

An introduction to the renewal of taxonomy

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► **To cite this version:**

Elsa Faugere, Isabelle Mauz. An introduction to the renewal of taxonomy. *Revue d'Anthropologie des Connaissances, Société d'Anthropologie des Connaissances*, 2013, 7, 2 (2), <10.3917/rac.019.0350>. <halshs-01664813>

HAL Id: halshs-01664813

<https://halshs.archives-ouvertes.fr/halshs-01664813>

Submitted on 15 Dec 2017

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Presentation

AN INTRODUCTION TO THE RENEWAL OF TAXONOMY

Elsa Faugère, Isabelle Mauz

S.A.C. | « *Revue d'anthropologie des connaissances* »

2013/2 Vol. 7, n° 2 | pages a à o

Article disponible en ligne à l'adresse :

<https://www.cairn.info/revue-anthropologie-des-connaissances-2013-2-page-a.htm>

Pour citer cet article :

Elsa Faugère, Isabelle Mauz « An introduction to the renewal of taxonomy », *Revue d'anthropologie des connaissances* 2013/2 (Vol. 7, n° 2), p. a-o.
DOI 10.3917/rac.019.0350

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PRESENTATION

**DOSSIER “THE RENEWAL OF TAXONOMY:
MODALITIES, EFFECTS AND PRACTICAL STAKES”**

**AN INTRODUCTION TO THE
RENEWAL OF TAXONOMY**

**ELSA FAUGÈRE
ISABELLE MAUZ**

**THE TWO GOLDEN AGES OF BIODIVERSITY
EXPLORATION**

Professional and amateur naturalists ceaselessly explore forests, shores, rivers, oceans and other nearby or remote areas, under sometimes difficult or even dangerous conditions, to collect Orthoptera, Coleoptera, mollusks, plants, etc. Their work is amazingly painstaking and meticulous, which is why we decided to study them more closely. These individuals can spend hours sorting marine micro-mollusks using a binocular microscope, from time to time exclaiming loudly about their colours and beauty, or nights in damp tropical forests to record the humming of crickets and catch them. They can also spend years pouring over the collections of natural history museums and books of forerunners in order to identify and describe different species. They participate as professionals or amateurs in a scientific discipline called taxonomy or systematics. Each contributes in their own way to the inventory and classification of life in the wake of several centuries of natural history. Historians consider that the observation and description of life date back to antiquity, becoming a discipline in the 18th century with Linnaeus’s work (see in this issue: David Dumoulin and Guillaume Ollivier). The great colonial era voyages during which Europeans discovered the extreme variety of life forms enabled natural history to experience its first golden age. According to the systematists of the early 21st century, biodiversity exploration is experiencing a new golden age, this time set against a post-colonial sociopolitical backdrop.

150 years (from 1850 to the 1990s) separate these two golden ages, during which former colonies have become independent sovereign states, and new biology-related fields (physiology, biochemistry, genetics, embryology, etc.) have gradually become institutionalized and fully-fledged scientific disciplines (Allen, 1975; Mayr, 1982; Appel, 1988; Dean, 1980). Competing with more experimental biological disciplines, systematics has lost some of its scientific aura and standing. Throughout the 20th century, it was accused of not being scientific enough and its approaches deemed too descriptive and deprived of explicit theoretical hypotheses (Vernon, 1993, Agnarsson and Kuntner 2007, Dayrat 2005, Will and al. 2005; Barberousse and Samadi, this issue).

But for thirty years or so, international discussions and negotiations about biodiversity conservation in a postcolonial world have developed. These are characterized by a strong asymmetry in the geopolitical distribution of biodiversity – mainly present in Southern countries – and an equally strong asymmetry in the distribution of knowledge and technical and scientific means of studying and harnessing it – mainly present in Northern countries. This has put systematics back in the spotlight (Hine, 2008). This old life sciences discipline not only seems to have survived the harsh criticism it has undergone since the mid-19th century, it has been extensively revitalized by its practitioners. This dossier intends to give an overview of the numerous ways in which systematists have striven to renew their discipline.

Systematics is currently experiencing deep-reaching changes linked to several events:

- The discovery in the 1980s of the extent of scientists' ignorance of the magnitude of biodiversity,
- The hypothesis of the existence of a 6th extinction crisis of species attributed to human activities,
- The invention of a new technology for diagnosing species: barcoding.

