ZOMBIES



photos by Wade Davis

Clairvius Narcisse, the first well-documented zombie, in the graveyard where he was buried in 1962. Narcisse returned with a scar on his cheek that he claimed was caused by a nail driven into his coffin.

by Clair G. Wood

When Clairvius Narcisse entered the Albert Schweitzer Hospital in Port-au-Prince, Haiti, he appeared to be suffering from malnutrition, high fever, and aches throughout his body. His condition deteriorated rapidly as he developed respiratory problems, became unresponsive, and then slipped into a coma. Two days later, on May 2, 1962, he was declared dead by two attending physicians. His sister, Angelina, identified the body, and another sister, Marie Claire, authenticated the death certificate by placing her fingerprint on it. The next day Angelina, Marie Claire, and the rest of the family buried Clairvius in a small cemetery near their village of l'Estere. Here the saga of Clairvius Narcisse should have ended, but 18 years later, in 1980, a shuffling, vacant-eyed man approached Angelina in the village marketplace and identified himself as her brother, Clairvius. His family and many villagers recognized him immediately, and he told them a fantastic tale of being dug up from his grave, beaten to his senses, and led away to work as a slave on a remote sugar plantation. Though surprised, the villagers accepted his story because they believed that the power of voodoo magic made such things possible. It was clear to them that Clairvius Narcisse had been a member of the living dead—a zombie.

Folklore inspires fiction

Zombies have been portrayed in low-budget horror films as half-decayed creatures that claw their way out of the grave to prey upon the helpless living. Inspiration for the Hollywood zombies came from the island of Haiti where voodoo, properly called *vodoun*, is the primary religion. Vodoun is a combination of beliefs and social traditions distilled from many West African religions. Followers are governed, in part, by rules made by secret societies and by the threat that they could be made into zombies.

Are zombies real, or are they a dramatic bit of folklore? It fell to Wade Davis, a graduate student of ethnobotany (study of human use of plants) at Harvard University, to explore the world of Haitian secret societies to learn if the legend of the zombie has any basis in fact.

Davis went to Haiti at the request of Harvard biology professor Richard Schultes and psychiatrist Nathan Kline, director of Rockland State Research Institute, New York, who specialized in the effects of drugs on the mind. Kline, who had worked in Haiti for many years, was intrigued by the zombie legends and believed that perhaps they could be explained by some powerful substance that acted as a neurotoxin and hallucinogen. A Haitian colleague of Kline, psychiatrist Lamarque Douyon, interviewed Narcisse after he showed up in the village in 1980. Douyon was impressed that Narcisse could recite childhood nicknames and anecdotes that were known only to the family, and he told Kline that this could be what they were waiting for—a documented zombie case where the victim had been certified dead by two doctors!

Narcisse became a celebrity when the British Broadcasting Corporation (BBC) featured him in a television documentary. The BBC obtained an official copy of his death certificate and found more than 200 relatives and residents of l'Estere who were willing to swear that the man who returned in 1980 was truly Narcisse. The BBC also obtained a sample of "zombie powder," which, according to legend, was the key to turning a healthy man into a zombie. They sent the powder to Kline for testing, but it did not contain any known drug or toxin. Kline, however, was convinced that *real* zombie powder existed, and he asked Wade Davis to fly to Haiti, obtain a sample, and return it to the United States for analysis.

