* of the highlands remains to be discovered. It may have been the fly-*amanita*, or perhaps a convolvulus (morning-glory in the USA), or a mint, or something else, whose leaves and stems and seed carried the sacred indole. The Brahmins in India discovered the virtue of *Str. cubensis* and made use of it instead of the original *soma*, and called it by the same name.

Str. cubensis grows only in hot countries. I understand that there have been good mycologists studying the fungal life of India. Why have they never reported *Str. cubensis*? With its restricted habitat, its prevalence all year round, its large size and beauty, this failure to be mentioned in the mycological literature calls for an explanation. I once asked Professor Heim how the spores found the cowpad, — whether a stage in the alimentary canal of the cow was necessary. He thought the spores traveled on the breezes until they found their home, but he did not know. If they must pass through the digestive system of the cow, then the supply of *soma* might become the monopoly of Brahman priests, who could control the cows having access to the spores. Like the ginkgo [sic] tree in China and that other tree of the Indians of the upper Amazon,

it would be a species owing its survival to cultivation by a priestly caste.

Surely the Sacred Cow of India has a different inspiration and origin from the sacred Bulls of the Near East and Egean [sic]. In the case of the Bull it was the massive brute strength of the creature, I should think, as manifested in the fights depicted on the Cretan pottery. If we are on the right track, we solve in part the question of the sacred cows of India. They did not come from the highlands, with the Aryans. The first sacred cows must have been in India. Whether the Aryans discovered the properties of the mushrooms and thus originated the holy quality of the cow, or whether the native Indians knew the property of *Str. cubensis*, would remain a question.

The following day, 21 June 1962, Wasson (1962f) wrote a letter containing three questions to his friend and sometime collaborator, mycologist Roger Heim:

1. Is it clear, as I remember your telling me, that *Stropharia cubensis* is reported from many parts of Southeast Asia but not from India? This mushroom always grows on bovine dung, does it not?
2. *Str. cubensis* is seriously toxic^[4] to a degree that is not shared by our *Psilocybe* spp. Has the toxic element in *Str. venenata* Imai been identified?
3. How are the spores carried to the bovine dung? By the breezes? Or must they pass through the digestive tract of a bovine mammal, — a cow, or buffalo, or yak? Or has this question never before been asked or carefully studied? Is the mycelium of this species confined to the excrement?

In his response dated 13 July 1962, Heim (1962) replied in French (here translated) that:

1. *Stropharia cubensis* exists in Thailand, Cambodia and Vietnam. There is no sure indication that it exists in India. It always grows on bovine dung. . . .
2. *Stropharia cubensis* certainly does have a somewhat noxious effect, in addition to its psychoactive power. . . . The poisonous effects of *Stropharia venenata* are unquestionably greater, since it leads to lethal poisoning. . . .
3. The spores of *Stropharia cubensis* germinate very easily; they are carried by the wind. I do not think that going through the stomach of ruminants can be considered necessary for the propagation of this species. Of course, the mycelium lives in dried dung, but like the great majority of stercoral species, reproduction is normally by direct germination. . . .

Subsequently, Wasson appears to have abandoned further efforts to investigate *Psilocybe* (*Stropharia*) *cubensis* or other psilocybin mushrooms as candidates for soma. He may have concluded that human "voracious demand" for *S. cubensis*, however intense, would not have been sufficient to explain its complete disappearance from India. More certain is that Wasson was increasingly convinced that "second form" psychoactivity in urine was a requisite for any soma candidate, thereby ruling out *S. cubensis*. His attention turned instead to research efforts aimed at confirming and finding the chemical basis of *A. muscaria*'s psychoactivity, both in the mushroom and in urine passed

by mammals, not just humans, who have eaten it. For example, Wasson (1975) asked for a progress report from a German research chemist who was trying to develop a technique for determining the presence and quantity of ibotenic acid and muscimole in *A. muscaria*, adding: "I am delighted to know that a goat will soon know the bliss of eating this mushroom and will look forward to learning the results." The goat was induced to ingest a large amount (150 mg) of ibotenic acid, but its urine, when collected and processed, showed no signs of either ibotenic acid or muscimole, leading the researcher to conclude that ibotenic acid in the goat had been transformed into other, unknown compounds. On another occasion, as reported by Schultes (1990:17), "Gordon wrote to a scientific colleague in Sweden requesting him to carry out an experiment: feed *Amanita muscaria* to a reindeer in the Stockholm zoo, collect urine from the animal and examine it for muscimole to see if, as in humans, it passes through the deer's body and is excreted unmetabolised. The colleague was not so enthusiastic as Gordon, and the experiment was never done!"

