PLANT MAGIC: THE MEDICINE CABINET IS FULL OF IT

The sound of the little 36-horse power diesel motor echoed off the forest walls on either bank of the river like a roar, shattering the silence. Black caiman sunning themselves on the banks slipped beneath the muddy water to escape it; bands of monkeys shrieked as they fled from the sound into the forest. Pairs of macaws, their blue and red and gold feathers the brightest colors in all of Amazonia, squawked as they flew high overhead to get away. There was no need to flee. The crew.of the 42-foot converted fishing boat making it’s way up the Rio Yivari, the border between Peru and Brazil, was not after skins or pets or trophy feathers. They were there to search out the curanderos, the healers at the occasional indigenous villages that dotted the sparsely populated river over its 400-mile length to find out what plants they used to treat illnesses. When they arrived at a village—which were hours, sometimes a day apart—the crew’s 35-year-old botanist and medical doctor, Tom Carlson, would wait until the others, more familiar with the Yagua, and more often Matses and Mayoruna who lived on the river, had said hello and been welcomed. The indigenous didn’t get many visitors out there, and the sight of strangers would often bring everyone to the riverbank. Strange words were spoken: “Bi-ram-bo? Bu-chi bi-ram-bo?” Their sound, curt though it was, more frequently brought a positive response than a negative one, and when it did the little crew would disembark and make their way up the hill on which the villages were built—done that way to prevent flooding during high-water season when much of the Amazon is a vast floodplain. Dr. Carlson would follow, looking over the children who always stayed near, for signs of fungus or infection. That was his entrée for getting to speak with the village headman, who was generally also the curandero, or healer, there. He would point out the infirmity and indicate, through hand signals and rough translation done by one of the assistants, that he was a doctor and had medicine to cure it. The curanderos would often counter they, too, had a cure, and that they were already taking care of things. Dr. Carlson, obviously pleased, would then take out a book of photographs and ask the headman if he had cures for the diseases they depicted as well. The photos were gruesome but compelling: pictures of extreme cases of herpes of the mouth, of seeping skin lesions, of fungus that covered finger-and-toe nails; shingles, measles, mumps and a host of other disorders. While Carlson went through the photos, his assistant would take notes on the photos the headman was most positive on. Their aim was to find five or 10 disorders each headman was sure he had a remedy for, then to go out with him for the next day or two to collect the plant material used. Several branches and leaves of each were delicately pressed for herbarium specimens so that the species and variety could be identified back in the States; the part of the plant used in the cure would be collected in bulk and put in plastic jugs full of alcohol to extract the active ingredients—a process that would allow chemists back in the US to investigate them for pharmacological activity and possible pharmaceutical use. At some villages the curanderos had forgotten much of their traditional knowledge or simply didn’t recognize the symptoms in the photographs. At others, the curanderos were a veritable encyclopedia of plant medicines. The company Carlson worked for, Shaman Pharmaceuticals, was one of the most innovative and ambitious medicinal-plant investigational outfits to come out of the late 20th century’s surge of interest in ethnobotany—the study of cultures’ interaction with the local flora. Conceptually it was a dream: Backed by the biggest names in the field, including Harvard’s Richard Schultes, PhD, the modern Father of Ethnobotany, some of the brightest young botanists, ethnobotanists and chemists in the world and $200,000,000 of Eli Lilly’s funding, it was hoped that Shaman would be able to quickly find new plants that could be parlayed—either directly or through synthetics modeled after the plant alkaloids—into important pharmaceuticals. The methodology was innovative in that that rather than randomly collecting and screening plants for biological activity, Shaman’s bio-prospectors headed out to indigenous villages in Central and South America, as well as Africa, in search of curanderos who were already working with plants for specific remedies. By utilizing the knowledge of those indigenous healers the company hoped to eliminate much of the time and expense involved in random collections and bioassays. A plant that was already in use in several villages—often in different countries—for a particular type of fungus, the thinking went, would probably have a much higher chance of producing a pharmaceutical for the same fungus—and in a much shorter time—than simply collecting thousands and thousands of plants and hoping for a fungus remedy. Unfortunately, when the company didn’t produce any instant winners—though they had several promising medicinals in the pipeline—the publicly traded Shaman stock fell due to unmet expectations, Lilly pulled its capital and the company closed its doors just a few years after opening them. The fact that Shaman Pharmaceuticals failed as a company, however, has not dampened the enthusiasm of ethnobotanists who believe that