In the 1980s, following an amazing experiment, biologists discovered the extent of their ignorance of specific diversity: in 1982, an American biologist, Terry Erwin, sprayed insecticide over an isolated tree in the Amazon forest and collected an unexpected number of species. The magnitude of specific diversity appeared far greater than what had been suspected so far. The idea that biodiversity should be investigated at a much faster pace gained ground:

“The naturalists' dream – to describe, inventory and exhaustively sort all living species – is becoming more distant. The disagreement over the order of magnitude (from 10 to 100 million species) indicates our incapacity to quantify the number of species. And finally, studying “specific biodiversity” requires far more force than that of isolated naturalists as they embark upon short missions in rich environments with meagre means.” (Le Guyader 2008 : 8, our translation).

Simultaneously, biologists discovered the threats bearing down on living species. During the national forum on biodiversity held in Washington D.C. in

1986, American conservation biologists raised the alarm about the biodiversity crisis. This had a significant impact in the media and political world. Biologists considered that biological diversity was disappearing so quickly that they could speak of a 6th extinction crisis without hesitation.

These discoveries led to several initiatives in the 1990s and 2000s, with the aim of solving two problems:

- the lack of scientific knowledge about the diversity of species;
- the weakness of conservation policies, compared to the threats of extinction facing biodiversity.

In the early 1990s, biologists considered that they faced a “taxonomic impediment” that considerably slowed down the still urgent production of new scientific knowledge about biodiversity, as well as an equally urgent need for new conservation policies:

“Paradoxically, despite the importance of the stakes, the pace of biodiversity exploration and description is ridiculously slow. At the current pace of knowledge advancement, 250 to 1 000 years would be necessary to achieve the biodiversity inventory required by decision makers, scientists and managers. This is precisely what the Convention on Biological Diversity calls the “taxonomic impediment (<http://www.cbd.int/gti/>) (Bouchet, Le Guyader and Pascal, 2008, our translation).

During the 1990s and 2000s, numerous initiatives sought to overcome this impediment. They can be divided into two groups:

- Governmental and non-governmental international institutional arrangements (such as the Global Taxonomy Initiative, the Global Biodiversity Information Facility, the European Distributed Institute of Taxonomy, the Consortium for the Barcode of Life, etc.) sought to modernize taxonomy using genetics, on the one hand, and modern technologies for entering, handling, disseminating and storing information, on the other hand. By transforming systematics into a cyberscience (Hine, 2008) the aim was to renew and boost the systematists’ global networks. The use of genetics changed the way species were diagnosed¹;
- Large naturalist expeditions, supported notably by private foundations, gathered together more than a hundred participants using a wide array of techniques for sampling, collecting, inventorying and exploring subterranean, terrestrial and marine biodiversity.

Since 2010, estimates of the magnitude of biodiversity have been substantially revised downwards, thanks notably to the results of large naturalist expeditions.

¹ Following the success of the Santo 2006 expedition in the eyes of academia and the media, the organizers (The National Museum of Natural History in Paris, the Pro-Natura International NGO and the IRD (research institute for development) launched a ten-year programme for to explore biodiversity *hot spots* in the South entitled “The Revisited Planet”. About the current renewal of naturalist inventories, see (Mauz, 2011).

Several authors – some of whom participated in these expeditions to collect species – claim that the total number of species living on earth amounts to some 6 million, which is very far from the high estimate (100 million) and even from the low estimate (10 million). These results suggest that the naturalists' dream – to describe, inventory and exhaustively sort all living species – may well be realized. Claiming that it is possible to describe all living species within one generation is an extremely strong message for science, politics, and the media. These studies also show that the idea of the biodiversity crisis, conveyed by the systematists themselves, needs to be refined: there have never been more systematists than there are today and they have never described as many species per year. According to one of the organizers of large naturalist expeditions, educated as a botanist, the problem, if any, does not come from the total number of systematists but from the discipline's organization. This suffers from a lack or absence of specialists in some taxa of terrestrial and marine invertebrates.

THE DOSSIER: DISCIPLINING SYSTEMATICS

Systematics is thus subject to a series of debates, controversies and changes regarding the scope of its task, the technologies and competences it needs, its partnerships with public and private institutions, its internal organization, and its status and relationships with the other disciplines involved in knowing and conserving life. The debates and criticism concern its very existence as a scientific discipline. Now, what is a discipline?²

“Albeit very old, the term “discipline” was used only recently to designate a principle of research specialization that intends to be both logical, through its reference to a unified theory of intelligibility, and functional, through its principles of knowledge diversity organization. The “system of disciplines” then seems to replace the language of the organization of knowledge and know-how into “specialties” or “professions”, in order to cover the “natural” range of sciences and arts, using an encyclopaedic conception of knowledge as justification. In the European history of scientific institutions, the institutionalization of a new signage system, the unification of nomenclatures of scientific communication and the distribution of knowledge into a sensible form of classification were adjusted through a long professionalization process of scientific activities.” (Boutier, Passeron and Revel (dir.), 2006, our translation)

