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Origins of Psychedelia

Peter Webster

The Most Human Universal

The search for evidence that human tribes and societies throughout global history have used psychoactive plants for religious, shamanic, philosophical, and medical purposes has met with great success. Publications citing such evidence come from an entire spectrum, from drug-use oriented screeds to the most conservative of scientific journals. The ultra-respectable Scientific American Library Series counts among its handsome and lavishly illustrated volumes its *Plants, People, and Culture—The Science of Ethnobotany,* and devotes an entire chapter to plants that have been used for "Entering the Other World." A world map shows clearly just how universal psychoactive plant use has been, the historical locations of use of a dozen of the major plant species being shown across the globe.[1]

The science of anthropology has not always been at the forefront of such research, however, and still today some of the reigning paradigms of the discipline reveal a willful ignorance of the importance of psychoactive use in the evolution of human societies. Many examples could be cited, but one especially concerns us here: the still-ongoing "nature versus nurture" debate, which, as we will see, has allowed anthropologists to ignore psychoactive plant use as a mere curiosity, or worse, as a perversion or degeneration of a supposed original "drug-free" shamanism.

Anthropological paradigms of the twentieth century have vacillated between "nature" and "nurture" as the prime cause of human behavior: whether it is culture or genetic inheritance that influences behavior the most strongly. In some professional circles the proponents of "cultural relativism" had slowly gained ground to the point of flatly denying that anything like a universal "human nature" need be considered important for theories of human behavior. It was an attempt to relegate notions of human nature to the realm of "folk psychology," an attempt not alone among many other twentieth-century efforts to "clear the decks" and make of science something more precise and absolute, uncontaminated with certain negatively perceived characteristics of nineteenth-century science.

And then there arrived on the scene a revolutionary little book entitled *Human Universals*. Its author, the anthropologist Donald E. Brown, argues that not only do universals exist, but they "are important to any broad conception of the task of anthropology." Brown immediately takes the offensive to explain how anthropology had taken a wrong turn:

> [T]he study of universals has been effectively tabooed as an unintended consequence of assumptions that have predominated in anthropology (and other social sciences) throughout much of this century. From 1915 to 1934 American anthropologists established three fundamental principles about the nature of culture: that culture is a distinct kind of phenomenon that cannot be reduced to others (in particular, not to biology or psychology), that culture (rather than our physical nature) is the fundamental determinant of human behavior, and that culture is largely arbitrary. This combination of assumptions made universals anomalous and very likely to be rare; to admit or dwell upon their existence raised troubling questions about anthropology's fundamental assumptions. These assumptions also led many anthropologists to conclude or argue that anthropology should be narrowed from the study of humanity to the study of culture.[2]

While the final definition of a human universal may still be in a state of flux, Brown provides us with sufficient guidelines in his book so that we may apply the concept to our present endeavor. An

important point is that although a human universal may have its roots in human biology, it is above all social and cultural in nature, and not merely trivial and physiological as some had claimed. Brown's published list of universals is a thought-provoking list indeed, and includes a wide range of human behavioral characteristics. Some seem to be inherent in human nature and biology, while others are "cultural conventions that have come to have universal distribution." Of particular interest for us here is this one: "Mood- or consciousness-altering techniques and/or substances." Here, I shall claim that this is one of the most important, perhaps *the* most important and the *very first* of all human universals.

I should like to alter the definition of the universal a bit, however, to designate what must be its fundamental: it must be that the *seeking of non-ordinary states of consciousness* (NOSCs) is the universal, and methods to do so subsidiary to the seeking. The methods themselves may or may not be quite so universal, since they can be quite varied in time and place. Certain societies have—and others we don't know about *may* have—forgone or proscribed the use of psychoactive substances for various reasons, and/or employed alternatives for substance use such as meditation, breathing exercises, etc. Nevertheless, the use of psychoactives must remain at least a near-universal, since it is such a supremely effective way to alter consciousness. And psychoactive use must approach complete universality in the most ancient of societies where cultural organization was still in its early stages: in such early tribes and societies well-organized and often powerful priesthoods, the most likely source of psychoactive proscription or the imposition of substitute and even bogus methods for consciousness alteration, did not yet exist. Rudimentary shamanism was the norm for early man, and given the near-universal prevalence of psychoactive use in the shamanic tradition even today, it would be difficult to maintain that this does not reflect a universal practice for early man.

Donald Brown's establishment of the importance of human universals for anthropology logically extends into the realm of *paleo*-anthropology, and supports the idea that psychoactive plant use must go back to the very beginnings of human existence. The question naturally arises, then, whether—or, more importantly, *how*—the use of psychoactive plants might have played a role in the sudden appearance of modern man some time between 50 Ka and 150 Ka (thousand years ago). There really are only three hypotheses to consider: psychoactive use (1) played no role whatsoever, (2) accompanied and

perhaps assisted human emergence, and (3) was *necessary* for the evolution of humankind. The first hypothesis seems highly unlikely given the available evidence, and will probably only be adopted by those harboring a prejudicial antidrug bias. It need not be considered here.

There exists an important precedent for thinking that the seeking of NOSCs is a human universal, and that is the intentional psychoactive drug use of a wide range of animals. Georgio Samorini, in his book *Animals and Psychedelics*, presents evidence that

> entirely on their own and without the influence of captivity or conditioning—wild animals, birds, and even insects do indeed drug themselves. This deliberate seeking of inebriation among all classes of animals is a perfectly natural, normative behaviour. Indeed, the pursuit of inebriation has been proposed as a kind of fourth drive—akin to hunger, thirst, and sex, so ubiquitous is its manifestation.[3]

The evidence shows that although animals intoxicating themselves is a feature prevalent, but scattered throughout all levels of the animal world, it is not a universal in any given species or group of species. Yet it is common enough to conclude that it must be evidential of a general instinctive characteristic that humankind's predecessors would very probably have shared with the rest of the animal kingdom. The seeking of NOSCs becomes a universal, however, only with the advent of human existence. This was probably due to the co-existence of complex language as a means to make psychoactive use more than just an instinctive desire, occasionally realized, and to bring it into the cultural norms of the first manifestations of shamanism.

My reasons for making the second of these claims above, that the seeking of NOSCs was the *very first* human universal will become clear during the remainder of this chapter. I will argue that not only does the universal and the accompanying necessary psychoactive substance use pervade the earliest of human tribes, but that it was the first human universal, since without this catalyst proto-human social groups would have remained in that prehuman stasis that had already existed in East Africa for one hundred thousand years or more. During this long gestation, our not-yet-human predecessors were physically mature yet psychologically yet-to-be-born. Proto-man had exactly the same physical and neurological equipment we have today, yet his

transition to early man did not take place. Then suddenly, one summer . . . or perhaps it was winter, as I shall explain.

What Makyth a Man?

It has long been the accepted wisdom among many scientists, as well as the common mythology of public perception, that the rise of tool making—*technology*—was an important, if not defining characteristic of the evolutionary process connecting advanced apes to Early Man. Specifically, it has long been hypothesized that Darwinian selection for increasingly intelligent hominids came about through selection for the best abilities to make and use tools. In the extreme, at least before recent studies of tool use and especially tool *making* in some animal species, the technology of tools was thought to be a primary defining characteristic separating *Homo sapiens* from the animal kingdom. Also among extremities of interpretation has been the idea that tool making and early technology might even have been the force driving the extraordinarily rapid increase in the size of the primate brain, from the first hominids of two or three million years ago with a brain volume of about four hundred cubic centimeters, to modern man with a brain volume more than three times this figure.