Before leaving for Haiti, Davis visited Harvard's Botanical Museum and



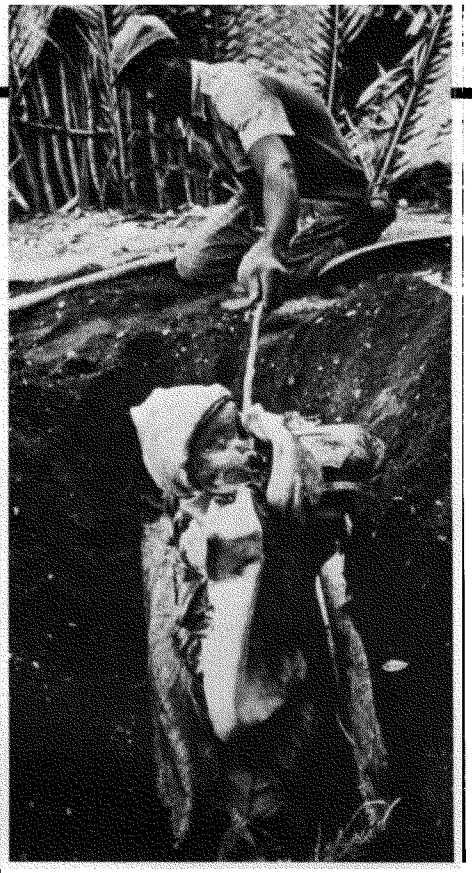
Poison makers prepare the zombie powder. The cotton in their nostrils and their clothing is for protection against the poison. Photo by Wade Davis

searched for plants whose toxic effects could induce a physical state that might be mistaken for death. One genus—datura—appeared particularly promising. The species *Datura stramonium* is known in North America as jimson weed, but in Haiti it is called "the zombie's cucumber." The use of datura seeds to poison or to induce trance-like states was well-documented in Africa, the ancestral home of the Haitians. Davis went to Haiti with the suspicion that datura might be the main ingredient in any zombie potion.

In Haiti, Davis met with Douyon, the psychiatrist who had examined Narcisse. They agreed that many of the symptoms described by Narcisse—disorientation, a sensation of floating outside the body, coldness, an inability to speak or move—could be associated with acute alkaloid poisoning from plants such as datura. But how could Davis find out for sure? Only by watching a vodoun priest prepare a sample of the powder. Douyon warned Davis that an outsider who was too curious about zombies placed himself in a precarious position.

Davis employed a high school student, Rachel Beauvoir, as interpreter. Rachel, a Haitian herself, understood Haitian beliefs, but she had lived in Massachusetts until age ten and planned to study anthropology in the United States.

The vodoun religion is a unqiue blend of West African beliefs with selected elements of Christianity. Followers see no contradiction in burying a person with the full rites of the Catholic church while believing that the person can be raised from death by the magic of a sorcerer called a *bokor*. Marcel Pierre was such a bokor, as well as a brothel keeper, and the BBC described him as "the incarnation of evil." After lengthy negotiations with Davis, Pierre agreed to prepare some zombie powder for Davis in exchange for a substantial sum of money. The sample contained powdered human skull, a brightly colored talc, and several species of leaves gathered from about the island. None of the plants



Exhuming the corpse of a child whose bones were used in a preparation of the zombie powder. Photo by Wade Davis

was particularly poisonous, and Davis soon concluded that he had been swindled. What should he do?

Confrontation

It might be possible for Davis to buy some real zombie powder from another bokor, but it was also possible that he would only succeed in gaining a reputation as a rich North American who could easily be conned. He decided that he couldn't let the deal with Pierre drop. Davis confronted Pierre and, in front of several of the women who worked for him, accused him of being a fraud. His pride at stake, Pierre gave Davis another sample of "zombie powder." Contemptuously, Davis opened the container and pretended to pour some of the brown powder into his palm, examine it, and return it to the bottle.

"You are a dead man," Pierre said.

"When will I die?" Davis asked. "Everyone must die sometime."

Outraged, Pierre brought out another bottle. "If you don't think I know how to make good poison, drink this," he challenged.

"It's not a question of whether you can make good poison," said Davis. "You've given me something that's useless, and you'll lose a lot of money if I end up with a bad preparation. Think about that—I'll be back in the morning."