somewhere in the plant world there are dozens, if not hundreds of major plant medicines waiting to be found. Among them is Dr. Dennis McKenna, a botanist now with the University of Minnisota and one of the original botanists with Shaman and later Aveda—which makes body products from plant materials. Dr. McKenna believes that somewhere in the plant kingdom there is a remedy for every ailment known to humanity and for every ailment we havn’t even developed yet. “We’ve co-evolved with these plants and plants don’t throw up pharmacologically active substances for fun,” he says; “they do it to save them from predation, or they might have signaling functions—both attractants and repellents—and they have these functions in relation to their environment. Animals flee or fight. Plants can’t, but they can be very creative chemists, and the sort of molecular diversity you find in the plant world is an expression of that creativity. And we’ve frequently found that by investigating these plants and finding these compounds they can be adapted to our own uses. And that’s beneficial to not only us but the plant as well, as we’ll then take care to insure that the plant is propagated and kept from extinction. “There are estimated to be 250,000 higher plant species; only about 10% have been looked at as potential sources of new medicines. And out of that 10% have come some very important medicines. So the take home lesson there is that the other 90% probably have an equally high number of medicinal potential. Whether the pharmaceutical companies will work toward discovering that is debatable. It’s difficult to say what the private sector is doing in this area. But the National Cancer Institute and other government agencies have long had natural products programs going on. And significant discoveries have come out of those programs.” Unfortunately, many pharmaceutical houses don’t

agree with McKenna, viewing the medicine-plant successes already on the market as either dumb luck or quaint anachronism. Since the 1940s most have preferred to work at purely synthetic drug development, ignoring the vast potential of the world’s flora. Which doesn’t mean that the large houses won’t get involved when the chance at a profit shows itself: Eli Lilly jumped on the rosy periwinkle of Madagascar once independent consultants discovered it had promising therapeutic potential. The result of their investigation led to the development of vincristine, the chemotherapeutic agent now used in the treatment of childhood leukemia. It was that success that led Lilly to invest in Shaman. Among those plant-based medicines already on the market are aspirin—now made synthetically, but initially derived from willow bark; morphine and codeine, which come from the opium poppy (Papaver Somniferum); quinine, used to combat malaria, was originally extracted from the root bark of various species of the Chinchona tree; digitoxin and digoxin, cardiac glycosides, come from woody foxglove (Digitalis purpurea); the glaucoma medication Philocarpine comes from Jaborandi leaves (Philocarpus Jaborandi); the antispasmodic atropine and the pre-operation sedative scopalomine both derive from deadly nightshade (Atropa Belladona); ephedrine, used in the treatment of asthma, comes from Ephedra sinica; the active agents in the cervical cancer chemotherapy taxol was initially found in the Pacific Yew tree (Taxis brufolio). There are a host of others as well, from the decongestant menthol to the tranquilizer resperine to the steroids that are the basis for a host of medicines, from progesterone to cortisone to prednisone. While most of those medicines mentioned above have been used for several decades—or in some cases centuries—by now, there are several new plant-derived or plant-chemistry-as-template-for-synthetic compounds either on the market or which hold great promise. Among the group already on the market are Tamiflu, the anti-viral used to treat avian flu, which was developed by Gilead Sciences, Inc from the Chinese star-anise fruit, the only known source for shikimic acid, the medicine’s prime active ingredient. Produced by Roche Laboratories it’s being stockpiled in several countries worldwide in the event of an avian flu epidemic. Extracts from Una de Gato, a vine from the Peruvian Amazon that’s also known as Cat’s Claw, (Uncaria Tomentosa), is produced by several companies, are now being utilized regularly as an adjunct therapy for both cancer and AIDS because of its anti-tumor and immune-system-bolstering activity. Unilever has recently bought the rights to market extracts of species of Hoodia Gordonii, a succulent from southern Africa traditionally used by the San people of the Kalahari desert, as a novel appetite suppressing medicine. Apomorphine, a derivative of morphine manufactured by Brittania Pharmaceuticals, was recently approved by the Food and Drug Administration for treatment of erectile dysfunction. In addition to those pharmaceuticals already on the market, several more are in the clinical human trials and will probably be on the market in the next couple of years. Among the most promising are Napo Pharmaceutical’s crofelemer-derived products for gastrointestinal indications such as chronic diarrhea in people living with HIV/AIDS, pediatric diarrhea and acute infectious diarrhea. The products have their basis in the red sap of the sangre de grado—Dragon’s Blood—tree (Croton lechleri), found throughout western