It is understandably important to science to explain this evolution in brain size, for it has often been noted that, on an evolutionary timescale, the rapidity of the change was practically unprecedented. Since the middle Pleistocene, about a half-million years ago, the rate of increase was particularly rapid, so much so that it has even been suggested that the enlargement might actually have been somewhat pathological, leading to a being whose irrationality and capability for wanton destructiveness equals or excels his creativity. Certainly, recent history has featured a wealth of both capabilities, but blaming our present situation on purported faults of evolution is neither productive nor scientifically logical.

It now appears that the tool-making hypotheses also have resulted less from a careful analysis of the data than from superficial concurrence of two tendencies. Recent work now shows it extremely likely that the ability to produce technology—it has been called *object-intelligence*, for want of a better term—has been a development that has "piggybacked" upon a much more important development

in intelligence, that which is required for *social transaction*. A recent collection of the important papers providing the foundation for the theory of *Machiavellian Intelligence* has been published as a book,[4] and one quotation should suffice to illustrate that even anthropologists such as Thomas Wynn, who might be surmised to have a vested interest in the importance of tool use and making in the development of early hominids, has wholeheartedly agreed with the new view:

> Given the evidence of brain evolution and the archaeological evidence of technological evolution, I think it fair to eliminate from consideration the simple scenario in which ability to make better and better tools selected for human intelligence. At almost no point in hominid evolution was there even a provocative correlation. The earliest known hominids, *Australopithecus afarensis*, had a brain larger than an ape's of equivalent size, but as far as we know, no greater reliance on tools. Early *Homo* at 2 Ma [million years ago] had a much more "encephalized" brain, but the tools and even the context of use were not beyond the capacity of modern apes. *Homo erectus* did possess technology that was outside the range of ape behaviour, but by this time, 1.5 Ma, much of the encephalization of the *Homo* line had already occurred. In sum, most of the evolution of the human brain, the presumed anatomy of intelligence, had occurred prior to any evidence for technological sophistication and, as a consequence, it appears unlikely that technology itself played a central role in the evolution of this impressive human ability.[5]

As one of the contributors to the book remarked, Wynn's paper "is a bombshell to the older 'Tools makyth Man' view. . . . Wynn throws the question of the cause of human brain size back into the realm of the invisible: either the social relationships or the lifestyle which produced technology, not the technology itself."[6]

The conclusions of the *Machiavellian Intelligence* hypothesis provide a key to the most probable evolutionary scenario for the influence of psychoactive plants in the emergence of modern humans. The arguments of the hypothesis show that the complexity of cognitive operations required for social interaction in large groups of individuals is far greater than that required for tool use or making,

or for that matter any other activity of primate species.[7] Studies of societies of monkeys and apes in both natural and controlled environments strongly support the theoretical arguments. The brain size of various species of modern primates, for example, has been closely correlated with the size and complexity of the social groups of the various species studied. The complexity of social interaction would increase geometrically with the number of possible interrelations between animals in a group consisting of three or more generations of relatively long-lived animals. Dominance relationships, alliances, group undertakings such as efficient foraging and hunting, lengthy childhood, and relatively constant possibility of mating activity add to the complexity. The demands of increasing social complexity was a development requiring far faster biological evolution of the equipment that facilitated it than any previous set of demands such as tool use and manufacture, climate change, interactions with other species, or other hypothesized evolutionary pressures. Thus, it is reasonable that the rapid increase in brain size among primates requires no other explanation, despite its unprecedented speed. The social transaction conclusions of the *Machiavellian Intelligence* hypothesis show how an advanced ape evolved to the point of having the required physical equipment to become artists, philosophers, musicians, and scientists, but as we shall see, proto-man, even with all this physical equipment, remained in a prehuman stasis for an extremely long period, changing little if any during the entire time. A further influence, sudden and catalytic, was necessary.

Evolutionary Scenario

Giving credit where it is certainly due, it is necessary here to mention that Terence McKenna has also presented a hypothesis parallel with mine concerning the necessary contribution of psychoactive use to human emergence.[8] We had discussed the idea in an exchange of letters before publication of his book, but it seemed to me even then that his proposed scenario put the critical influence of psychoactives in a far-too-distant time frame. In addition, his proposals that psychedelics were "mutation-causing" agents that "directly influenced the rapid reorganization of the brain's information-processing capacities" seemed to me unsupported by any significant lines of evidence. The *Machiavellian Intelligence* hypothesis had not yet been published,

however, nor had the genetic research that showed the ancestry of the entire human race to be very recent, and it was these two developments which provided me with a time frame and psychological mechanism to support my own "psychedelic awakening" scenario. It remains now to show at what period an intervention of psychedelic influence is most likely in consideration of several areas of knowledge about fossils, human genetics, climate changes and catastrophic events, and other sources of information. The *necessity* for a "psychedelic intervention" has been discussed elsewhere,[9] and will be summarized below.

Before presenting a possible evolutionary scenario, however, let me explore further the idea of social complexity and its relation to the "habit routine model" of normal cognitive operation I have proposed.[10] I state that the power of the habit routine cognitive system would have increased with the increasing complexity of animal species, and would have reached its summit in proto-man. In our proto-human ancestor we have a being whose potential intellectual capability extends to inventing mathematics and hypothesizing philosophy, yet for at least one hundred thousand years, with the identical equipment we possess today, we did no such thing. Our mental powers for original, creative, analytical thinking which are a natural product of that same intelligence that evolved for social transaction, were held in check by powerful instinctive forces—except perhaps for use in extreme emergencies, after which we would immediately revert to our habit-routine governed existence. The very requirements that brought our high-powered brain into existence—those necessary for complex social interaction—needed to be radically channeled to exclusive, habit-routine governed social use in normal times so that *social coherence* would be maintained, so that individuals in a social group used their powers in the established interests of the group, and so that *group selection* would further advance the evolution of advanced hominids. According to authors Elliot Sober and David Sloan Wilson, this was the essential situation for the evolution of unselfish or altruistic behavior.[11]

The *Machiavellian Intelligence* hypothesis, and its proposed increasing social complexity, fits perfectly with my surmise. Increased social complexity and the evolution of a large, expensive to support nervous system go hand in hand with extreme reliance on habit routine generation as the primary cognitive mechanism controlling behavior. One major consideration is that a large brain requires an excellent and copious diet, a requirement that would be fulfilled best

in a social group able to cooperate on the highest levels to procure and share a wide variety of nutritious foods. An ability to avoid toxic plants as well would depend on complex social relationships, as I will show in a moment.

