Editorial comment

Global phytochemistry: the Brazilian approach

One of the hottest issues worldwide is the preservation and sustainable use of biodiversity in the tropics (Fig. 1), and its exploitation by pharmaceutical companies in the race to discover and develop new drug candidates. In Brazil, the Convention on Biological Diversity signed in Rio de Janeiro in 1992 called the attention of a broad audience of scientists, politicians and non-governmental organizations (NGOs). Following the Convention, the issue of biodiversity went through extensive discussions in the media, well beyond the frontiers of research institutes and universities. Last year, Brazil celebrated 500 years of discovery and coincidentally the July issue of Nature (406, 13 July 2000) published in its cover report the news about an important scientific achievement that made the country of soccer and samba to gain the additional status of a “genomic country” (The Economist, 22 July 2000). This was possible as a result of the financial support provided by Fapesp (São Paulo State Foundation for Scientific Research) which enabled a group of 35 laboratories and 200 researchers to describe the first DNA sequence of a plant pathogen — the bacteria Xylella fastidiosa — responsible for the citrus variegated chlorosis, a disease causing almost 30% loss in citrus culture every year. Such investment had an immediate and continuing impact. The genome of Xanthomonas citri — another citrus disease agent — was next described, and several other important targets of agricultural interest are waiting for sequencing. Solutions to problems related to agriculture, cancer and tropical diseases, and to biological and evolutionary interactions, will emerge from the acquisition and development of sophisticated techniques and mainly by the established competence of the research groups participating in this project.

The ripening of the scientific community in Brazil can also be seen in its awareness of the importance of biodiversity studies, including the bioprospecting of natural products. As an outcome of academic discussions, in public and private sectors, and with the support of the Ministry of Environment and its Secretary of Coordination of Amazonia, the Brazilian Program of Molecular Ecology for the Sustainable Use of the Biodiversity of Amazonia — (PROBEM) was launched and is one of the priorities of the government plan “Avança Brasil”, which includes a dozen fast-tracking projects to accelerate the economic development in Amazonia. PROBEM was designed to foster the development of new products from biodiversity, and to encourage the settlement of new enterprises in Amazonia. To steer PROBEM and overcome the bureaucratic hurdles, a social organization (QUANGO — quasi autonomous non-governmental organization) named Bioamazonia was created. Its goals include the construction of the Amazonia Biotechnology Center (ABC) in Manaus, the city capital of the Amazon state, and the establishment of a network of Brazilian laboratories to research and develop products from biodiversity. An additional initiative within Bioamazonia is the Amazonia Permanent Trust Fund, created in association with A2R, a financial institution. Inspired by the framework of the Alaska Permanent Fund, which obtains royalties from the oil industry, the APTF will channel its revenues to the environmental management and social development in Amazonia.

The opportunities for investments in Brazil are unique and greater than never before. A recent survey by A.T. Kearney shows that Brazil ranks third, after the USA and China, in terms of reliability for investors, and is at the top position for new investments. Companies as important as Novartis Pharma and Glaxo Wellcome have already established partnership with Bioamazonia, universities, and business interested in the use of biodiversity, even though, insufficiencies in the Brazilian laws have brought about embarrassing, serious bottlenecks for all parties. Since then, the Brazilian federal government issued the provisional act no. 2042 (dated 29/08/2000) ruling the conservation and utilization of components of biological diversity, and the sharing of benefits from its exploitation, including rewards to indigenous and other local communities. The scientific community welcomes the new law, but the bureaucratic hurdles are expected to be many, in different instances, especially regarding the official permits to collect biological materials. Appropriate solutions will be needed in the near future.

Another important initiative in São Paulo State — the Biota Program — is also supported by Fapesp. The
Biodiversity Virtual Institute (www.biotasp.org.br) program, differently from Bioamazônia, does not involve the physical construction of a research institute. Instead, it focus mostly on the strengthening of interdisciplinary groups aiming to systematically evaluate the biodiversity of São Paulo State, including flora, fauna, microorganisms and the development of potential bioactive compounds from plants. The total budget of approximately eighteen million dollars provided for the initial four years is not large considering the number of researchers involved and the benefits expected in terms of basic knowledge to be achieved. Judging from the progress reported at the Fapesp workshop last January by project leaders, researchers, graduate and undergraduate students, additional funds certainly can be expected to continuously support these and other thematic projects.

Both successful programs funded by Fapesp — Genoma and Biota — demonstrate that significant changes in the scientific policy are taking place, but whether or not we are going to have an economy based on genome sequencing or on biodiversity exploitation depends on the establishment of long-term programs such as these. The discovery of new drug candidates to cure diseases from malaria to cancer, using thousands of plants or micro-organisms, is expected to be achieved in the near future with the access to high-throughput screening technologies and interdisciplinary approaches. Further developments to marketable drugs, and the involvement of small local companies are also highly expected. The genome blueprint for biosynthetic pathways of bioactive compounds, or even for a basic process such as that of lignification and its role in the evolution of land plants, plus several other important questions, will certainly be pursued in the near future. Nevertheless, the scientific and technological cooperation among the countries are in need of stimulation simply because a number of basic problems such as the taxonomy of our biodiversity cannot be solved fast enough or independently.

The organization of the phytochemical research community in Brazil has advanced significantly, through the Division of Natural Product Chemistry of the Brazilian Society of Chemistry. This Division, with approximately
220 members, enthusiastically discusses crucial topics related to biodiversity in all their annual meetings. Several new groups have emerged all over Brazil, and equipment facilities for phytochemical investigations are now easily available. A few groups are focused on the search for bioactive compounds, ecological studies, marine compounds, and also on cell tissue cultures and biosynthesis of natural products. The intellectual property rights of the new findings are also under discussion in a number of symposia and courses, and entrepreneurs and scientists alike are finally getting together in meetings. In the South American context, the debate has been initiated by the Latin American Society of Phytochemistry, but the management and the study of biodiversity in the continent as a whole waits for regulation as well.

Following the pressures raised by contracts signed with pharmaceutical companies, the establishment of solid and clear legislation regarding bioprospecting is a top priority for Brazilians, otherwise the hesitation could impair the creativity and the initial successful achievements such as those promoted by the genomic projects. There is an urgent need to develop basic science by means of long-term investment, to ensure a broad range of expertise. Additionally, specific actions from the federal government are required to improve our capacity to solve our own problems and to seed research companies and other enterprises. In this sense, the Ministry of Science and Technology and CNPq (National Council of Scientific and Technological Development) have announced that new funds for the Brazilian Genome Project, and specifically for the biodiversity studies, are on the way.

A new model of exploitation and conservation of biodiversity as the basis of economic development must be the next paradigm for Brazil and this is the way to establish a successful economic and scientific partnership in the globalized world.

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