Amazonia. Napo has already signed agreements with several pharmaceutical houses in China, India and elsewhere to develop crofelemer products that will meet the specific needs of the peoples of those regions. Britain’s GW Pharmaceuticals is in late development with Sativex, cannabis extracts (Cannabis Sativa), for use as an anti-spasmotic for muscular dystrophy as well as to lessen the violent vomiting that often accompanies chemotherapy. Sativex is also hoped to be effective as a vaso-dilator in those suffering from glaucoma. US-based PhytoCeutica is in late-stage testing of a 4-herb traditional Chinese medicine formulation that currently goes by the name PHY906 as a treatment for colorectal, liver and pancreatic cancers as well as neurovascular diseases. A number of other small biotech firms also have plants in the pipeline, from Canada’s CV Technologies—which already produces a respiratory medicine, COLD-fx to Oxford Natural Products, which is working with plants to develop a medicine to eliminate the symptoms of Hepetitis-C. How many of the 250,000 flowering plants mentioned by Dr. McKenna will eventually produce important medicines is hard to say. But Dr. Michael Balick of the Institute of Economic Botany at the New York Botanical Gardens, and Dr. Robert Mendelsohn, from the Yale School of Forestry and Environmental Studies, writing in a 1995 issue of Economic Botany estimate that at least 325 remain to be discovered. They base their estimates on how much of the world’s flora is thought to have already been screened for biological activity and how many major medicines that’s produced and extrapolated on the remainder. But new methods of genetically altering plants, biotechnology’s ever-greater ability to manipulate molecules using plants as a template, as well as the increasing ability of scientists to target specific disease-related molecules in the human body may increase the Balick-Mendelsohn number significantly. Which leads to the question: how many plants that might one day produce a new medicine are being pushed to extinction in the clearing of forests and the spreading of cities further into former countryside, among other reasons. Peter J. Houghton, Ph.D., from the Department of Pharmacology, King’s College, London estimates that 25% of the flowering plants on the planet today will be gone forever by 2025. That’s a large number of losses. Fortunately, some steps are being taken by individuals and groups to ensure that those plants already utilized by cultures worldwide will not be among those lost. In Belize, Rosita Arvigo founded the Ix Chel Farm in 1987 to preserve the botanical knowledge of Don Elijio Panti, an old Mopan Maya Indian. Since then the farm, funded by the National Institutes of Health and the US Agency for International Development, has identified 2,800 potentially curative plant species from several local healers. They are slowly being catalogued by Michael Balick, director of the Institute of Economic Botany at the New York Botanical Garden. To ensure that the people whose medicines are being investigated will get a cut of any eventual pharmaceutical profits, Arvigo organized the Belize Association of Traditional Healers, and to ensure that the plants themselves won’t be lost to deforestation, BATH established the Terra Nova Medicinal Plant Reserve on government-owned rainforest land. In Ecuador, a similar project, Plantas Medicinales del Campo, works to conserve the knowledge of the Andean healers, and has produced a book of traditional medicines. In southern India, the Irula Tribal Women’s Society has begun collecting and documenting the medicinal knowledge of the local healers, and marketing some of the plant extracts. While an important element of all of these projects is to ensure that traditional plantlore is not lost, their most important principle is to generate continuing interest by the peoples themselves in their own cultural heritage. One of the first to realize the importance of such a step was ethnobotanist

and author Dr. Mark Plotkin, who set up The Shaman’s Apprentice program several years ago to return in written form to each Amazon tribe he worked with all the plant knowledge he learned from them—in the hopes that it would generate interest in the herblore among younger tribal members. In other areas, like China, where plant medicines and herbals continue to hold a place of high importance across all of that country’s cultures, and in those areas where Ayurvedic medicine is practiced in India and elsewhere on the sub-continent, a natural and positive enlightened self-interest is working to protect the plants. As Dr. McKenna noted, plants and humans have co-evolved on this planet. Plants have provided us with food, clothing, shelter, and medicines since the dawn of time. The era of modern medicine is still in its infancy, but already dozens of plant-derived pharmaceuticals have been developed and are vital to much of the world’s population. And yet the World Wildlife Fund estimates that less than 2 percent of the flora of the Amazon has been investigated for potential medical use in even the most cursory fashion. That percentage is even lower in Africa, where most of the population still depends directly on plants for their medicine. That there is more to be discovered is clear. All botanists like Dr. Tom Carlson want is someone to send them out on the river somewhere in a converted fishing boat to go find them.

About the Author