It might be said that all these requirements would be an argument *against* the use of psychedelic agents in such social groups, an argument with which I entirely agree! The increasing social complexity and food requirements are arguments for the increasing power of ingrained and necessary habit routines that would prevent any cognitive breakthrough to using the new brain for purposes other than the maintenance of social order and group prosperity. Experimentation with new foods, such as psychedelic plants, would not in normal circumstances have been a common, or even likely occurrence. Any individual who developed a taste for consciousness alteration using psychoactive plants would likely be seen as disruptive and deviant, and be shunned or expelled from the social group. Such was the substance of Andrew Weil's dismissal of McKenna's "wild speculation" in *Food of the Gods,* expressed at the first Tucson conference on consciousness.[12]

Two quotations concerning the diet and food sources for primates will illustrate the point, the first quotation concerning the necessity for a rich and complex diet, the second on the ways this is fulfilled while yet preventing exposure to toxic (or presumably psychedelic) items:

> Monkeys and apes have to balance their diet, which they do by wide ranging and yet selective eating; this is nicely illustrated by a study of Sri Lankan monkeys, *Macaca sinica,* by Marcel Hladik. By careful observation and quantification of their feeding, and phytochemical analysis of their food plants, he was able to show that for these "frugivorous" monkeys, fruit was always more abundant than they could ever need. However, the monkeys had large day ranges and occupied a home range too large for efficient defense as a territory. Why? Their ranging was apparently a consequence of a need to eat fungi, rotten wood, insects, bark, shoots—a whole range of items that allowed them to make up the protein, vitamin, and mineral deficiencies of the energy-rich ripe fruit (Hladik 1975). The need for a balanced diet forces many primates to eat items that are

> hard to find. In studying baboon ecology, I was continually amazed at the subtle cues that they must use to identify some of their plant foods; at the most harsh time of year, the main survival foods were all either underground, or tiny and inconspicuous.[13]
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> Mother primates of several species pull their infants away from novel objects (two species of macaque), or remove foods from infants if the food is not part of the diet (chimpanzee). Caro and Hauser suggest that the latter might be "accidental," but having seen it happen in gorillas, I doubt this (Anne Russon, who has noted the same in orang-utans, shares my scepticism). An infant gorilla was fiddling with and chewing at a leaf (of a species not normally eaten), facing away from the mother who was eating herself, when the mother broke off her feeding, reached over the infant's head and took the leaf, dropping it well out of the infant's reach. In the case of a chimpanzee watched by Mariko Hiraiwa-Hasegawa (1986), the mother not only did the same, but systematically picked every other leaf of the same species in the infant's reach and placed her foot firmly on the pile of leaves! But in any of these cases, the function is unclear: does the behaviour serve to teach, or simply to remove infants from danger?[14]

It has been proposed that the dietary requirements of animals with complex nervous systems was itself a factor in the evolution of hominid intelligence, the increasing need for a high-quality diet selecting for advances in intelligence and larger brains, which itself would demand further dietary improvements.[15] This must certainly be the case, but I think that the methods used by advancing species to procure better and better diets are themselves aspects of social behavior, and thus fall under the hypotheses of *Machiavellian Intelligence*. It was only through the advancing complexity of social life that the dietary requirements could be met, either for the actual procurement and sharing of foodstuffs or for the transmission of the knowledge of how to obtain them, and how to avoid serious errors such as ingesting toxic items.

Psychedelic influence on *H. erectus* and even more remote human predecessors is, of course, possible, as McKenna's model suggests, but I believe it was unlikely, and if so, unimportant to either

social or neurological evolution. Certainly, evidence is very sparse indeed, and there are important counterarguments to be considered: For example, *H. erectus* lived on three continents in various habitats and through several periods of disruptive climatic change for a period of one or two million years, yet remained in a relatively unchanging state, with few signs of significant cultural or technological innovation. This is certainly a sign of normal, slow evolution, not psychedelically assisted evolution. By contrast, the culture of early Greece, with psychedelic influence,[16] advanced dramatically from a quite primitive state to an advanced civilization in the space of a thousand years or so. In addition, the progression from *Australopithecus* to *erectus* to *sapiens* involved many different anatomical developments, not only brain size and reorganizations, but speech-enabling changes to the larynx,[17] even an enlargement of nerve canals in the spine suggested as facilitating the precise diaphragm control needed for speech,[18] and many other anatomical changes. This is certainly an argument for slow gradual evolution, not psychedelically enabled or "psychedelic-mutagenic" evolution as suggested by McKenna.

From the preceding arguments concerning social stability, we may thus surmise that the influence of psychedelics on our immediate ancestors must have also involved some other simultaneous and important changes or events that helped to suppress the described tendencies to greater and greater dependence on habit routine as the primary determinant of normal behavior. Some unusual change must have occurred to allow and ensure that psychedelic use would occur on a significant scale and would rapidly and irreversibly transform the habits of the hominid group that became the first group of modern humans.

It is necessary to point out, however, that the very brain changes that facilitated social evolution and a powerful habit routine cognitive system would be the same changes that would make an eventual psychedelic intervention most effective; a greatly expanded cortex, allowing retention and access to long-lasting and complex memory data used for habit routine search and selection, would also be critical to eventually implement creativity and original thinking that was far more than random trial and error, creativity that could intentionally produce wide-ranging positive results. We would not expect attempts at individual creativity by a small-brained animal to result in much more than increased risk for that animal. A greatly expanded portion of the cortex involved with "association processing," allowing

the assembly of habit routines of a multisensory and intentional complexity, would also facilitate highly effective creativity. And a greatly expanded frontal cortex, the seat of working memory and other advanced cognitive abilities, facilitating habit routine based upon simultaneous nested levels of intentionality, would likewise be instrumental to a being requiring the frequent use of improvisation in situations that involved simultaneous trains of logical operations. The same nervous system improvements that enable advanced habit routine generation and use also provide for psychedelically enlightened operation that is productive and creative, and not just hazardous to an animal. Here we have an additional argument against the influence of psychedelic agents at an early, small-brained stage of hominid evolution: psychedelics would not have "worked" on hominids with limited brain capabilities.

One further argument will suffice to eliminate from consideration an early psychedelic influence on hominid evolution. The role of language in hominid development has been another hotly debated topic. It is my contention that the psychedelic state of consciousness would have been of little or no creative value for an individual, and would have provided no evolutionary breakthrough for a social group that did not already have the benefit of complex language abilities. (I mentioned this above, as a reason why consciousness alteration only became a universal with the advent of human social existence.) Psychedelic use and its effects are most valuable as a cumulative and social phenomenon. The psychedelic experience must not only be individually integrated but socially integrated as well, if it is to provide a key to rapid cultural advance as happened, for example, in ancient Greece (see Note 16). There must arise a "psychedelic culture," which is transmitted and developed from one generation to the next, and through which shamanism can arise and prosper. Without symbolic language, it is difficult to see how such a process might happen. Once a fairly complex language ability had evolved, however, we may imagine that psychedelic experience would have provided an impetus for further important language development into abilities concerned with the expression of the abstract, the mythical, the artistic . . . language capable of elaborating and transmitting *tradition and ritual*, a hallmark of culture.

Whereas written language is a cultural phenomenon, which must be taught (a child who is not taught to read and write will certainly not pick up the ability spontaneously), spoken language *is* assimilated spontaneously. Spoken language is a *biologically inherent*

feature of the human brain, a realization that became apparent to the linguist Noam Chomsky several decades ago. Steven Pinker, a former student of Chomsky, has made several conclusions concerning language and its evolution which are pertinent to a hypothesis of the time period in which psychedelic influence might have played a role in human evolution.[19] On the strength of much recent research, Pinker concludes that the first anatomically modern humans *already* spoke the equivalent of modern human language. Since language is intrinsic to the brain structures that produce and interpret it, language must have co-evolved with those structures, and have been fully realized with the advent of the brain with which it co-evolved. Spoken language was therefore not "invented" at a late stage of that evolution, (although reading and writing most certainly were). Since language is inherently a social phenomenon, this proposed co-evolution of brain and language fits nicely with the *Machiavellian Intelligence* hypothesis of brain advances being driven by social requirements, including the advancement of language capability.