The next morning Pierre took Davis into the temple and presented him with a bottle of liquid in which seeds, wood fragments, and other debris floated. Davis uncorked the bottle and took a drink. A moment later the silence in the temple was broken by laughter, first Pierre's, then Davis's. The foul-looking liquid had been a challenge. By drinking it, Davis proved that he was serious, that he would not be put off by tricks, and that he was willing to trust Pierre, despite his evil reputation. Pierre agreed to mix Davis another—authentic—batch of zombie powder.

Shortly thereafter, Davis and Rachel accompanied Pierre, two of his women, and a male assistant named Jean, on a midnight visit to a small village cemetery. They sought what Pierre claimed was the most important ingredient—human remains. They dug up the recently interred body of a young girl and removed pieces of the skull. Pierre took Davis to a deserted spot, along with a grill and the ingredients for the poison. He charred on the grill the bone fragments, the remains of two irridescent blue lizards, and a large toad. Davis recognized the toad as *Bufo marinus*, a highly toxic species common to Haiti. Next came leaves from two plants that Davis recognized; they were not toxic or hallucinogenic. Jean ground the charred bone and animals together in a large mortar while Pierre and the women chanted vodoun incantations. Then, when Davis saw the final ingredient, he suspected he was witnessing the preparation of *real* zombie powder. Jean added a common puffer fish. Datura, despite being called "the zombie's cucumber" by the Haitians, was not an ingredient in zombie powder. Davis would later learn its true role.

Davis sent a sample of Pierre's new powder to Professor Leon Roizin of the New York State Psychiatric Institute at Columbia Presbyterian College, New York; Roizin conducted some quick, preliminary tests. The

powder was applied to laboratory rats on a shaved section of their backs. The rats soon became comatose and moved only when strongly stimulated. After six hours they did not respond to stimulus and, by all appearances, were dead. However, when Roizin used electronic monitors, the EKG showed a faint heartbeat, and the EEG revealed the presence of brain waves. Davis pointed out that these were preliminary tests that should be repeated (with different samples, different doses, etc.) before drawing firm scientific conclusions, but the results indicated that the powder contained a *very* active ingredient.

Laurent Rivier, a plant chemist at the University of Lausanne, Switzerland, had the sample analyzed and confirmed that it contained *tetrodotoxin*, the well-known toxin of the puffer fish (see box, "Tetrodotoxin").

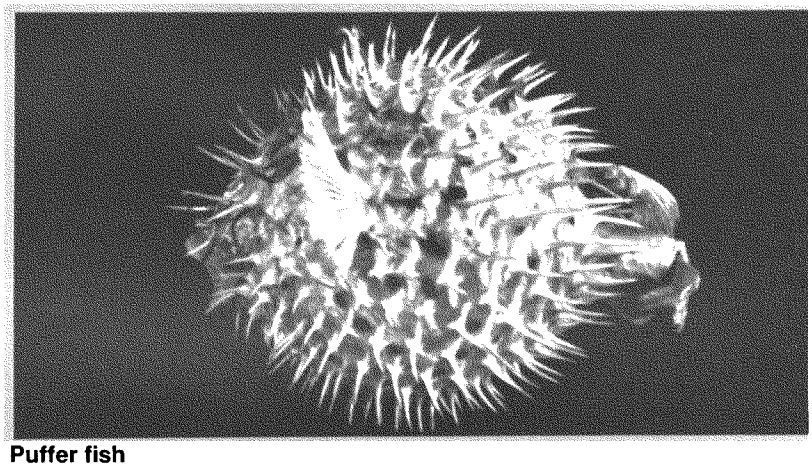
Dangerous delicacy

In Japan, where the flesh of the puffer fish is eaten as a delicacy, accidental ingestion of the liver or reproductive organs cause poisoning for which there is no known antidote. About 60% of these cases prove fatal, but the other victims recover completely without treatment. Many victims exhibit lowered body temperature, a drop in blood pressure to the point where there is no discernible pulse, paralysis, and a bluish-grey (cyanotic) cast to the skin due to lack of oxygen. These are symptoms of clinical death, so it is not surprising that Clairvius Narcisse, locked in the paralysis of tetrodotoxin poisoning, was declared dead by the attending physicians. In fact, Davis's later research uncovered a similar case from Japan. In Osaka, after the funeral of a victim of puffer poisoning, his body was placed in a ceremonial cart and was being