Following the seminal article by Mullins (1972), numerous studies have focused on the emergence of new scientific specialties. The scientific and social conditions favouring this emergence, as well as the stages through which a new

² See (Jean-Louis Fabiani, 2006) and all the articles of the issue *Enquête* n°5, devoted to the question: What is a discipline? (J. Boutier, J.-C. Passeron, J. Revel, (dir), 2006).

discipline passes until it becomes “mature”, are thus well known (Law, 1973; Johnston & Rabbins, 2011). The case of systematics raises a different question, which we intend to address and clarify in this dossier: what conditions enable a scientific discipline to be preserved over time even when it has a “low academic status”³? Indeed, systematics has long struggled to be seen as a fully-fledged discipline. In their struggle to confirm the scientific status of their discipline, systematists have explored many different possibilities or avenues, some of which are presented and analyzed in this dossier.

Undoubtedly, the avenue that has been most explored by systematists and studied by science and technology studies is the use of new technologies, whether information and communication technologies (Hine, 2008; Wheeler, 2008; Hagen, 2001; Scoble, 2008) or molecular biology technologies (Meier, 2008; Strasser, 2011, 2012; Strasser and Chadarevian, 2011; Waterton, 2010; Ellis, Waterton and Wynne, 2009; Ellis, 2008). In this issue, it is precisely the ever tighter relationships between morphological systematists and molecular systematists that Isabelle Mauz and Elsa Faugère seek to document in their article. Drawing on the case of barcoding, they analyze the practical ways in which scientists, here i.e. molecularists, seek to enlist other scientists, i.e. morphologists, in their research activities. While collaboration between scientists has been thoroughly investigated in social studies of science, the practical modalities of this enlistment process have been brushed over. This article aims to address this gap.

A second avenue, which can be termed scientific or epistemological, consists in showing the theoretical dimensions underpinning systematists' practices. These are based on the theory of evolution and allow hypotheses to be put forward about the structure and evolution of biodiversity (Agnarsson and Kuntner, 2007; Dayrat, 2005; Will and al., 2005). By insisting on the theoretical aspects of systematics, generally masked by its adversaries, the discipline's proponents also hope to enhance the particularly low impact factors of the discipline's scientific journals and render it more attractive to young researchers (Agnarsson and Kuntner, 2007). Two texts explore this second avenue, that by David Dumoulin and Guillaume Ollivier, and that by Anouk Barberousse and Sarah Samadi.

The article by David Dumoulin and Guillaume Ollivier opens the dossier and dives into the long history of taxonomy-systematics. It questions its disciplinary boundaries and the shifting uses of the two terms. Through an approach inspired by the sociology of professions, the authors then study the role played over the last thirty years by a learned society, the French Society of Systematics, as it has attempted to save the discipline from a crisis situation. In the conclusion to their article, they underline the mixed results of these French efforts and the existence of new professional dynamics pervading more international arenas.

3 According to the qualification used by systematists at different times in the discipline's history (see Tancoigne, 2011).

The article by Anouk Barberousse and Sarah Samadi leads us into the storm of taxonomy, by presenting the sometimes harsh criticism targeting its status. Taxonomy is indeed often considered a mere investigation technique serving sciences such as ecology rather than a science in its own right with its own research questions and hypotheses. Excluded from current biology by some of its opponents exasperated by the slowness of its methods and practices in the context of the 6th extinction crisis of species, taxonomy explores new and faster means of identifying and describing species through molecular biology. Combining their perspectives as philosopher and biologist, the authors remind us of the importance of this discipline suggesting that it should be seen as the cornerstone of the production of knowledge about life, which hence enables other biological disciplines to lay their own foundations.

The third avenue followed by systematists struggling for their discipline's recognition and development is social and political. It consists in leading the discipline out of its academic setting by enlisting a diversity of partners who must be convinced of the discipline's interest. Numerous amateurs have long been among these partners. They make it possible to compensate, at least partially, for the weakness of academic recruitment and contribute to the discipline's dynamism (Kohler, 1991, 2006; Charvolin, 2009; Charvolin, Micoud and Nyhart, 2007; Lawrence and Turnhout, 2010; Faugère, 2012).