Claviceps purpurea

Wasson's final alternative candidate for soma was *Claviceps purpurea*, a fungal parasite of rye, barley and wheat that the English call ergot. LSD had been discovered in the 1940s when Hofmann extracted it from ergot's alkaloidal component, ergonovine. In their book *The Road to Eleusis*, Wasson, Hofmann and Ruck (1978) proposed that the ancient Greek Mystery Rites of Eleusis involved a sacramental brew that included ergonovine from ergot of barley and which therefore was a potent hallucinogen. The theory led Wasson (1978a) to comment to Hofmann, in a letter dated 19 July 1978: "I foresee that our *Eleusis* may lead to a challenge of my identity for Soma in *SOMA: Divine Mushroom of Immortality*. The Aryans of the RigVeda cultivated both barley and wheat. The crucial test might well be this: when the dried sclerotia of *Claviceps purpurea* is rehydrated with water and poured out, as was the Aryans' practice, what is the color of the resulting fluid? Note picture of [the tawny yellow] *pávamaña* facing page 35 of my *SOMA*."

In a subsequent letter to Hofmann dated 4 November 1978, Wasson (1978b) affirmed that "the ergot possibility for Soma naturally occurred to me. This must be thoroughly explored. I have an open mind. There are difficulties in the elimination of *A. muscaria*. The color suggestions in the RgVeda are too numerous perhaps to be dismissed lightly." But the theory that soma was ergot posed another, familiar difficulty. According to McKenna (1992:135), "... so far as I am aware no one has subjected the Wasson-Hofmann theory to the acid test. That would mean the actual brewing of a superior hallucinogen from a cereal grain infected with some strain of ergot. Until this is done the

[Eleusis] theory remains nothing more than well-argued speculation. . . . As with Wasson's theory of the identity of Soma, the problem is to obtain a reliable intoxication from the assumed source of the intoxicant."

Hofmann (Wasson et al. 1978:30-31) did report "psychotropic, mood-changing, slightly hallucinogenic activity" from a self-administered 1.5 mg dose of ergobasin (the ergonovine base of a 2.0 mg dose of ergonovine hydrogenmaleinate), "the same amount as an effective dose of lysergic acid amide, the main constituent of *ololiuhqui*. Its potency is about one-twentieth of the potency of LSD and about five times that of psilocybin." But Wasson (1976) had earlier reported, in a letter to Hofmann dated 22 May 1976, that when he and a colleague ingested almost identical doses (adjusted for body weight) they were "strongly affected psychically but were without hallucinations, visual or auditory, though . . . [the colleague] had the feeling that if his dose had been somewhat larger he would have hallucinated." Results of later tests by other researchers who ingested substantially higher, 10.0 mg doses of ergonovine (Bigwood, Ott & Neely 1979) and 2.0 mg doses of the more potent lysergic acid derivative methylegonovine (Ott & Neely 1980) were likewise disappointing. The latter concluded that both drugs, unlike LSD, evoke uncomfortable somatic effects, such as lassitude, that "supervene at doses insufficient to elicit profound entheogenic [hallucinogenic] effects."

Further empirical research on the psychoactive effects of *Claviceps purpurea* as well as *A. muscaria* thus seems warranted.

CONCLUSION

The next step in solving the soma enigma may be a rapprochement between proponents of conflicting theories. McKenna (1992) demonstrated this goal when he suggested that *Peganum harmala*, favored by Flattery and Schwartz, might have been used in combination with psilocybin mushrooms to synergize and enhance the effects of psilocybin when mushroom supplies ran low, after which *Peganum harmala* came to supplant the increasingly scarce mushrooms altogether. Likewise, as Wasson suggested in his letter to Graves, the psilocybin mushrooms may themselves have been a replacement for *A. muscaria*. McKenna (1992:118-120) proposed the following:

Whatever relationship the Indo-Europeans may have had to *Amanita [muscaria]* in their region of origin, it is most reasonable to suppose that the Vedas were written during the long centuries of their migration toward the Indian subcontinent. These were centuries during which the Indo-Europeans subjugated and assimilated the valley pastoralists whom they conquered. From their contact with these cultures, the Indo-Europeans for the first time encountered the miracle of Soma and the awesome power in psilocybin. . . .