Pinker notes, therefore, that "language did not first appear in the Upper Paleolithic beginning about 30,000 years ago, contrary to claims frequently seen in archaeological . . . and popular science treatments."[20] The idea that psychedelics would not have "worked" on our small-brained forbears such as *Australopithecus* is supported by the proposed necessity of the existence of complex language as a precursor for the beneficial influence of psychedelics, and considerably narrows the time frame in which such influence must have played its role. Using conclusions from linguistics and brain evolution, we see that such a time frame should extend from about 150 Ka to 50 Ka (thousand years ago). I shall further narrow this window of opportunity for psychedelic influence in my arguments to follow. The important conclusion which has just been developed is that psychoactive plants in the environment cannot have played any significant role in either the early development of language, nor in the parallel development and tripling in size of the hominid brain during the period from about 3 Ma to the appearance of anatomically modern humans about 150 Ka.

Genetics to the Rescue

The suggestion of an evolutionary scenario for human development attempts to establish an actual series of events in history, even if the period will for the most part remain a *prehistoric* one. Considering

the very fragmentary evidence in the fossil record, and the indirect nature of other modern evidence to be described below, the chance for error in proposing the story of how Early Man made his way out of Eden is humbling. As we have seen above, the first theory of psychedelic evolution, that of McKenna, has suffered terminally from a dose of counterargument all too easily supplied by the critics. Much of McKenna's book remains admirable, however; for instance, his presentation of evidence indicating the probable importance of psychedelic plants for the very early tribal societies that lived on the Tassili Plateau of southern Algeria, or Çatal Hüyük in central Anatolia. These are examples, along with ancient Greece and the Eleusinian Mysteries, which illustrate the rapid flowering of culture possible in societies in which there is strong, if not incontrovertible evidence of psychedelic use. The importance of psychedelics for early man certainly suggests an important evolutionary influence as well. The trick is to deduce, using a wide variety of ancient and modern evidence, when and where, and why, that evolutionary influence might have taken place. Let me start by considering some modern reinterpretations of the fossil evidence which have recently received overwhelming support from one of science's most recent and fascinating developments, molecular genetics.

Chris Stringer, who is today the head of the Human Origins Group of the Natural History Museum in London, recounts a most interesting tale of scientific discovery in his recent book, *African Exodus*, co-authored by the science writer Robin McKie. It is the kind of story that has epitomized the romance and excitement of scientific discovery and revolution as perceived by the lay public, stories such as the Curies' discovery of radium or Galileo's road to revolutionary views of the heavens. But not only is the story of these recent discoveries concerning human origins of interest to the general public, it represents a Kuhnian scientific revolution[21] of important scope, comparable to the recent revolution in geology with the advent of the discovery of plate tectonics, or even the revolution in physics earlier in the twentieth century.

The first chapters of *African Exodus* are concerned with a close examination of the archaeological "bones and stones," in which Dr. Stringer shows how the Multiregional Hypothesis[22] of human evolution, the predominant model for most of the last century, has just recently been discredited in favor of an Out-of-Africa (actually, an Out-of-Africa II)[23] model. A new mathematical technique, multivari-

ate analysis, used by Dr. Stringer during his several years of work on the fossils, led him to doubt the validity of the multiregional theory early on in his career. But only a small minority of paleoanthropologists were ready to listen to new analyses of fossil characteristics that called into question the status quo of their profession, for many great scientists of the past decades had analyzed these same fossils and there was wide consensus that a multiregional scenario was the correct one. The upheavals and conflicts typical of a newly born scientific revolution ensued. A revolutionary new idea proposed by a small group of scientists, at first rejected as absurd by the establishment, soon began to topple that establishment. Chris Stringer and Robin McKie introduce the book:

> For the past few years, a small group of scientists has been accumulating evidence that has revolutionised our awareness of ourselves, and our animal origins. They have shown that we belong to a young species, which rose like a phoenix from a crisis which threatened its very survival, and then conquered the world in a few millennia. The story is an intriguing and mysterious one, and it challenges many basic assumptions we have about ourselves. . . . It is a remarkable, and highly controversial narrative that has generated headlines round the world and which has been the subject of a sustained programme of vilification by scientists who have spent their lives committed to the opposing view that we have an ancient, million-year-old ancestry. The debate, which reverberates in museums, universities and learned institutions across the world, is one of the most bitter in the history of science.[24]

What finally broke the dam of resistance to the new ideas was the entry upon the scene of revolutionary new techniques from a field that had previously played no role whatever in paleoanthropology, molecular genetics. Until very recently, the possibility that we might learn something about the evolution of our distant ancestors by studying the genetic makeup of living humans was hardly even suspected, and of course the techniques for doing so completely unknown. But all this changed rapidly as the science of molecular genetics grew from its infancy in the 1960s to the powerful tool it is today. The use of genetic analysis for understanding evolution, the science of *molecular*

anthropology, also had its beginning the 1960s, with the pioneering work of Allan Wilson (later to be a key player in the confirmation of the Out-of-Africa scenario) and Vincent Sarich. It was their early work that began to topple many sacred cows of paleoanthropology, the first to fall being the idea that apes and humans had diverged very early, between fifteen and thirty Ma. By comparing protein structures of modern apes and man, Wilson and Sarich concluded that the separation could have been no earlier than 5 Ma. "We were variously ignored, abused and scorned," recalls Sarich. But it was the first of many venerable precepts of paleoanthropology that was to fall to the new techniques of genetic analysis. The research of Wilson and the many others who followed came along at precisely the right time to resoundingly confirm the early work of Stringer.

Stringer and McKie mention in their introduction above that our species "rose like a phoenix from a crisis which threatened its very survival," and propose later on in the book the occurrence of a population bottleneck sometime about 100 to 150 Ka. The possibility of such a bottleneck has also drawn criticism from defenders of the orthodoxy, yet again the genetic evidence has come to the forefront to support the proposal.

The genetic evidence in question was not at first concerned with the DNA of the cell nuclei, which are found in every cell of the body and are responsible for control of the growing embryo and inheritance of physical traits, but DNA contained the *mitochondria* of these same cells. These small structures within animal cells act like metabolic power-packs, enabling the biochemical reactions which provide the cell with energy. That these structures contain their own DNA, entirely different from nuclear DNA, is something of a curiosity, and has led to speculation that very early on in evolution, mitochondria might have been a separate organism that developed a symbiotic relationship with primitive single-celled life forms to enable the evolution of the first true single-celled animals. Whatever their evolutionary story, the mitochondria and their independently organized DNA strands have provided an important key for the understanding of hominid evolution. Two specific characteristics of mtDNA (mitochondrial DNA) figure importantly: Firstly, mtDNA is transmitted only through the female lineage, since the mitochondria of sperm reside in the cell's extranuclear protoplasm, and do not enter the egg at fertilization. Thus, mtDNA provides a powerful tool for

tracing genealogies in animals and reconstructing recent evolutionary trees. Secondly, mtDNA has a relatively high and constant rate of random mutation which is conveniently analyzed, thus constituting a "molecular clock" providing genetic markers for accurately tracing migration and fissioning in human societies. A recent paper by Rebecca L. Cann, an early associate of Allan C. Wilson, explains more fully the peculiarities of mtDNA which result in its being such a powerful tool for the study of evolution. Concerning the bottleneck hypothesis resulting from mtDNA studies she recounts:

> When I began my study of mtDNA in the late 1970s with Dr. Allan C. Wilson, one of his postdoctoral fellows, Dr. Wesley Brown, was writing up his work on a study of 21 human mtDNAs. Dr. Brown had discovered that using restriction fragment length polymorphisms (RFLPs), humans as a species looked "different" to other mammals. He found that in comparison to two chimpanzees, or two gorillas, or two orang-utans, or two gibbons, or even two pocket gophers, humans had only one-half to one-fifth of the intraspecific variability seen in our closest primate relatives and other genetically well-characterized mammals. In 1980, Brown proposed that the level of variability sampled in his study was consistent with the derivation of the human mitochondrial sequence from a single female about 200,000 years ago. This was the origin of the bottle-neck hypothesis and mitochondrial "Eve."[25]

The mitochondrial "Eve" hypothesis naturally made big headlines, was featured on the cover of such magazines as *Time* and *Newsweek,* and also quite naturally was journalistically exaggerated out of all proportion to the original claims. A concerted attack by the multiregionalist "old guard" also helped to make the new idea sound a bit absurd, both to the public and to scientists in other fields not yet acquainted with the genetic evidence. All the criticisms have been adequately countered however, and the findings confirmed by newer and more complete studies, including studies on the nuclear DNA. Rebecca Cann was careful to explain, in the above quoted paper, the intended interpretation of the hypothesis concerning the possible number of individuals existing at the time of the proposed bottleneck.