This third avenue closes the dossier with the ethnographic text by Dan Podjed, which is devoted to amateur ornithologists in Slovenia. Drawing on a survey of the Bird Observation and Study Society of this country, the author shows how Slovenian amateur naturalists have thoroughly changed the way they go about things and work together over the last fifty years. Influenced by the nature protection movements that emerged in the 1990s, these amateur ornithologists have shifted from a classical taxonomic approach to an ecological approach and, in so doing, from a very individual observation of birds to a collective method.

But leading the discipline out of its academic setting does not only mean enlisting amateurs. It also means convincing other types of stakeholders of the importance of the taxonomic endeavour. Now and then in the history of systematics, journalists, sponsors, managers and ethnologists have also been attracted to and interested in the scientific and social challenges of exploring and inventorying biodiversity (Kohler, 1991; Mauz, 2012; Faugère, 2008; Faugère and Louafi, 2011; Faugère and Pascal, 2011). This will be attested through the remainder of this article.

The results of these ever-renewed efforts are mixed but show the discipline's real dynamism. While systematists themselves consider that the academic status of systematics remains relatively low, systematics does continue to exist, attract young people, and evolve thanks notably to the permanent efforts of its practitioners to establish it as a science. From this perspective, systematic seems to be constantly working on self-maintenance, which questions the notion of "mature science". It is thus some of these approaches to renewing an old and marginalized discipline that this dossier aims to explore through these four

articles. They show systematists' repeated and long-standing efforts to boost their discipline: the creation of the French Society of Systematics, the claim that scientific questions and hypotheses exist in this field, the resort to molecular biology, the shift from individual practices to collective practices can all be read as attempts at renewal. Systematists have explored yet another avenue: the establishment of new relationships with human and social scientists. This avenue is demonstrated by the surveys we carried out, the very making of this dossier and the remainder of this introductory article.

POLITICIZING SYSTEMATICS AND ENLISTING SOCIAL SCIENCES

The sociopolitical context of the new golden age of biodiversity exploration mentioned by systematists is very different from that of the colonial era. Western systematists now have to comply with rules and procedures that vary from one country to the next, in order to have access to biodiversity in Southern countries, which hold the largest part of the diversity of life and constitute a genuine pool of species to be discovered. These new rules governing access to biodiversity stem from the Convention on Biological Diversity that was signed in Rio in 1992. This important international convention made a major change to the very status of life by considering that biodiversity is not part of humanity's common heritage accessible to all, but national property belonging to each state and its people (Aubertin, 2005; Aubertin, Pinton and Boisvert, 2007). The 1980s were characterized by the development of biotechnologies and the expansion of intellectual property rights on life (Aubertin, Pinton and Boisvert, 2007). From then on, the idea has gained ground that biodiversity would be the "green gold" of Southern countries. Systematists' explorations and collections of species in these countries have thus unfolded in an international atmosphere wary of the real goals of Western scientists.

The stakes of social sciences in the Santo 2006 expedition

Facing political and administrative difficulties and new procedures and rules governing access to biodiversity in Southern countries, the organizers of large naturalist expeditions decided to open "their" expeditions to social scientists. This opening had two aims: on the one hand, to provide a better understanding of the stakes and sociopolitical machinery of the expeditions and, on the other hand, to help manage bioprospecting issues. In 2004, following the Panglao expedition in the Philippines, Philippe, one of the organizers of large expeditions, started preparing a new and unprecedentedly large expedition in Vanuatu, bringing together marine and terrestrial biologists (more than 150 participants

from 25 countries). Philippe then decided to invite social scientists to join the adventure, in order to carry out two types of studies:

- studies in ethnoscience on local representations of biodiversity, with an ethno-pharmacological part explicitly including bioprospecting;
- a study of the expedition itself and its political, financial and scientific dimensions.

However, during a preparatory mission carried out in October 2005 by the expedition's organizers, the Vanuatu government was reluctant to agree to the ethnological study, suspecting that its real aims were those of bioprospecting or even biopiracy. "Southern countries are convinced that Northern countries plunder local know-how to discover new medicine", says Philippe. This ultrasensitive issue jeopardized the whole expedition (Morin, 2006). Facing the government's reactions, the organizers cancelled the ethno-pharmacological part of the expedition and excluded the ethno-pharmacologist responsible for its implementation⁴. The other ethnological approaches dealing with how scientists and local populations grasp and know biodiversity and focusing on the scientific expedition itself were nevertheless maintained. In addition to the four ethnologists participating in the Santo expedition, a specialist in law and an economist were also invited as observers to focus on access to biodiversity and the sharing of benefits issues.