Tetrodotoxin

The liver and reproductive organs of the puffer fish contain tetrodotoxin, an extremely powerful nerve poison. Only 0.00000065 g of tetrodotoxin is required to kill an adult, making it about 1000 times more toxic than cyanide. The effects of tetrodotoxin are well documented in Japan, where the highly prized dish *fugu* is prepared from the raw flesh of the puffer fish. Chefs must be specially trained and licensed to prepare fugu. Even so, during the past 10 years, nearly 200 Japanese diners have paid the ultimate price to satisfy their craving for fugu. "It is a terrible death," reports one fugu devotee. "Even though you can think very clearly, your arms and legs become numb and you cannot sit up. You cannot speak, cannot move, and soon cannot breathe."

Japanese researchers have described three degrees of tetrodotoxin poisoning. The first is distinguished by a progressive numbing sensation and a loss of motor control akin to having the entire body "fall asleep." The second includes paralysis of the body, difficulty in breathing, cyanosis, and a precipitous drop in blood pressure.



Puffer fish

Meanwhile, the victim can see and hear what is going on around him, although he has no sense of touch. In the third and last degree, death is caused by acute respiratory failure.

If tetrodotoxin is ingested, the victim nearly always succumbs, but if it is applied to the skin, there is at least a 50–50 chance of recovery. However, it is not always necessary for the toxin to be ingested to be deadly. In 1967, an Australian soldier picked up a blue-ringed octopus that was tiny enough to crawl on the back of his hand. The creature bit him and, despite immediate medical aid, he developed respiratory distress, became paralyzed, and died.

A great deal of research has been done on the physiological effects of tetrodotoxin. It blocks the function of the axons (that part of the nerve cell through which electrical impulses are transmitted), making the voluntary muscles unusable. It also causes the smooth muscle of the vascular system to relax, leading to a fall in arterial blood pressure. A rapid drop in body temperature appears to be related to the toxin's action on the hypothalamus, the part of the brain that regulates temperature, ion and fluid balance, and certain hormonal secretions. The mechanisms by which these phenomena occur are not completely understood, but the toxins appear to work by blocking sodium ion transport channels in neurons and disrupting nerve voltage.

wheeled to a crematorium when he recovered, climbed out of the cart, and headed home—much to the consternation of the funeral attendants!

Worse than jail

Davis's investigation forced him to learn as much about Haitian culture as about poisonous toads and fish. In Haitian villages, zombies are part of a traditional system of social control that oversees individual behavior and dispenses justice. Being made a zombie is a punishment more severe than jail. From what he learned about Haitian secret societies, Davis was able to piece together what had probably happened to Narcisse.

Vodoun religion includes a strict set of rules of behavior, some of which Clairvious Narcisse had violated. It was widely known in the village that Narcisse had cheated other members of his family out of some land. Apparently one of these family members, some said a brother of Narcisse, reported this transgression to one of the secret societies that wield social power over the villagers. Narcisse later said that he was taken before a tribunal, judged, and condemned. The bokor no doubt prepared the zombie powder and arranged for it to be administered. Haitians believe that the powder works when merely brushed on the skin, and therefore can be administered without the victim's knowledge. According to legend, the powder can be smeared on the door step of the victim's house so he will absord it through the soles of his feet. Davis points out that all reliable reports show that the material must enter the blood directly, through a cut or abrasion, and it is therefore unlikely that it could be administered without the victim's knowledge.

