

The adventurer's
guide to the
mysteries of

THE AMAZON



A Scientist Speaks Out

By Professor M.C. Meyer

A passionate spokesman for the potential of Amazonian pharmacology, Professor Mario Christian Meyer provides a privileged look into the future potential of Amazonian plant life. Trained as a neuropsychiatrist at Université Paris VII, he is presently a guest professor at the University of Paris as well as Deputy Governor and senior adviser to the Governor of Amazonas for international business development. He is also a senior expert of scientific, technological and industrial cooperation in biotechnology and environmental sciences to leading industrial groups around the world. As a liaison between medicine, science and business, the Brazilian-born Meyer represents a new kind of Amazonian advocate—dedicated to utilizing the resources of the planet in a life-supporting, Earth-supporting capacity for all involved.

The Amazon possesses nearly two-thirds of the world's living plant and animal species, and, by consequence, two-thirds of our planet's genetic heritage. For thousands of years Amazonian Indians have been well aware of the active therapeutic properties found in the colossal arsenal of jungle plants. Even prehistoric man used medicinal plants. Researchers have detected pollen in medicinal levels of usage in bones dating as far back as 50,000 B.C. What we have come to discover is that prehistoric usage of medicinal plants had been related mainly to stimulants, diuretics and astringents. Aspirin, today one of the widest known and most consumed medicines in the world, was initially an extract of willow bark, from which the active principle "salicine" was isolated along with vitamins, glycosides, etc.

Since the beginning of the century, teams of the "Institut Pasteur" have traveled to Amazônia in order to extract natural substances from plants; these studies have becoming increasingly important today in the face of AIDS and other immunological catastrophes that are affecting our modern-day population. It was nearly ninety years ago that Professor **Charles Richet**, a French scientist, discovered in Amazônia a new vegetal toxin, the crepitine, an extract from the plant *assaku*, that allowed him to understand the basic functioning of the immunological mechanism of humans. Today crepitine appears to be an important antiviral compound. In 1908 Richet brought back from Rio Purus (a tributary of the Amazon) the latex of this plant that the Indians used to "poison" the river water in order to facilitate the capture of fish.

BIOTECH AND BIO-INDUSTRY

Plant-based medicines, once reserved mainly for shamans, folk medicinemen, and herbalists, and at the beginning of the century, for artisanal biological-chemistry scientists (discoverers of aspirin, for example) were later harnessed by pure chemists who often replaced the plant-based molecules with synthetic molecules. Today plant-based medicine moves away from pure chemists and synthetic transformation and onward to an original universe of high-tech production, based again upon biological models. From this movement has arisen the present-day advent of the **BIO-industry**, that is to say, any technology-oriented industry that uses biological systems, living organisms or derivatives to make or modify products or processes for specific use.

Given the vertiginous evolution in biotech research, one could conjecture that by the end of the century pharmaceutical labs will have even more performant techniques of isolation, chromatography, spectroscopy, ultracentrifugation and nuclear magnetic resonance. This advanced technology would permit, on one hand, the identification and selection of new natural molecules of Amazonian origin, and on the other hand, verification of the active principle in a considerable number of plants prescribed in the treatment of three-fourths of the illnesses of the planet—diseases treated even today, in many cases, by an artisanal plant-based therapy (traditional natural folk medicine, over-the-counter herbistry, etc.).

TECHNOLOGICAL, ECONOMIC AND ENVIRONMENTAL CHALLENGES

Due to high research and development costs, pharmaceutical giants find themselves today confronted with a significant slowdown in the number of chemical innovations in pharmacology, reducing the discovery, on average, to only one new and profitable molecule per year among 10,000 synthetic molecules tested. In contrast, twenty years ago, twenty new molecules were being discovered per year.

Pharmaceutical companies are now particularly interested in research alternatives that traditional medicine and its "living" molecules can offer. For example, a leading U.S. pharmaceutical company, interested in identification and selection of plants having new therapeutic properties, recently passed special agreements with **INBIO**, a Costa Rican Institute and the government of Costa Rica. In return for a \$ 1 million investment for technical assistance on the part of the American company, the Costa Rican side agreed to furnish 100 plant extracts and microorganisms, together with an exclusivity on the pharmacological analysis for a period of two years.