For the organizers, the enlisting of the ethnologists and the two specialists in access to biodiversity and benefit-sharing was essential. Indeed, in the current international context, there are substantial tensions between those who defend countries providing biodiversity (i.e. Southern countries and their "indigenous and local communities") and those who want access to that biodiversity, for scientific reasons (e.g. the biologists of the Santo expedition) or commercial reasons (bioprospecting for medicine, cosmetics and agro-food purposes). Ethnologists have generally taken sides with indigenous and local communities. With regard to this "new indigenous issue", voices were raised as early as the 1980s. Ethnobiologists especially were immediately active in defending the rights and interests of the indigenous and local populations of Southern countries when it came to biodiversity in particular and natural resources in general. The goal was to defend these populations against Western scientists and multinational companies charged with studying or plundering the biodiversity of Southern countries without giving anything in exchange.

In this international debate, ethnologists have generally acted as spokespersons for indigenous peoples and Southern countries, thus appearing to act as the opponent of natural science researchers. The Santo expedition's organizers pointed to the fact that some aspects of the Convention on Biological Diversity did not reflect the reality of their job as academic researchers in

4 For a detailed account of the trials and tribulations of the Santo 2006 expedition, see (Faugère, 2008; Faugère and Louafi, 2011).

systematics. They sought to convince the ethnologists, economists and law specialists involved in the expedition of this lack of correspondence.

Relationships between systematists and social scientists – mixed success

From the outset, the expedition organizers and participants took the gamble of trusting the social scientists, treating them as full partners. They enabled the social scientists not only to participate in the expeditions, but also to attend and record preparatory meetings, access all email exchanges relating to the Santo 2006 expedition, as well as political and administrative documents (conventions, memorandum of understanding, etc.), participate in meetings with the countries' political and administrative authorities, etc. They expected the social scientists to return this trust and to treat them as co-workers rather than mere providers of research material. Under these circumstances, the conflict triggered by some of the social scientists' research practices became sufficiently serious to jeopardize all the relationships between the systematists and social scientists as well as the very team formed by the latter.

The making of a documentary film about the Santo inhabitants' perspectives on and reactions to the expedition particularly irritated and outraged the organizers, who felt betrayed. More than the content of the documentary itself, it was the organizers' acute sense of betrayal that eventually destroyed all relations with the documentary's author and generally undermined relations with the ethnologists for a considerable period of time. Betrayal is a strong word, with heavy moral and emotional connotations. It must be heard and taken seriously, for morals and emotions take up much room in field and travel sciences like systematics (Kohler, 2006) and ethnology. The emotional focus was on two issues, which proved to be particularly sensitive for both the systematists and the social scientists in all of their interactions:

- the issue of delivering results and compensating local populations;
- the issue of field and data access.

Contemporary empirical social sciences (Mariangela Rossi, this issue) and natural field sciences have difficulty dealing with the particularly sensitive issues of providing local populations and host country with compensation and delivering research results.

In a connected world, any interviewee, whether a systematist or a member of an isolated tribe, can have access to social scientists' publications and find out in real time how they are being presented and analyzed. The delivery of research results incurs risks for the interviewee, whose reputation may be damaged through a publication or film, but also for the social scientist, who might lose access to their field if their "research subjects" dislike them or their publications.

The sharing of benefits with indigenous and local populations is an important issue in international texts on biodiversity conservation: article 15 of the Convention on Biological Diversity (1992), Bonn guidelines⁵ (2002) and Nagoya Protocol⁶ (2010). The organizers of the Santo 2006 expedition have always claimed to strive to respect the CBD's spirit in general and the question of benefit-sharing in particular. Considering that their budget did not enable them to offer financial compensation (e.g. royalties), they chose to launch training activities for local students, a number of whom participated in several naturalist parts of the expedition. Nearly all the participants in the Santo expedition contributed to a book edited by the organizers and published in 2011 (Bouchet, Le Guyader and Pascal, 2011). In June 2011, Philippe went back to Vanuatu to deliver the results and disseminate this book so that it could be used to teach biology in the archipelago's schools. In addition to this book, the expedition funded the repair and restoration of a boat, the Euphrosyne, meant to be used for the transport of medicine and other products to Santo's remote and inaccessible parts.

Beyond the Santo expedition, criticism relating to compensation focuses on the difficult and complex issue of sharing the benefits with local populations as well as the more general issue of delivering research outcomes. To what extent can researchers, be they biologists, ethnologists, archaeologists or linguists, be asked to carry out social and local development work as compensation for their academic research?