Since mtDNA is passed on only through the female lineage, the existence of a mitochondrial "Eve" does not imply that our *nuclear DNA* is also descended from a single individual, nor that at one point the human lineage was reduced to a single, or mere handful of individuals (the "Biblical Eve" scenario!) Recent estimates of the number of individuals existing at the time of the bottleneck, including that of Chris Stringer, puts the number at perhaps ten thousand.[26] It may be argued that a population of ten thousand individuals is not what one could call a genetic bottleneck, yet the sum of the genetic evidence indicates that "there were at least 100,000 adult archaic forebears of our Africa ancestors about 200,000 years ago."[27] Thus, a decrease to ten thousand individuals is certainly a "population crash" indicative of important events in the early evolution of modern man.

As for the date of the lifetime of "mitochondrial Eve," there have been various estimates between the extremes of about 60 to 400 Ka based on several different methods of mtDNA analysis. Some best estimates put the life of mitochondrial Eve at about 130 to 140 Ka, "the date of origin of modern humans."[28] The uncertainties in these several estimates may be narrowed by considering data from other fields of study, and from a view of the overall evolutionary scenario that emerges upon consideration of all the information at our disposal, including my own hypotheses of the influence of psychedelics on the overall process. Using all these sources, a reasonably constrained sequence of events with fairly accurate dates becomes possible.

The Trigger Event

In looking at the combined evidence from new interpretations of the "stones and bones" (Chris Stringer's findings), the genetic evidence (now far more convincing than just a few years ago), and other pieces of the puzzle, Stringer and other workers have come to the conclusion that there must have been some kind of unusual event, some catalyst, some kind of "trigger," which set in motion the very rapid rise of human culture and civilization which began a mere few moments ago on an evolutionary scale.[29] The strong evidence for a population bottleneck, during which time individuals existed who were our sole ancestors, and the ensuing rapid migration and rapid rise of human culture in every corner of the earth, has led these workers to ask a

central and important question for which they have not yet formulated an answer. Stringer and McKie write:

> It was one of the critical events in mankind's convoluted route to evolutionary success. The nature of the trigger of this great social upheaval is still hotly debated, but remains a mystery at the heart of our "progress" as a species. Was it a biological, mental or social event that sent our species rushing pell-mell towards world domination? Was it the advent of symbolic language, the appearance of the nuclear family as the basic element of human social structure, or a fundamental change in the workings of the brain? Whatever the nature of the change, it has a lot to answer for. It transformed us from minor bit players in a zoological soap opera into evolutionary superstars, with all the attendant dangers of vanity, hubris and indifference to the fate of others that such an analogy carries with it.[30]

Reading this paragraph in *African Exodus* when it was first published, I realized I had been for several years working on ideas that constituted the very answer sought by this recent revolution in thinking about human evolution. It was a falling into place of pieces of a puzzle which justified so much earlier "wild speculation," a realization that practically by accident I had found a key that many others were actively searching for which would enable the opening of a door to an important future in understanding.

Rebecca Cann writes,

> We often wonder if language played a part of the process, and that our ancestors all had some new mutations which allowed them to spread, at the expense of the other indigenous peoples. [Results of genetic research] suggest the spread of our ancestors was rapid, with little mixing.[31]

Although language certainly played a part in the process, as I have already discussed, the identity of the trigger, the origin of the population bottleneck, the reason behind man's migration to the ends of the earth, the factor enabling the rapid rise of culture independently in all these regions, the factor behind the ability of the new homi-

nids to outcompete all former races of archaic man, the secret of the birth of the human race, may all be intimately related to one and the same phenomenon: the advent of socially relevant psychoactive plant use by a regionally isolated group of proto-humans somewhere in Africa. Such use might then have spread with the spread of the descendants of this core group of individuals, mimicking a population bottleneck in that psychoactive use and the advantages it provided were closely guarded secrets not evident or available to "competing tribes." As I stated previously, if a member of a competing tribe were to use the new medicine, it would only serve to isolate him from his own group. Psychoactive use could then have been at once the reason for an apparent but not necessarily absolute bottleneck, and also the trigger, the key that enabled this original group to expand and prosper by virtue of the cognitive advantages provided by the cumulative effects of psychoactive use. These advantages, I remind the reader, concern a new and powerful ability to suspend a mode of existence entirely governed by habit routine. The advanced ape that was our predecessor necessarily had, as I have stated above, the most complete, one might say irrevocable dependence on habit routine of any animal yet evolved, a dependence entirely precluding the use of the most advanced nervous system ever evolved for creative purposes.

Climate Change

But what of that other facilitating factor I mentioned before, the one that would allow psychedelic use to become important and not just an infrequent and disorienting event for single individuals who might then be expelled from their group? Some environmental or social situation must have resulted in the frequent use of psychedelics by a significant proportion of the core group, and psychedelic use must then have rapidly become part and parcel of the social structure of the group. There are several possibilities. Here another body of research information on climate change becomes important, for during the proposed period between 60 Ka and 200 Ka, drastic climatic changes were occurring on a timescale certain to disrupt all life on the planet, especially those advanced forms of life so dependent on social complexity and a diversified diet.

In view of the best estimates for the time slot for the population bottleneck and mitochondrial Eve (about 133 Ka),[32] a particular peri-

od of climatic history stands out: the Eemian interglacial period. During the Eemian, warm, wet, and tropical conditions extended much farther north than at present. The fossil evidence shows that hippopotamuses browsed along the banks of the Thames and the Rhine, while lions and elephants roamed the forests of southern England. Until recently, the Eemian interglacial period was thought to have been a stable climatic period lasting from about 130 Ka to 114 Ka, when the beginning of the last ice age commenced. Climatic information has been obtained from such methods as analysis of ocean sediment cores, pollen cores from terrestrial sources, and ice cores drilled in such locations as Antarctica and Greenland. A recent ice core analysis from Greenland however, has given us a radically new view of the Eemain climatic era, indicating that it was not a period of stability but rather one of wild climatic oscillations:

> The early part of the Eemian was dominated by several oscillations between warm and cool stages. The temperature dropped by as much as 10 degrees, sometimes within as short a time as ten to thirty years. Some cold spells lasted a few decades, while others lasted several hundred years. After 8000 years of fluctuating conditions, the climate settled into a period of stable warmth lasting some 2000 years. This warm period ended abruptly . . . when the temperature in Greenland dropped about 14 °C within ten years.[33]

Such a period as the early Eemain seems to provide exactly the kind of opportunities for the disruption and crisis conditions for groups of human predecessors that would lead to the discovery of psychedelic use. Several times there must have been abrupt changes in habitability of various regions, with changes in flora and fauna and resulting dietary pressures, food shortages, the encroachment of and conflict with neighboring tribes, the possible occurrence of new diseases and a resulting search for medicinal remedies promoting population movements, in essence, frequent turmoil. If modern chimpanzees have the need to roam far and wide to procure their necessary diet including "fungi, rotten wood, insects, bark, shoots," we may safely assume that proto-man had similar if not even greater exigencies. If uprooted from a home ground, or if rapid climate change forced him to experiment with new foods, an opportunity for the social discovery and use of psychedelic plants becomes important.

