Natural Resources and Biodiversity as Global Public Goods

The Science Diplomacy of French Natural Substance Chemists

An InsSciDE Case Study

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With the end of colonial empires in the 1960s, European countries had to develop political, diplomatic, and economic strategies to gain access to natural resources. Pharmaceuticals are made mainly from natural substances. Tension exists between the richest countries expressing a huge demand for medicines, and the poorer intertropical countries, in which are found the required natural products and medicinal plants. Natural substances chemists need access to raw materials found in tropical regions in order to research and uncover new chemical compounds. How did scientists behave when French science policy on such international activity was not explicit, and when funding was lacking? Or when French diplomacy was unaware of the academic and industrial importance of natural products? This case examines how French scientists had to be pragmatic and create new processes of cooperation, collaboration, and funding in order to continue to explore new territories, study new species, and discover new molecules. It considers how they reconciled these means to produce new knowledge with addressing the growing endangerment of their subject species, as continuous overexploitation of the intertropical zone has critically impacted environmental biodiversity.

Image credit: Public domain

Keywords:

Intertropical zone, natural substances, pharmaceuticals, networks, biodiversity

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While balancing ethical concerns as well as societal and global pressures for new medicines, how have French researchers in the intertropical zone built partnerships that became part of French and then European diplomacy over time? Independent in the 1960s of foreign policy processes, field researchers became stakeholders in the diplomacy of the 1980s-2010s. This case study traces how, in the past 60 years, scientists at the French National Centre for Scientific Research (CNRS) Institute for Natural Substances Chemistry (ICSN) moved from a paradigm of sampling natural goods to one of international cooperation in the management of plants and of training through co-research. Today we are witnessing a new mistrust on the part of some scientists because of the growing destruction of biodiversity and the proximity of multinational companies to diplomatic networks. How did researchers become whistle-blowers?

From a medical point of view, the intertropical zone has long been considered to be of great value because "a large part of the plant species are unknown and they provide natural substances from the fauna and flora" (Potier 2001). Science for a long time could not provide pharmaceuticals that could be synthesized without the use of natural products. Biology, genetics, and chemistry have only recently provided synthetic medical treatments for the major diseases of our time and even today, synthetic products are very often more expensive than products based on substances extracted from medicinal plants.

At the beginning of the 1960s, the two former colonial powers of the United Kingdom and France had to give up their empires and with them, their extractivist prerogatives. They no longer had access to the extremely rich raw materials and natural products present in the intertropical zone. French academic research departments had to deploy strategies to gain access to these rich areas in order to be at the forefront of fundamental and applied disciplinary fields such as natural substances chemistry, biology, and biogenetics. The prizes were knowledge, products, and international prestige both academically and industrially (for pharmaceutical companies in particular). These zones were over-exploited during colonial periods and continue to be so today, in part due to the principle of self-determination and the legitimate aspirations of intertropical peoples to control their living and mineral resources.

Stakes: A narrative based on archives, and a new view on science-based diplomacy

The history of science, through its method and focus on analysis over a long period of time, provides a critical analysis that gives diplomats new ways of viewing contemporary facts. Our case study underlines the complexity that has prevailed for more than fifty years underlying the emergence of a diplomacy based on science. Our sources are archives, unpublished literature, testimonies, and interviews.

This longue-durée approach allows us to understand how French field scientists, ethnobotanists, and natural substance chemists produced reliable knowledge that led to the discovery of medicines. This case examines specific collaborative strategies deployed on the ground in Madagascar, Malaysia, and Uganda based on co-generating knowledge with local researchers and thereby gaining access to raw materials. French scientists created partnerships in a process that can be described as a form of science diplomacy.

The independence and autonomy of researchers is the prerequisite for obtaining scientific results. These two conditions allow an objectification of data that make researchers valuable partners for diplomats dealing with biodiversity issues.