Relationships, attachments and tensions between social scientists and systematists

Trust in social scientists, already damaged by the Santo affair, was again compromised by tensions in the Atimo Vatae expedition in Madagascar. We sought to re-establish trusting relationships as this was a prerequisite to continuing our research through large contemporary naturalist expeditions. We also felt morally and emotionally engaged with the organizers who had accepted our surveys. We also thought that this was heuristic. We therefore tried to deliver our results in a more collaborative manner: we invited interviewees to react on work in progress (Mauz, 2013), we co-authored scientific articles (Faugère and Pascal, 2011) (see in this issue the article by Anouk Barberousse and Sarah Samadi), and we invited interviewees to contribute to special issues (Puillandre, 2012) and seminars.

However, the drafting of the article by Isabelle Mauz and Elsa Faugère (this issue) points to the difficulty of more collaborative relationships being established between systematists and social scientists. We had initially planned

5 Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising out of their Utilization, <http://www.cbd.int/doc/publications/cbd-bonn-gdls-en.pdf>.

6 The Nagoya Protocol on Access and Benefit-Sharing, <http://www.cbd.int/abs/>

to include in this dossier one or two articles by systematists about themselves and their work, considering that an endogenous perspective on ways of producing knowledge would be totally relevant to our approach. We received a proposal from a young systematist who intended to write an article about molecular technologies and barcoding. We had several exchanges about the need to render the text more sociological, since it was to be published in a social science journal. We then jointly decided to modify the initial project and hold an interview that would enable the systematist to relate his trajectory and his work methods based on molecular biology. As the journal was willing to accept this type of format, we performed and transcribed this interview in May 2012. We then tried to write a text that was very close to what the interviewee had said while at the same time shedding a sociological perspective on the content. After several attempts, we finally opted to return to a more classical sociological article, as can be seen through this issue. We then suggested that he co-author this article but he declined our proposal because he felt that parts of the text did not reflect his thoughts properly. We had therefore failed to share the work of problematization and writing. During a seminar on shells organized in order to finalize a special issue in *Techniques & Culture*, Philippe, one of the expeditions' organizers, also declared that our publications did not correctly reflect his work. According to him, we had failed to account for the systematists' work of knowledge production.

More generally, the articles in this dossier bear witness to the multiple relationships established between systematists and social scientists over the last years. The articles by Anouk Barberousse (philosopher) and Sarah Samadi (biologist), Isabelle Mauz (sociologist) and Elsa Faugère (ethnologist) result from experiments and attempts to weave new types of relationships between social scientists and systematists, and not consider the latter as mere research subjects. As mentioned above, systematists themselves have played a key role in these experiments, at different stages of the process. In some cases (Elsa Faugère), it is they who, for political and administrative reasons, proposed to act as research subjects for the social sciences and sought to enlist ethnologists to study the local and vernacular representations of biodiversity in the regions where they were performing their scientific inventories. As already mentioned, this opening sometimes led to tense relationships and long-lasting conflicts with the ethnologists and among the ethnologists themselves. The outcome of this type of collaboration is thus very mixed.

In other cases (Isabelle Mauz), it is the sociologist alone who decided to study the practices of naturalist inventories, drawing on the case of the All Taxa Biodiversity Inventory in the Mercantour national park (France). This spontaneous initiative was much welcomed by the systematists and staff of the national park who facilitated the survey by organizing encounters in the field and easily accepted the idea of semi-directed interviews. The study was even included in the final presentation of the inventory (Mauz, 2012) and the interviewees contributed to the analysis work by accepting to react to articles in the making.

EMOTIONAL AND MORAL ECONOMIES OF FIELD SCIENCES

To renew their discipline, systematists have thus explored a number of avenues, including collaboration with human and social sciences. The surveys on which some of the following articles draw and the very making of this dossier show that this avenue offers a certain degree of satisfaction and pleasant surprises for both parties, as well as difficulties, the risk of misunderstandings, disappointment and conflict. Moreover, the potentially chaotic character of the relationships between systematists and human and social scientists sheds light on their respective methods for delivering their results, compensating local populations and accessing research fields. It also underlines the importance of (positive and negative) emotions in establishing and maintaining collaboration.

Both systematists and social scientists practice field sciences and must find ways to access field data. In all the situations we studied, systematists had to negotiate access to the field. In the case of the naturalist expeditions in Southern countries, they spent a lot of time negotiating with governments. The context was sensitive owing to the weight of the economic and political stakes involved in accessing natural resources and producing knowledge about these. In the case of the Mercantour ATBI, the systematists had to accept the conditions of the national park if they wanted to be authorized to collect specimens. They also had to pledge to provide the national museum of natural history with specimens and to deliver reports to the park in order to have their mission costs fully reimbursed.