Somehow, Narcisse received a dose of the zombie powder. He became ill, went to the hospital, became paralyzed, and "died." He later said that he was conscious throughout and heard himself pronounced dead. After burial, he was dug up, beaten "to prevent his spirit from reentering his body," and led away to a distant plantation. According to some accounts, zombies are fed a paste made from *datura stramonium*—the zombie's cucumber—that contains tropane alkaloids capable of inducing a psychotic state. Continued doses could keep a zombie confused and docile during his new life as a slave. In the case of Narcisse, the slave owner died after 18 years, and Narcisse regained his freedom by simply wandering away from the plantation.

Mind and molecules

Such a summary can be misleading. Davis believes that making a zombie is not just a matter of occult pharmacy. "Psychoactive drugs have a

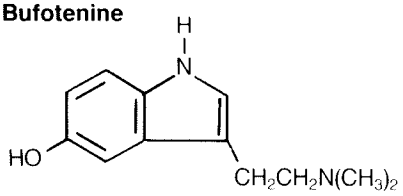
Bufotoxin

Dried toad skins were included in the zombie powder. The active ingredients in toad venom are *bufotenine* and *bufotoxin*, and these probably enhanced the effect of the primary toxin derived from the puffer fish. Both bufotenines and bufotoxins increase the contractive powers of weak heart muscle. In addition, the bufotenines have hallucinogenic properties that have been used in many different cultures. The Yoruba tribesmen of Nigeria rub toads on their foreheads to relieve pain and fatigue. The Maya also used toads, perhaps in hallucinatory religious rites. A large number of toad skeletons were found at a Maya site in Mexico dating to 1290 B.C.

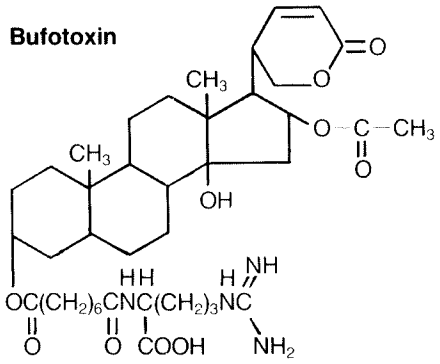
Anthropologist Timothy Knab once drank a potion brewed from the toad *Bufo marinus* and had terrifying hallucinations and could not move a muscle for six hours.

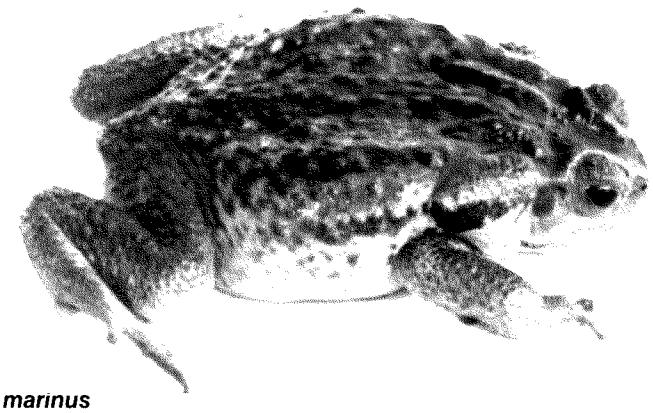
Ch'an'su, the dried venom of the common Chinese toad, has been used for the treatment of heart disease since 3500 B.C. The Chinese obtained the venom by frightening the animal and then scraping its defensive secretion from its skin. Ch'an'su reached Europe in the seventeenth century and was sold as a heart drug for two centuries until it was replaced by digitalis. It can be very risky to use bufotoxin as a drug, because as little as 0.022 g can kill a 180-lb person.

Bufotenine



Bufotoxin





Bufo marinus

completely ambivalent potential," he says. "In effect they serve only as a template on which cultural forces and beliefs can go to work. The Japanese victim, if he survives, can rationalize puffer fish poison within the mindset of his own culture. The Haitian peasant, who since childhood has believed in zombies, has another set of expectations. To him, a zombie is a complex process rooted in magical beliefs."