From their very first missions overseas, the scientists of our case witnessed irreversible destruction, the main cause of which was overexploitation for national and, above all, international economic purposes. Despite their role in international arenas, their cooperation with national, binational and European research programs, researchers became whistleblowers in the face of the collapse of biodiversity. They have contributed both knowledge and action to address the international issues that arise around natural resources, which are sometimes seen as a common good but often as resources to be exploited indiscriminately.

Critical analysis of the archives for an objective account of the facts

Why do field scientists today express a renewed distrust of diplomats and transnational organizations? Opening the archives to know and restore the exact nature of the relations between science and diplomacy offers a new vision of the scientific as well as political and economic stakes.

The critical analysis of these archives permits the reconstruction of the context in which decisions were taken. It allows us to understand the choices made by scientists, who were sometimes opposed to any proximity with political leaders – and sometimes cooperated with diplomats and industrialists alike.

It appears that, independently of science policy decided by government, researchers have been able to combine diplomatic imperatives with the need to find public and private funding in order to discover new drugs. Their archives show that they were fully aware of the contradictory logic within which they had to operate.

Reading these archives deconstructs some previous notions about science/diplomacy relations. We found that researchers are reflexive observers, who are aware of the issues raised by their work. They are conscious of the risks of instrumentalization to which they are subject. They are pragmatic and produce reliable data that is co-constructed within their international community, while at the same time they are involved actors and mediators on the ground.

Tropical natural common goods for a shared global health

Antarctica is not the only great space needing international attention and governance. Local spaces under the power of national and local governments need it too. The environment of the intertropical zone is very delicate mainly due to over-exploitation during colonial periods and ongoing economic activities (industrial, touristic, etc.) since their independence. A tension arises between peoples' need to exploit local resources to reach a level of decent quality of life, and the objective of conservation for humankind and future generations. Similarly, questions of national sovereignty are juxtaposed with (perhaps Eurocentric) visions of a new governance mixing international, national and local bodies to administratively oversee these fragile areas for the benefit of all. In this sense, recounting the history of researchers' field practices and their attitudes towards supervisory authorities (research centers, governments, funding agencies, diplomats, etc.) can help pinpoint the interests of the various stakeholders and illuminate issues that might be tabled – or merely implicit – in future diplomatic negotiations.

The Institute for Natural Substances Chemistry

The ICSN, part of the French national research network CNRS, is home to a community of academic researchers with a dual mission: to increase knowledge and to produce new active molecules. It is in this academic laboratory that two anti-cancer drugs based on natural products, Navelbine and Taxotere, were discovered in the 1980s and 1990s, respectively.
In order to do their job, the chemists of ICSN needed raw materials from the intertropical zone. Access to countries having the flora or the fauna could be obtained via three paths: a personal route via networks built by themselves, the official route via the CNRS and the Foreign Affairs or Economy Ministries, or a mixed route.

Science policies at both the French and European levels were slow to emerge and become structured. Priority was given to nuclear, aeronautics, and aerospace fields, leaving both great freedom and reduced financial resources to other research sectors. In this context, ICSN principal investigators in the 1960s were free to choose which topic to study and were allowed to fund their research however they could, including through partnerships with industry on top of their state grants. They oversaw field researchers whose task it was to develop cooperation with colleagues located in environmental hot spots such as Madagascar, Malaysia, Vietnam, Uganda, and other countries – often implying the invention of new ways of working and collaborating, with the added dimension of overseas distance.

Book and herbarium plate for Catharanthus roseus by Sieur de Flacourt. Photo credits: Lucile Allorge, National Museum of Natural History - Paris

Research pragmatism: When lack of means rhymes with autonomy and freedom of action

During the period under study, scientific competition became very intense across the board and led to the formation of highly specialized global scientific communities. For the natural substance chemistry community, a diminished level of funding would result in the financing of pharmaceutical research and development by the private sector.