As a result of our anthropological and biotechnological work on the rational exploitation of Amazonian natural resources, major French pharmaceutical laboratories have committed themselves along the same lines for plant research in the Amazon, precipitating a landmark Franco-Amazonian government commitment without precedent. This cooperation has great potential for the establishment of joint-ventures as well as significant positive social-economic repercussions for the Amazon region. This kind of rational exploitation of the Amazonian biodiversity, through BIO-tech, is, in my opinion, the only pragmatic and realistic way to deal with delicate and crucial environmental problems. Indeed, it could be said that natural molecules from Amazonian flora and fauna have, in themselves, a direct and indirect economic value. In fact, they serve as a

direct raw-materials source for medicines as well as indirect models for new synthetic molecules even more active, more specific, and provoking fewer side effects than classical chemical medicines.

HIGH-TECH VS. SAVAGE MIND

The contribution of natural molecules raises a crucial question as the century comes to an end. It concerns access to genetic resources and the "royalties for Nature's know-how." This was a key point in the Convention of Bio-Diversity at the Summit of Rio 1992, attended by 160 heads of state as well as numerous scientists, ecologists and activists.

In my own opinion, the utilization of Amazonian Indian knowledge by First-World pharmaceutical companies requires some fundamental reflection. In fact, I have come to believe that there is an inherent cultural conflict between the Amerindian and Western scientists in their perceptions of their psychocultural identities.

In my own project called the "Franco-Amazonian Project for Scientific Technological and Industrial Cooperation," the cooperation between the Amerindians and high-tech scientists has demonstrated that we must give important consideration to the means and limits of their interaction in order to avoid potential perverse consequences of the "power struggle" between Indians and Western-thinking scientists. Indians who today come into contact with urban Amazonian centers, often enticed by money or too embarrassed to return to the tribe because of a failure at urbanization, are exploited as prostitutes, or fall under the influence of drug dealers or *garimpeiros* (goldminers) as well as being adversely affected by the polluting effects of mercury used to mine gold. Moreover, isolated native tribes that come into unsupervised conflict with outside influences are also at great psychological risk, and have been known to suffer deeply from loss of roots, emotional orientation, intellectual dynamism, and even brain functions, resulting in a psycho-social form of schizophrenia. If those in the so-called "civilized" sector continue to invade and exploit the forest as they have done for many centuries, without forethought to social, psychological and environmental consequences, tribal peoples, the true kings of the richest forest in the world, may easily become the "rubbish" of this cross-cultural conflict.

In the final analysis, the only way to safeguard tribal peoples from acculturation or even extermination is to respect their knowledge in a practical way by integrating their traditional technology and their "science of nature" into the development of modern society. The Indians, in fact, as "scientists of nature," could be integrated into the

labor force at a level where their skills and thousand-year-old traditions would be respected and passed on to advanced technological and industrial projects, human and environmentally friendly, in a fairly balanced cooperation. Otherwise, the Amazonian Indian will become what they themselves fear most: just an insignificant piece of a fossilized "ecological Sanctuary" or a "Wax Museum zoo."

SACRED AND SECRET "NEW" MOLECULES

The ancient botanical knowledge of Indians, often times characterized as sacred and secret, has from its initiation been associated with myths of longevity and youth through invoking the "gods of Nature" or by cultivating the "magical" (and even pharmacodynamic) virtues of plants.

It is therefore not surprising that our analytical and structural chemical studies of these plants have shown the presence of powerful antioxidants and anti-free radicals in high concentration (such as various flavonoides of the rutaceae family). Responsible for equalizing cellular metabolism, these plants contain important protective and regenerating properties for tissue: external tissue in the field of dermatology, by improving the quality of collagen and elastine, thereby acting against skin aging, as well as internal tissue, in the field of cardiology, where they have proven effective against rigidity of the arteries as well as being highly beneficial to the vascular system. In the same Amazonian plant family, we have identified numerous plants, particularly rich in saponines, glycosides and terpenes—often associated with rare metals such as germanium, which according to nonpublished Brazilian and Japanese studies, have strong pharmacodynamic reactions against cancerous tumors. Such is the case with a recently discovered molecule, *hexacyclique nortriterpene*, unknown until the present, which is reported to inhibit the growth of cancerous cells in vitro, according to 1986 research at Tokushima Bunri University in Japan.