As climatic conditions changed and as the Indo-Europeans

migrated further and further east, it is likely that the mild temperatures and grassland conditions required by *Stropharia cubensis* ceased to be available. Other mushrooms may have enjoyed use as Soma substitutes, and of these *Amanita muscaria* may have been preferred, because of its availability, its psychoactivity (however ambiguous), and its striking appearance.

Among "a number of possible problems with this theory," McKenna (1992:120) acknowledged primarily "the lack of confirmation of the presence in India of *Stropharia cubensis* or other psilocybin-containing mushrooms." But he predicted that "a careful search of the flora of India will reveal *Stropharia cubensis* as a common indigenous component of the biome of the subcontinent."

Perhaps more promising, because potentially more conclusive scientifically, would be an effort by paleobotanists to search geological strata dating back to Vedic times for mushroom spores or mycelia and especially fossilized cow dung infested with either or both of these. If it is found, as proposed by both Wasson and McKenna, that *Psilocybe (Stropharia) cubensis* was available to Vedic priests, their successors and/or their imitators among the lower castes, it may be that "voracious demand" and diligent harvesting (Wasson's theory) conspired with changing climatic conditions (McKenna's theory) to sharply curtail the distribution of the species, perhaps in combination with a cattle disease epidemic. Similar hybrid theories may help modify knowledge of Classical Greece, where scholars such as Ruck (1990) and Wohlberg (1990) see remnants of the original soma cult in the Mystery Rites of Eleusis and Dionysian rituals respectively.

NOTES

1. Francesco Festi, in a recent review of the literature (Festi & Bianchi 1991), concluded that muscimole's action is different from that of the indole hallucinogens, such as LSD and psilocybin, possibly because, in his opinion, its main effect is antagonistic to γ -aminobutyric acid (GABA), one of the principle neurotransmitter amino acids of the central nervous system (CNS). He attributes the ataxia, dizziness and other vestibular symptoms that are commonly reported for *A. muscaria* intoxication to GABA-mimetic action on cerebrovestibular pathways, and decreased motor activity and catalepsy to "the interface with the GABAergic control of dopaminergic (and probably also acetylcholinergic) neurons in the nigro-striato-pallidal complex." The mushroom's somewhat ambiguous psychoactivity he traces to muscimole's "ability to depress the rate of serotonergic raphe neurons." Noting that it has been demonstrated that "there is a picrotoxin-sensitive inhibition of these neurons after iontophoretic application of GABA," that "the afferent adrenergic pathways to the dorsal raphe are mediated by GABAergic interneurons," and that *A. muscaria*'s hallucinatory effects are reportedly sometimes stronger following

deep sleep induced by the mushroom, he concludes that the hallucinations may be due to "a greater inferential power when the CNS is in the sleeping biochemical-physiological states. In fact, because this is the natural background for 'endogenous' dreams, the state of sleep may produce an amplifying action on the effectiveness of this compound [muscimole]" (Festi's italics).

2. It should be noted that a similar objection might be raised about Flattery and Schwartz's (1989) soma theory. Conceding that *Peganum harmala* is not used as an intoxicant in modern Iran, and citing no significant reports of any person successfully using the plant for this purpose, they implicitly dismiss the need to try the drug themselves or to arrange for its use by another, trained observer because, in their opinion, the "subjective experiences of modern Westerners who would consume the drugs of harmel can have but limited relevance, in lack of a traditional context giving form and meaning to the experience" (p. 24). Their argument favoring *P. harmala* hinges on the fact that it contains the same psychoactive alkaloids (the β -carbolines harmine, harmaline and tetrahydroharmine) found in *Banisteriopsis caapi*, the hallucinogenic "vine of the soul" indigenous to northwestern South America. Tribal peoples of the Amazon ingest *B. caapi* as a snuff, chew its dried stem bark or, most often, combine it with other plants that seem to enhance its effects, in a brew called *ayahuasca*

or *yagé*. It would seem to be a logical expedient for Flattery and Schwartz to have prepared *P. harmala* in similar fashion and tested it in order to confirm their hypothesis. Instead, they assume that because the two plants have a similar chemical content, descriptions of *B. caapi*'s hallucinogenic effects are equally representative of *P. harmala*'s.

3. Though Wasson and McKenna both persist in calling this *Stropharia cubensis*, it was formally reclassified *Psilocybe cubensis* many years ago.

4. Since *Psilocybe (Stropharia) cubensis* is not poisonous except for being hallucinogenic, Wasson's reference here to serious toxicity and Heim's response acknowledging its "somewhat noxious" effect are confusing. Most likely, they were thinking of the fact that people sometimes experience nausea in early stages of hallucinogenic sessions using this mushroom.

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