The worldwide rush to discover new active molecules to produce and patent new pharmaceuticals gained political and economic legitimacy after the Nixon administration's cancer plan was issued in 1971. Given the lack of public funding, the ICSN's everyday research practices became very pragmatic. Research team leaders chose their research topics and produced fundamental knowledge in full academic independence. At the same time, they consciously deployed strategies to attract industrial sponsorship. Partnership contracts, signed by researchers themselves, stipulated that the industrialists had to pay for raw material supplies, and for field expeditions to inventory local flora and fauna or to discover new species. Researchers and industrialists were joint owners of any patents and shared royalties. While this funding approach was not an official policy of the CNRS, it was tolerated.

Scientists were accustomed to intellectual independence; for the French research community, the state both funds and guarantees academic freedom. There was no contradiction in benefiting from state funding for equipment and employment, rejecting top-down topical directives, and fiercely defending the open-ended character of research. This professional culture was very dominant until the 1990s. On the other hand, turning to private sponsorship was felt to have its risks. Cooperation with industrialists could be interpreted by academic peers as compromising. Being too close to state agents deployed in diplomatic roles could have been seen as suspicious. Yet cooperation was needed with both industrialists and with diplomats for material and in-kind support in order to pursue research programs on the ground.

In the absence of a precise French scientific policy in the field of natural substances, in the absence of European diplomacy and cooperation, and in the presence of a French diplomacy that was little interested or aware of the importance of this academic and industrial sector, the ICSN scientists and their associates came up with pragmatic new ways of working, cooperating, and collaborating.

Protagonists

Among a wide range of actors, the protagonists of this story were French researchers, chemists, ethnobotanists and those of the partner countries, industrialists and, finally, diplomats.

Four researchers stand out:

- Pierre Boiteau, the militant (in the political sense of the term);
- Pierre Potier, his boss, the *de facto* diplomat-negotiator;
- Thierry Sévenet, the field scientific advisor;
- Sabrina Krief, the whistleblower.

Pragmatism and reciprocity: Researchers' tools of diplomacy

Pierre Boiteau, an ethnobotanist and director of the vegetal identification laboratory at ICSN-CNRS (1968-1980), was a Communist party member and elected councilor (1949-1958) to the Assembly of the French Union (Fourth Republic). He defended the social rights of the Malagasy people, seeking to preserve flora and fauna from destruction due to overexploitation. This militant action caused difficulties for him with the French colonial government, and although he remained a CNRS researcher, he was forced to leave Madagascar.

1982 commemorative stamp of Pierre Boiteau (1911-1980) highlighting his support for Malagasy Independence. Source: Malagasy Post Office.

Pierre Potier, pharmacist, chemist and director of the ICSN, sent Boiteau back to Madagascar after it achieved independence in June 1960. French diplomacy needed scientists to maintain relations, and scientists needed Malagasy dry plants to pursue their investigations. Thanks to Boiteau's extensive knowledge of Madagascar's social, cultural, and economic issues, not to mention the Malagasy language, Boiteau and Potier were able to initiate a scientific cooperation with the new government. Malagasy doctoral candidates received training in France at the ICSN and Malagasy university professors were granted residence; in return, a permanent French university research team was set up in Madagascar.

Pierre Potier (1934-2006). Photo credit: © Mme Christiane Marmonteil, https://id.erudit.org/iderudit/013180ar

Boiteau's scientific knowledge and network resulted in France's adaptation of its relations with the independent nation's government as well as increased influence in the Indian Ocean countries. French diplomatic relations were re-established thanks to this new type of academic reciprocity conceived by Potier and promoted by Boiteau. The commitment shown by Boiteau confirms that ethnobotanists and natural substances chemists began to express social responsibility long before the Stockholm UN conference in 1972 and outside the circles of that organization.

Thanks to the independence of researchers, science is dynamic and ahead of national policies and international diplomacy. It is the researchers who were the precursors of an original strain of diplomacy that emerged in the late 1960s and 1970s, affecting both arrangements on the ground and policy options at national level. A triangular cooperation took place between scientists and the Malagasy government on the one hand, and scientists and the French government on the other hand – and in between, less bilateral and more international relations with new actors in the region such as the Soviets, Europeans, and Americans.