Social scientists do not (yet?) have to comply with such rules, at least in France – things are known to be different in Anglo-Saxon countries. But we have seen that their relationships with the systematists they take as research subjects can be complicated and tense. In some cases, social scientists have not participated in books that would necessarily be read by interviewed systematists, fearing that the retaliation would go as far as forbidding access to the field. The issue of access to the field, agreements and negotiations with interviewees – whether systematists, inhabitants of Santo or Madagascar – and the obtaining of informed consent is therefore very important for ethnologists and sociologists too.

Finally, opening up their fields to social scientists appears to be a potential resource for systematists as they strive to promote their discipline. But this resource is difficult to handle and can become a threat at almost any time. From the systematists' perspective, social scientists feel entitled to judge and criticize their colleagues' practices while refusing to have their own practices scrutinized and criticized and are therefore particularly-difficult-to-discipline partners. The initial gamble of trust can then be rapidly replaced by wariness or even rejection. From the social scientists' perspective, systematists are first and foremost, and sometimes exclusively, interviewees. However, we think it is essential to reflect on the moral and emotional economies underpinning

surveys that reject any control over the modalities pertaining to field access and delivery of results and that require sophisticated strategies to prevent “research subjects” from reading these results.

REFERENCES

- Agnarsson, I., Kuntner, M. (2007), Taxonomy in a Changing World: Seeking Solutions for a Science in Crisis, *Syst. Biol.* 56(3), 531-539.
- Allen, G. E., (1975), *Life Science in the Twentieth Century*, New York.
- Appel, T. A. (1988), Organizing Biology. The American Society of Naturalists and its 'Affiliated Societies', 1883-1923, *American Development of Biology*, R. Rainger, K. R. Benson, J. Maienschein (eds.), Philadelphia.
- Aubertin, C., Vivien, F.-D., (1998), *Les enjeux de la biodiversité* (chap 3 : Le sommet de la Terre et la CDB), Paris : Economica, 43-55.
- Basset, Y., Cizek, L., Cuénoud, P., Didham, R. K., Guilhaumon, F., Missa, O., Novotny, V., Ødegaard, F., Roslin, T., Schmidl, J., Tishechkin, A. K., Winchester, N. N., Roubik, D. W., Aberlenc, H.-P., Bail, J., Barrios, H., Bridle, J. R., Castaño-Meneses, G., Corbara, B., Curletti, G., Duarte da Rocha, W., De Bakker, D., Delabie, J. H. C., Dejean, A., Fagan, L. L., Floren, A., Kitching, R. L., Medianero, E., Miller, S. E., Gama de Oliveira, E., Orivel, J., Pollet, M., Rapp, M., Ribeiro, S. P., Roisin, Y., Schmidt, J. B., Sørensen, L., Leponce, M., (2012), Arthropod Diversity in a Tropical Forest, *Science* (338), 1481-1484.
- Boisvert, V., (2005), Bioprospection et biopiraterie : le visage de Janus d'une activité méconnue, in *Cahier du GEMDEV*, n° 30, 123-136.
- Bouchet, P., Le Guyader, H., Pascal, O. (2008), Des voyages de Cook à l'expédition Santo 2006 : un renouveau des explorations naturalistes des îles du Pacifique, *Journal de la Société des Océanistes*, (126-127), 167-185.
- Boutier, J., Passeron, J.-C., Revel, J. (eds.), (2006), Qu'est-ce qu'une discipline ?, *Enquête* 5, EHESS.
- Charvolin, F. (2009), Comment penser les sciences naturalistes « à amateurs » à partir des passions cognitives, *Natures, Sciences, Sociétés* n° 17.
- Charvolin, F., Micoud, A., Nyhart, L. (eds.), (2007), *Des sciences citoyennes ? La question de l'amateur dans les sciences naturalistes*, La Tour d'Aigues, L'Aube.
- Costello, M. J., May, R. M., Stork, N. E. (2013), Can We Name Earth's Species Before They Go Extinct? *Science* (339), 413-416.
- Dayrat, B. (2005), Towards integrative taxonomy, *Biol. J. Linn. Soc.* 85, 407-415.
- Dean, J. R. (1980), A Naturalistic Model of Classification and its Relevance to Some Controversies in Botanical Systematics 1900-1950, Ph.D. thesis, University of Edinburgh.
- Dumoulin, D., Rodary, E. (2005), Les ONG, au centre du secteur mondial de la conservation de la biodiversité, in Catherine Aubertin (ed.), *Représenter la nature ? ONG et biodiversité*, Éditions de l'IRD.
- Ellis, R. (2008), Rethinking the value of biological specimens: laboratories, museums and the Barcoding of Life Initiative. *Museum and society*, 6, 172-191.
- Ellis, R., Waterton, C., Wynne, B. (2009), Taxonomy, biodiversity and their publics in twenty-first-century DNA barcoding. *Public Understanding of Science*, 19, 497-512.
- Fabiani, J.-L. (2006), À quoi sert la notion de discipline ?, in J. Boutier, J.-C. Passeron, J. Revel (eds.), *Qu'est-ce qu'une discipline ?*, *Enquête* 5, Ecole des Hautes Etudes en Sciences Sociales, 11-34.
- Faugère, E. (2008), L'exploration contemporaine de la biodiversité. Approche anthropologique de l'expédition Santo 2006, *Journal de la Société des Océanistes*, (126-127), 195-205.
- Faugère E. (2012), Échanges de coquillages entre amateurs et professionnels. L'économie morale des sciences naturalistes, *Techniques & Culture*, 59 (2), 206-223.