The biochemical effects of the toad and puffer toxins are strongly reinforced by the beliefs of the victim. Part of the bokor's power was that Narcisse *expected* to be punished and *knew* what would happen during the process of being converted to a zombie. When Davis asked Narcisse how he had been turned into a zombie, Narcisse said that "the bokor had not poisoned him but had taken his soul."

Stranger than fiction

Hollywood zombies—the ghoulish figures that come back from the grave to haunt the living—are fantastic but fictional. Davis set out to answer the question, "Are zombies real?" Some have said that his investigation, along with the work of Kline and Douyon, has established zombies as fact. Wade Davis describes his work in more scientific terms.

"Becoming a zombie is essentially a magical event and has a social reality in Haiti that continues to influence behavior. We're trying to see if there can be, at the basis of that belief, a physical reality that can explain the rare cases that pop up from time to time, including the case of Narcisse.

"I prefer to present this as a hypothesis. Known substances in this preparation not only can but have caused people to appear to be dead, even though they were still alive, and those people have recovered. It's either a coincidence that the tetrodotoxin and other substances are in the powder or it's not. I've gathered evidence to support the hypothesis that it's *not* a coincidence."

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References

"American Scientist Interviews Wade Davis." *American Scientist 1987,* 75, 412–17.

Davis, W. *The Serpent and the Rainbow:* Simon & Schuster: New York, 1985.

Davis, W. *Passage of Darkness: The Ethnobiology of the Haitian Zombie;* Univ. of North Carolina Press: Chapel Hill, N.C. In press.

Humm, H.J.; Lane, C.E., Eds., *Bioactive Compounds from the Sea;* Marcel Dekker: New York, 1974.

Martin, D.; Padilla, G. *Marine Pharmacognosy;* Academic: New York, 1973.

Ragelis, E.P., Ed., *Seafood Toxins;* American Chemical Society: Washington, D.C., 1984.

Testing for TTX

Wade Davis's hypothesis—that zombies are made with the aid of tetrodotoxin (TTX) and other potent compounds—is very difficult to test, but it is possible to check for the presence of TTX in the powder. Accordingly, samples of the powder were analyzed by Takeshy Yasumoto, at Tohoku University, Sendai, Japan, in cooperation with C. Y. Kao at the Health Science Center, Brooklyn, N.Y.; Michael Lazdunski, at the University of Nice, France; and Laurent Rivier, at the University of Lausanne, Switzerland. Their tests gave mixed results. In Japan, Yasumoto's initial tests (using high-pressure liquid chromatography and fluorescence techniques) were negative, but he later reported a minute amount of TTX in one sample (*Toxicon*, 1986, *24*[8], 747–49). In France, Lazdunski tested six samples (using a sensitive technique involving competitive displacement of radio-labeled TTX from its receptor in brain membranes) and found "TTX-like substances" in one. In Switzerland, Rivier and co-workers confirmed (by gas chromatography–mass spectrometry) the TTX in that sample. Rivier believes that all the tests were complicated by the fact that TTX is stable in neutral or mild acidic solutions but breaks down in basic solution, and some other, unknown ingredient in the sample becomes basic upon dissolving in water. Rivier added enough acetic acid as a "buffer" to counteract the basic ingredient when he extracted TTX. In Haiti, the powder is not dissolved in water but is applied to the victim's abraded skin and dissolves in the blood, which is naturally buffered. Davis points out that it is not *necessary* that every sample of powder contain TTX. If the victim does not succumb, the bokor can claim that he was saved by the timely intervention of a *houngan*, the benevolent vodoun priest. Davis says, "The creation of a zombie is a supernatural battle in which the warring factions invoke all the forces of white and black magic. The possibilities for rationalization are endless, and it is this dynamic that protects the belief system from falsification."

D.P.R.

Tetrodotoxin