Potier initiated and maintained this type of cooperation, first informally and then formally. Institutionalizing exchanges was a way of protecting scientific work from being used by unscrupulous industrialists. Hosting researchers from emerging countries consolidated access to natural resources and the supply of raw materials to the laboratory. The sharing of knowledge and training through research performed by foreign students reinforced sustainability, since on their return they favored relations with their French laboratory.

Thierry Sévenet, pharmacist and physicist, ICSN research group director. Uganda, mid-2000s. Photo (undated): Françoise Guéritte.

Thierry Sévenet, research group director, replicated the ICSN model for cooperation. Sévenet traveled to tropical countries on Potier's request (the French overseas territory of New Caledonia, and Malaysia, Vietnam, and Uganda) and to Morocco. The same principles were deployed: first, write to the French Embassy scientific adviser to secure funding for an expedition; next, negotiate an agreement between universities; then top up funding from both the scientific bureau of the French Embassy and ICSN royalties drawn from Navelbine and Taxotere. Local researchers were listed as co-authors on publications and patent applications. Grants for students to complete their thesis in France were funded by the French Embassy and the ICSN. Knowledge transfer and cooperation were to continue following the return of the newly minted PhD holders to their country. While French diplomats were not at the origin of this procedure, they were involved and helpful. Indeed their diplomatic action would be enriched and expanded, as they were exposed to "green arguments" heard in the context of scientific and personal cooperation.

Dr. Jane Namukobe (left) and members of her phytochemical research team, Makarere University, Uganda, 2021; she has cooperated on natural substances field and laboratory research with ICSN. Photo courtesy of Dr. Namukobe.

Biodiversity protection: The cooperation model integrates more state action

Driven by a universalist vision of science, the ICSN science diplomacy for research and training was directed towards both ensuring the material means to work, and contributing to a collective awareness of the fragility of the environment.

The ICSN archives show an evolution of views on biodiversity threats and protection. In the oldest archives, it is written that irreversibly endangered species must be inventoried and analyzed. Then, during the 1980s researchers denounced the deforestation of Malaysia and Vietnam for the benefit of multinational companies. A new paradigm emerged. French scientists, aware of the irreversible losses, were looking for a way to limit the destruction of Malagasy, Malaysian or Ugandan natural resources resulting from overexploitation by local and multinational firms as well as by the local population. This implied changes to the way they dealt with the material issues necessary to develop a research program: because they needed more resources, they needed access to an international forum. They approached French and, in the case of Uganda, both French and European diplomats. In this context of biodiversity conservation and defense, the archives suggest a shift from pragmatic diplomacy led by researchers, to a request for help that would lead to a new process for cooperation in which the state is asked to take an active role. Natural product exchanges would gradually become co-constructed by European diplomats and scientists as matters of health and science diplomacy with countries outside Europe.

In the early 2000s, Sabrina Krief arrived in Uganda to complete her doctorate on the biological and chemical effects of plants and other substances selected and consumed by great apes. The cooperation pattern was classical. The expeditions were organized by CNRS and the French National Museum of Natural History (MNHN), drawing on scientists' personal networks, with no specific involvement of French diplomatic agents except, at the beginning, for security matters.

However, because of the environment's wealth and extreme fragility, the scientists moved to place research programs under agreements protecting natural resources from greedy exploitation. At the time, government objectives under President Yoweri Museveni were, for international and economic issues, in line with the 1992 Rio Conference Declaration on Environment and Development. Laws were voted to control natural resource exploitation, whether for academic or economic-industrialist purposes. A cooperation agreement drawn up with the help of the French Embassy and signed by the CEOs of three organizations (CNRS, MNHN and Uganda's Makerere University) helped to protect the research zones from the aggressive Chinese extractivist presence across Africa that had increased dramatically in Uganda, degrading research conditions for the French scientists and their counterparts.