In the case of edible fungi today, for example, it is well known that many, if not the majority of cases of poisoning result when individuals or groups, newly arrived in an area, see and consume a mushroom that they had always safely consumed in their previous home region. Many mushrooms look nearly identical, and some fungi species are known to be safe in one region, yet toxic in another. A changing climate might well alter a fungal species, changing its visible characteristics or production of metabolites. Some recent work has shown that fungi tend to proliferate at far greater rates in a tropical, CO_2 rich climate, as must have existed during the Eemian.[34] In these facts we see a possible, if not probable mechanism whereby a group of our ancestors might have discovered the use of a psychedelic mushroom or other plant, in which the discovery involved the use of that plant by the entire group, and for an extended period of time. The likelihood of widespread existence of unfamiliar and unusual species of alkaloid-containing plants is, of course, much higher in the tropical and humid, and fluctuating, conditions of the Eemian, rather than during the dry, cold, and barren ice age conditions that preceded it. And the dates of the climatic disruptions of the early Eemian that might have led to such a discovery match nicely the mtDNA evidence of a population bottleneck.

The Eemian might well have been the period of mankind's first important exposure to psychedelic drugs, for by 90 Ka we see the appearance of sophisticated bone harpoons and knives in what is now Zaire, a level of technology that was not seen in Europe until fifty thousand years later.[35] But we should not expect that the initial psychedelic exposure would have led to rapid cultural change as we would today define it. Evidence from studies of "primitive" yet ecologically stable and wise tribal societies indicates that psychedelic use and the associated rise of shamanism does not automatically propel a society toward building automobiles and atom bombs, but, rather, preferentially enables another kind of creativity involving tradition, stability, and equilibrium. Some of the oldest of tribal societies, those that have been discovered in New Guinea, or in the backwaters of the Amazon basin, or the vast tundra of the Siberian wilderness, all have a long tradition of psychedelically influenced shamanism, and have remained stable for many thousands of years. If we should look at such a society and call it "primitive," their practices being seen as "backward" and "ignorant," how much more so may such a stable and ecological society view the all-too-obvious happenings and extrapo-

lations of twentieth-century "Civilization"? Our view today of what constitutes "progress" and "civilized living" has practically nothing in common with the views of hundreds, even thousands of societies that have come before, and lasted far longer than our recent experiment in "progress." With a little luck, the remnants of an isolated tribe or two may well survive us.

A psychedelically enlightened society does not at all produce rampant technological change, just for the sake of change. They do not fly to the moon just because it is there, or to impress and propagandize tribal members with their supposed superiority over a rival tribe in some cold war scenario. A psychedelically enabled society does, however, make rapid advances of a creative nature in response to real challenges such as climate change, the necessity to emigrate to new regions, the avoidance of disease and a search for new medicines (chimpanzees and even elephants have been shown to intentionally search out and consume effective medicinals as required). But in periods of climatic and resource stability the psychedelically enabled society also exhibits an ecological stability: it has the power and intelligence to make creative changes as it pleases, and chooses consciously to remain in equilibrium with nature. What could be more illustrative of wisdom than this? In times of stability, psychedelically enabled tribes produce myth, art, they use their creative powers to elaborate tradition, the hallmark of culture; they do not spend their time in petty schemes to conquer nature, or exploit reality, or develop "backward" regions. Perhaps the long-term lesson that is taught by the psychedelic experience is that the human animal, having evolved slowly over millions of years, is ill-equipped to handle sudden large advances in technology, which have historically resulted very reliably in mass production of weapons, ecological destruction, genocide, waste, and the collapse of civilizations. Surely there is a better use for creativity than this.

The point here is to give a better view of what a psychedelically enabled tribe, at the advent of the human race, might do with its powers of creativity. If our original African ancestors began the use of psychedelic agents as the first step toward an organized shamanism, only our modern illusions of what constitutes "progress" would predict that such a society, if truly a society of *man,* would rapidly invent and amass technology. A broader view would predict that what would be amassed by the true *Homo sapiens* would be techniques of living exhibiting a consciously designed harmony and ecology, leading

to long-lasting modes of tribal life changing only slowly with time. Psychedelically enlightened tribes would optimally remain stable for millennia. To restate: creativity in such a group would involve the creation and preservation of myth and ritual, the gradual perfection of a style of living, the elaboration of tradition, not a headlong rush into exploitation of "resources" and a supposed domination of nature.

Thus, our originally psychedelically enlightened ancestors, the first humans, would have spread slowly and surely from their original home, perhaps in East Africa, and carried with them such traditions of stability and longevity. Only severe challenges to their survival and continuation would result in their use of the creative power to make radical changes in their technology and lifestyle. Before long, even a slow migration would have brought descendants of the original core group into the Middle East, as evidenced by fossils of modern humans in Israel dated at 100 Ka.[36] We must remember that climatic changes after the end of the Eemian, although following a general tendency toward the next ice age, continued to include occasional but abrupt reversals, as is shown by the recent Greenland ice core studies. Migration was likely, therefore, to have been a sporadic happening, as certain habitats and food sources changed. Considering these tribes' penchant for stability, intentional migration, just for the sake of migration, was unlikely. The spread of our ancestors would therefore have been slow and occasional, initiated by the occasional climatic upheavals and other environmental challenges such as volcanic eruption, changing food supplies, occurrence and avoidance of diseases, and perhaps the search for new medicines and psychedelic plants. We know from anthropological studies how important are the recommendations of the shamans for decisions taken by tribal elders, and it is thus possible that shamans also greatly influenced decisions of our early ancestors concerning their movements. The shamans' use and search for psychedelic plants may well have initiated some early migrations.

It is necessary to understand the above described tendencies that would naturally follow our original psychedelic enlightenment to see why modern culture as we know it did not get underway for more than sixty thousand years. Tradition and stability reigned for many thousands of years while a slow migration brought human ancestors to Europe, Asia, and finally the Americas. But the flowering of modern culture did not really get underway until forty thousand years ago, when art and body ornamentation, sophisticated bone tools, built

hearths and structured living spaces, open site "religious" burials, storage pits and social storage, quarries, the long distance exchange of raw materials, long-term occupation of harsh environments, and signs of complex forward planning made a wide appearance as evidenced in the archaeological record.[37] This apparently sudden appearance of the roots of the modern age, in which the beginnings of modern technology can be seen, is the phenomenon that has challenged anthropologists the most. If anatomically and cognitively modern humans began their specieshood in Africa 130 Ka, why did it take so long for the modern trend to get underway? And importantly, what was the catalyst that precipitated this event so suddenly? Like all history, the answers to such questions, even if they could be known, must necessarily be very complex, a story that can be told in a multitude of ways that might seem contradictory. Consider the myriad ways that even recent history can be written.