Through the efforts of my collaboration with many Brazilian and French scientists, a large arsenal of **vegetal hormones** has recently been identified, which has proven effective in regulating the human metabolism, notably diminishing the cholesterol level in the blood and increasing the coronary circulation. Stigmasterol and sitosterol are principally responsible; the latter has the power, among others, to increase the level of estrogen in the organism in a balanced manner, as well as playing an essential role in the regulation of the cellular aging process.

As scientists delve deeper into the hidden aspects of forest potential, they are finding that native legends often provide "sacred" clues into the vast potential of a species. For instance, according to legend, the well-known Amazonian plant guaraná was given to the Indians as a gift by the Thunder god Tupan to help them fight against the evils of the bad spirit Juruparo. The plant was rediscovered by Europeans in 1669 as a result of the mission work of Superior Betendorf, a Jesuit priest, among two Amazonian tribespeople, the Andiras, and the Sateres-Mawes. Throughout centuries guaraná has been used by jungle inhabitants as a psychostimulant tonic, appetite suppressant, and as an anti-cramping compound, as well as an aphrodisiac when associated with an energetic neuromuscular tonic (family olacaceae). Today, all strata of the population continues to consume guaraná in many forms (bark, powder, and as an additive to a popular Brazilian soft drink, among others). In the future, untapped usage of guaraná may include weight control as well as anti-cellulite combat, but at the present the research results remain industrial secrets.

The entities involved in this research include the Universidade do Amazonas, Fundação Oswaldo Cruz, INPA (Instituto Nacional de Pesquisa da Amazônia), EMBRAPA (Empresa Brasileira de Pesquisa Agropecuária), UTAM (Universidade Tecnológica do Amazonas, among others.

AN EXOTIC PHARMACY by Professor M. Christian Meyer

The richness of Amazonian biodiversity constitutes a double treasure for specialists of "natural medicine;" first, the large variety of plants with therapeutic properties and second, the great diversity of mammals naturally extracting healing substances from these plants.

In response to the pressing need to discover new superior medicines in plant life in the face of growing epidemics like AIDS and other social and environmental illnesses, a new, exotic specialist has thus been inspired to arise within the scientific arena—the zoopharmacologist. These specialists study plants which animals use to treat their own illness (such as antibiotics) or to regulate certain vital biological functions, such as contraception.

For instance, among the uncountable varieties of monkeys in the southern regions of the Amazonian forest, we find the muriqui, the biggest monkey of the Americas, measuring about 70 centimeter in body) with a tail just as long. Apparent masters at controlling their own population, the females manage to reduce their fertility, thanks to the ingestion of certain leaves rich in isoflavonoides, which have a physiological effect similar to that of estrogen. Inversely, the same females have been found to ingest "orelha de macaco" (monkey's ear), a vegetable rich in a steroid that facilitates fertility. Scientists have discovered that these females often tend to chew on this plant during times of ovulation, suggesting that they may have the firm intention to be fertilized.

OTHER MEDICINAL PLANTS

Copaiba: The copaiba tree can be found in copious amounts in the Amazon's *terra firme* regions. Rich in beta-caryophyllene and copaene, its therapeutic property is antiviral and antipsoriasis. Its oil is anti-inflammatory, antirheumatic, and has other numerous healing properties. It's also used in cases of chronic varicose ulcerations and pharyngitis.

Crajiru: This is a type of creeping plant used as an anti-inflammatory. The dry leaves contain tannins, quinones and alkaloids. The plant, often served as a tea, is used to counteract intestinal colic and uterine inflammation. Other therapeutic properties are used as an astringent and as a powerful anticheloid (to heal rough scar tissue). In Amazonas, silkworms fed *crajiru* leaves (rich in flavonoid pigment) produce red thread.

Urucum: The seeds of this plant, which contain carotenoidlike beta carotene (pro-vitamin A), have properties capable of increasing the pigmentation of fatty tissue and thus making the skin resistant with natural coloration (it contains an excellent UVB filter which acts as sunscreen). It is also a bioinsecticide, a cure and protection against insect bites. It can either be ingested as capsules or by cooking with it in powder form similar to that of paprika. For thousands of years Amerindians have used urucum for their body-painting rituals because of its bright color. They also mix the pulp which surrounds the seeds with the oil of the Amazonian fish to make a cream which protects against the sun and insect bites.