Sabrina Krief, primatologist, whistleblower. Uganda, mid-2000s. Photo (undated): Françoise Guéritte

The new generation of researchers was influenced by paradigms arising from international biodiversity conferences, legitimating new international scientific activism for a global governance of endangered areas. While rooted in previous models, the Ugandan research relationships drew on the principles of international cooperation affirmed in the Rio and Nagoya Conventions. It was becoming urgent to find a sustainable way to protect the primates whose habitat was regularly being destroyed. Researchers would draw on all means available to them. Sabrina Krief led researchers in cooperating with non governmental organizations (NGOs), fostering the creation of local NGOs with or without the help of the Ugandan govern-

ment, and mobilizing French and European diplomats. Very aware of Chinese soft power that enabled companies to penetrate environmental hotspots, the researchers became closer to French and European diplomats in order to support both their research and the protection of endangered areas. However, they remained discreet about such cooperation, as it could be seen by the rest of the scientific community as a compromise with neo-colonial power.

The rapprochement with diplomats was coupled with aid granted by French multinational companies. Companies with activities in Uganda were well aware of the requirements of international conventions and, moreover, were exposed to the pressure exerted by European public opinion mobilized by researchers like Krief. They developed charters, which they published and undertook to respect. They therefore had a definite interest in supporting scientists' research and environmental protection programs. Although in popular perception cooperation with an industrialist can be seen as an attack on the environment, nonetheless such partnerships proved to be effective, in that multinational companies have to think about their reputation before making any decision. The cooperation between these French companies and researchers can be called virtuous. Moreover, the use by these firms of the best international experts, gathered in independent scientific councils, facilitated the production of data that no purely academic research program could have funded.

Initiated in 1982 by Dr Thierry Sévenet (ICSN-CNRS) and Prof. K. C. Chan (University of Malaya UM, Malaysia), collaboration led in 2015 to the signature of agreement for a joint endeavor, the International French Malaysian Natural Product Laboratory. Photo credit: ICSN.

Conclusions

Today, any researcher may be mobilized to serve the science diplomacy of his or her country or of the EU. To understand the issues at stake in this diplomacy, it is necessary to keep in mind different scales of analysis, from local to global, and scrutinize the role and interest of different actors at each level. For instance, what is public and published by companies is a matter of reputation preservation as well as of corporate social responsibility.

By re-examining the way chemists organized their research conditions over the long term, we can see how they prepared their ground missions and how relationship-making evolved. We thus approach the materiality, often invisible in historiography, of professional practices. Reading through the ICSN archives and interviewing witnesses shed light on the researchers' anticipation of, and adaptation to, political and economic constraints. We saw a community aware of their instrumentalization by certain organizations or powers, and saw their lucid processes to advance their own goals. They found themselves having to deal with the desire for discovery (new species, new molecules, new medicines), and with the duty to warn and protect sensitive areas, including against the economic practices of local populations which may appear justified in a short-term perspective but are unsustainable. They have to cooperate with politicians, whom they know are not totally transparent, and sign agreements with industrialists, whose interests may diverge but without whom they may have no financial support. In this way, a complex image emerges of research that exists only because it is based on alliances, often transnational and transcultural: chemists/ethnobotanists, chemists/industrialists, scientists and diplomats.

Study Questions

• Which goals and priorities were served by the French scientists' diplomatic moves? What do you think of the role played by personal research networks and cooperative arrangements in attaining these goals?

• Why is it so complicated for politicians or diplomats to read/use researchers' works?

• Could scientists contribute to the emergence of a more virtuous diplomacy that considers the sustainability of resources beyond immediate national/economic interests?

Endnotes

• A fuller version of this InsSciDE work is forthcoming. Le Roux (in press, 2022) La biodiversité, source de médicaments: entre compétition et éthique quelle place pour les chercheurs? In Les cahiers du Comité pour l'histoire de l'Inserm.

• Cover image: Madagascar Periwinkle (Cantharanthus roseus), used by Potier to develop anticancer medication. Public domain.

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