But some scholars have proposed that the sudden flowering of the modern age beginning about 40 Ka might actually have been more gradual, and sporadic. Such ideas fit in with the above observations on the likely characteristics of psychedelically enlightened societies. The appearance of the previously mentioned bone harpoons in Zaire, and other scattered evidence may well indicate that local tribes made advances in technology in fits and starts, in response to novel challenges, and then returned to long periods of stability. The appearance of cave art seems today from modern discoveries to be rather abrupt, yet the quality of such art would indicate a long tradition of artistic endeavor. Certainly, the artists of the Lascaux and Cosquer caves were no amateurs; thousands of years of tradition no doubt led up to their remarkable artistic abilities. New discoveries of even more ancient sites are bound to indicate that the first "artists" did not suddenly appear around forty thousand years ago, but that artistic expression was a slowly maturing phenomenon of very long duration indeed, going back to the Eemian perhaps.

The psychedelic model of evolution of culture therefore agrees that some recent interpretations of evidence indicating a "sudden flowering" of culture beginning about 40 Ka is too drastic. Alison Brooks, an archeologist who with John Yellen made the important finds in Zaire, states:

> A closer scrutiny of the archeological record leads one to inquire, Just how abrupt *was* the behavioral transition

> in Europe? I believe that the gulf between the Middle Paleolithic and the Upper Paleolithic has been artificially widened by de-emphasizing the very real evidence of cultural complexity in the former and overstressing the achievement of early modern humans, who, in Europe, did not achieve all of the behaviors usually cited as part of the Upper Paleolithic "revolution" until the very end of the Pleistocene [near ten thousand years ago].[38]

One final surmise about the trigger events that may have continued to push Early Man along the road to modern civilization will bring this chapter to a close. If, according to my theory, there was a gradual evolution of culture during the seventy thousand years between the Eemian and the period in which the beginnings of modern culture are deemed to have begun forty thousand years ago, then we might look for the rapid, yet sporadic and geographically independent advances in culture and technology to coincide with known instances of rapid climatic change, with instances of severe volcanic activity or other known or to-be-discovered radical environmental influences during the period. It will certainly be interesting to compare further detailed analyses of the new Greenland ice cores to known and future archeological discoveries in an attempt to correlate cultural change with environmental disruption. Perhaps there will never be enough evidence to write history about such prehistoric times, but intriguing clues and parallel developments may well appear that will at least allow the writing of a probable scenario.

The question of how geographically isolated groups of modern men all developed astounding cultural and technological advances, and how at least two dozen different regional societies of men experienced along with such changes a dramatic increase in population, has been a puzzle for many archaeologists, linguists, anthropologists, and other workers. In the words of Chris Stringer and Robin McKie,

> It is an extraordinary catalogue of achievements that seem to have come about virtually from nowhere—though obviously they did have a source. The question is: what was it? Did we bring the seeds of this mental revolution with us when we began our African Exodus, though its effects were so subtle they took another 50,000 years to accumulate before snowballing into a cultural and technological

> avalanche that now threatens to engulf *Homo sapiens*? Or did that final change occur later, and was it therefore more profound, and much speedier in its effects?[39]

I believe the answer is neither of these, or rather a combination of the two: the seeds of the revolution were indeed carried by *Homo sapiens* from his birthplace in Africa, but they were seeds that needed periodic stimulation to grow vigorously. As I have argued, psychedelic wisdom does not of itself propel societies to produce a "technological avalanche" nor should we believe that "technological avalanches" are inherently good. Psychedelic wisdom, rather, leads to ecology, stability, and longevity. But when novel and severe challenges present themselves to psychedelically enabled societies, they are able to react intelligently and with foresight and complex long-range planning. This is perhaps the most important difference between the true *Homo sapiens* and his animal forebears.

The Long Winter

Thus, the periodic and now well-established abrupt climatic upheavals of the post-Eemian world became the catalyst which successively and cumulatively forced tribes of men living in many isolated areas of the globe to use their Godlike powers of creativity to advance technology in the interests of survival and stability. An ice age was approaching, with fits and starts, and global climatic change was frequent and severe. If the cognitive seeds existed, dormant in the sense of not automatically producing technological change at a rate we moderns believe essential to our species, and these seeds existed in all the societies of men around the globe, the fact of climatic change being a global phenomenon would explain how these seeds flowered, or were forced to grow independently in all these regions.

During the post-Eemian period, changes in the earth's orbit were responsible for the climatic disruption and slow onset of a new ice age. But such orbital changes have sometimes been hypothesized as the catalyst for increased volcanic activity as well. Whatever the cause, at least one extremely severe volcanic eruption occurred during the period leading up to that famous starting date for the beginning of modern technology and, in line with my proposals, may have been a major event pushing tribal societies around the world toward

radical changes in the effort to survive. Stringer and McKie tell of the eruption:

> The Earth was gripped by continuing climatic mayhem as changes in its orbit began inexorably to push down the world's thermostat. Then to add to these woes, about 74,000 years ago, Mount Toba on the island of Sumatra exploded in the largest volcanic eruption of the past 450 million years. The blast was 4,000 times more powerful than that of Mount St Helens and would have sent more than 1,000 cubic kilometres of dust and ash into the atmosphere, plunging the earth into years-long volcanic winters. Summer temperatures could have dropped by as much as twelve degrees centigrade, while forests shrank, deserts spread, and in eastern Asia, a prolonged winter monsoon would have swept clouds of dust from inland deserts round the globe. . . . Having evolved in warm Savannah sun we nearly perished, huddled in cold dismal misery as volcanic plumes straddled the earth.[40]

Examination of some recent charts of sea levels and estimated prevailing temperatures reveals that this event seems to have brought on the most severe period of the last ice age. The post-Eemian climate between 115 Ka to 75 Ka is now known to be more changeable, the Greenland ice core data showing several abrupt reversals, yet the same data show that after a significant warming period peaking about 75 Ka to 80 Ka, a severe decline then led into the very coldest period of the ice age. The whole of the post-Eemian climatic turmoil may well have been the partner to those original African seeds of modern culture, which required such periodic stimulation to grow. The volcanic eruption might have been one of the most important instances driving societies to improvise and find technological solutions in order to survive. The aftermath of the Mount Toba event would have disrupted flora and fauna worldwide, it would have caused food shortages, driven intentional and planned migration in search of resources, brought about wide experimentation with new foods and medicinal plants, and perhaps even led to the appearance of new or altered species of psychedelic plants such as the fungi that might have proliferated in the wake of widespread forest death and an abundance of decaying vegetation. *Psilocybe cyanescens*, for example, usually a

fairly rare species, thrives in decaying woody debris and in colder climes. It is also one of the more powerful *Psilocybe* species.

Since all the previous climatic changes of the Eemian were fairly gradual, taking at a minimum several years to develop, it becomes difficult to choose a specific one as a candidate for the "trigger" event leading to social psychoactive use. But in the Toba eruption and succeeding volcanic winter, we have an extremely abrupt event that surely caused the kinds of disruption required to change habits overnight. Thus, the Toba eruption, although occurring a bit late for other parts of the argument here, might well have been the initial trigger event. This possible scenario does tie in with some further important evidence, however.

Ethiopia

If the Toba eruption is to be our catalytic event, looking for a geographical location where that first psychedelically enabled tribe might have evolved would lead us to the Abyssinian highlands of Ethiopia, a possible area of refuge and retreat for our original ancestors who were previously living in the Herto region, a lowland coastal region to the east. A recent BBC report places the earliest yet discovered anatomically modern humans there: a 160,000-year-old fossil find shows that modern, yet still *proto*-human beings existed there in a state of prehuman stasis for a very long time indeed. The Highlands to the west of the Herto were a place where they might have escaped the drought and starvation the Toba eruption must have produced. It is of course impossible to say what psychedelic plants might have existed there at the time, with the radical climate disruption ongoing.

It is certainly a difficult task to sift and weigh all these factors in the attempt to propose a concise scenario for psychedelic influence on early man. Two or more seemingly contradictory scenarios might well have happened simultaneously in different regions, or consecutively. The idea of psychedelic evolution is still too new, and much more work will have to take place with these new hypotheses in mind, trying to prove and disprove the many resulting implications before we can decide on a likely scenario. As I have said, this task is more than just the construction of a temporary model, it is an attempt to discover actual history and subject to real error.

8. The Bible.

9. L. Moraldi, (a cura di), *Testi gnostici* (Torino: UTET, 1982), 240. A translation also to be found at http://www.nag-hammadi.com/.

10. F. Gosso, "Coscienza e cartografie," *I Fogli di ORISS* 23 (2005): 82–92; or see J. Lacan, *Ecrits: The First Complete Edition in English* New York: W. W. Norton, 2007).

11. Per ciò che riguarda l'evoluzione del cristianesimo vedi: K. Deschner, *Storia criminale del Cristianesimo,* 9 Vol. (Milano: Ariele, 2003 e seg.).

12. F. Gosso and G. Camilla, *Allucinogeni e Cristianesimo. Evidenze nell'arte sacra* (Paderno Dugnano [MI]: Colibrì, 2007. See also Carl A. P. Ruck and Mark Alwin Hoffman, *The Effluents of Deity: Alchemy and Psychoactive Sacraments in Medieval and Renaissance Art* (Durham, NC: Carolina Academic Press, 2012).

13. G. Filoramo, "Il problema delle pietre sacre: alcuni itinerari simbolici," Benaco '85, in *La cultura figurativa rupestre dalla protostoria ai nostri giorni* (Torino: Antropologia Alpina, 1986), 25–36.

14. R. Gremmo, *Le grandi pietre magiche* (Biella: ELF, 1995).

15. A. M. Mercuri, C. A. Accorsi, and M. Bandini, "The Long History of Cannabis and Its Cultivation by the Romans in Central Italy, Shown by Polle: Records from Lago Albano and Lago di Nemi," *Vegetation History and Archaeobotany* 11, no. 4 (2002): 263–76.

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17. E. Bourguignon, *Religion, Altered States of Consciousness, and Social Change* (Columbus: Ohio State University Press, 1973).

18. G. Lapassade, *Dallo sciamano al raver* (Milano: Urra/Apogeo, 1997), 35.

19. "Prefazione,""Hanno visto migliaia di Dei . . . ," op.cit.

20. P. Webster, "Thomas Kuhn e la rivoluzione psichedelica," *Altrove* 13 (2007):123–37.

21. "Prefazione,""Hanno visto migliaia di Dei . . . " op.cit.

Chapter 4. Origins of Psychedelia

1. M. J. Balick and P. A. Cox, *Plants, People, and Culture—The Science of Ethnobotany* (New York: Scientific American Library, 1996), 156–57.

2. Donald E. Brown, *Human Universals* (Philadelphia: Temple University Press, 1991), 6.

3. G. Samorini, *Animals and Psychedelics—The Natural World and the Instinct to Alter Consciousness* (Rochester, VT: Park Street Press, 2002), from the foreword by Rob Montgomery. Originally published in Italian under the title *Animali che si drogano,* by Telesterion, Vicenza.

4. Richard W. Byrne and Andrew Whiten, *Machiavellian Intelligence* (Oxford: Clarendon Press, 1988.

5. T. Wynn, "Tools and the Evolution of Human Intelligence," ibid., 283.

6. A. Jolly, "The Evolution of Purpose" ibid., 373–74.

7. See for example the paper by Daniel C. Dennett, "The Intentional Stance in Theory and Practice" for an appreciation of the "levels of intentionality" necessary and implicit in social interaction, ibid., 180–202.

8. T. McKenna, *Food of the Gods* (New York: Bantam Books, 1992.

9. Manuscript in preparation.

10. Ibid. A "habit routine" in my analysis could be initially defined as a nested set of habitual-but-variable responses to a situation, physiological in some instances, as when an approaching tennis ball activates a largely automatic, prelearned and practised yet variable set of physical actions in a "return of volley." More importantly here are the habit routines concerning the thinking processes that are used to arrive at an evaluation and conclusion about a situation. Established ideas, conditioned attitudes, prejudices, etc., predominate and shape how we routinely and normally arrive at our view of a situation, and it requires a far more active, creative, intentional, and analytical effort on our part to come to a view that may be at odds with our habitual ways. Howard Margolis, a student of Thomas Kuhn, has written two admirable books concerning "habits of mind" and how they govern perception, judgment, and even scientific beliefs. See *Patterns, Thinking and Cognition* (1987) and *Paradigms and Barriers, How Habits of Mind Govern Scientific Beliefs* (1993), both University of Chicago Press.

11. Elliott Sober and David Sloan Wilson, *Unto Others* (Cambridge: Harvard University Press, 1998).

12. See Hameroff, Kaszniak, and Scott, eds., *Toward a Science of Consciousness* (Cambridge: MIT Press, 1996), 687.

13. R. Byrne, *The Thinking Ape* (Oxford: Oxford University Press, 1995), 178.

14. Ibid., 142.

15. Katherine Milton, "Foraging Behavior and the Evolution of Primate Intelligence," in *Machiavellian Intelligence,* 285–305.

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17. See for example C. Stringer and R. McKie, *African Exodus* (London: Jonathan Cape, 1996), 92–93.

18. J. Kingdon, *Self-Made Man* (New York: John Wiley and Sons, 1993), 97.

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20. Ibid., 271.

21. T. Kuhn, *The Structure of Scientific Revolutions* (Chicago: The University of Chicago Press, 1962, 1970).

22. The Multiregional Hypothesis posits that an early migration by *Homo erectus* from the African heartland to the Near East, Europe, Asia, Australia was followed by a long period of regional and parallel development, with some intermixing between regions, to produce *Homo sapiens* quasi-independently in the various regions. Under this scenario, racial differences, long thought to be far more significant than has recently been shown to be the case by genetic analysis, were supposedly evolved during this at least million-year period.

23. The first Out-of-Africa migration being that of *H. erectus* 1.5 to 2 Ma.

24. Stringer and McKie, *African Exodus*, from the Preface.

25. "Mitochondrial DNA and Human Evolution" in *Origins of the Human Brain*, 128.

26. *African Exodus,* 150.

27. Ibid.

28. R. Lewin, *The Origin of Modern Humans* (New York: Scientific American Library, 1993), 99.

29. See for example S. Wells, *The Journey of Man* (Princeton: Princeton University Press, 2002); and R. Klein, *The Human Career* (Chicago: The University of Chicago Press, 1989).

30. *African Exodus,* 5–6.

31. Ibid., 134.

32. See *The Origin of Modern Humans,* 99.

33. "Chill Warnings from Greenland," *New Scientist*, August 28, 1993, 29–33.

34. "Sneezing While the Earth Warms," *New Scientist*, August 24, 1996, 5.

35. *African Exodus,* 5.

36. See *African Exodus,* various index entries under "Qafzeh, Israel."

37. See the chart in C. Stringer and C. Gamble, *In Search of the Neanderthals* (London: Thames and Hudson, 1993), 198.

38. Quoted in Lewin, *The Origin of Modern Humans,* 128.

39. *African Exodus,* 186–87.

40. Ibid., 153. Stringer and McKie give the reference for the eruption as M. Rampino and S. Self, "Climate-Volcanism Feedback and the Toba Eruption of ca. 74,000 Years Ago," *Quatenary Research* 40 (1993): 269–80.