- Faugère, E., Louafi, S. (2011), Le nouveau climat des expéditions naturalistes au sud. L'exemple de Santo 2006 au Vanuatu, *Revue Tiers Monde*, (207), 79-96.
- Faugère, E., Pascal, O. (2011), La fabrique de l'information. Le cas des grandes expéditions naturalistes contemporaines, C. Granjou, I. Mauz (eds.), *Les promesses de la biodiversité, Quaderni*, (76), 39-51.
- Hagen, J. B. (2001), The Introduction of Computers into Systematic Research in the United States during the 1960s, *Stud. Hist. Phil. Biol. & Biomed. Sci.*, vol. 32, n°2, 291-314.
- Hamilton A. J., Basset Y., Benke K. K., Grimbacher P. S., Miller S. E., Novotny V., Samuelson G. A., Stork N. E., Weiblen G. D., Yen J. D. L. (2010), Quantifying uncertainty of tropical arthropod species richness, *Am. Nat.* (176), 90-95.
- Hine, C. (2008), *Systematics as Cyberscience. Computers, Change, and Continuity in Science*, MIT Press.
- Johnston, R., Rabbits, D. (2011), The development of specialties in industrialized science. *The Sociological Review* 25: 87-108.
- Kohler, R. E. (1991), *Partners in Science. Foundations and Natural Scientists 1900-1945*, The University of Chicago Press, Chicago.
- Kohler, R. E. (2006), *All Creatures. Naturalists, Collectors, and Biodiversity, 1850-1950*, Princeton University Press, Princeton and Oxford.
- Law, J. (1973), The Development of Specialties in Science: The Case of X-Ray protein Crystallography. *Science Studies* 3: 375-303.
- Lawrence, A., Turnhout, E. (2010), Personal meaning in the public sphere. The standardisation and rationalisation of biodiversity data in the UK and the Netherlands. *Journal of Rural Studies* 26: 353-360.
- Le Guyader H. (2008), La biodiversité : un concept flou ou une réalité scientifique ?, *Courrier de l'environnement de l'INRA*, (55), 7-26.
- Mauz, I., (2012), La mise en circulation des objets scientifiques. Organisation pratique et changements de statut. Le cas des escargots patrimoniaux du Mercantour. *Techniques & Culture*, 59 (2), 224-241.
- Mayr, E. (1982), *The Growth of Biological Thought*, Cambridge, Mass.
- Meier, R. (2008), DNA Sequences in Taxonomy: Opportunities and Challenges, in Q. R. Wheeler (ed.), *The New Taxonomy*, CRC Press, 95-127.
- Mullins, N. C. (1972), The development of a scientific specialty: The phage group and the origins of molecular biology. *Minerva* 10: 51-82.
- Rodary, E., Castellonet, C. (2003), Les trois temps de la conservation, in E. Rodary, C. Castellonet, G. Rossi, *Conservation de la nature et développement : l'intégration impossible ?* Paris, GRET, Karthala, p. 4-64.
- Scoble, M. J. (2008), Networks and Their Role in e-Taxonomy, *The New Taxonomy*, in Q. R. Wheeler (ed.), *The New Taxonomy*, CRC Press, 19-31.
- Strasser, B. (2011), The experimenter's museum: GenBank, natural history, and the moral economies of biomedicine. *Isis*. 102, 60-96.
- Strasser, B. (2012), Collecting Nature: Practices, Styles, and Narratives, *Osiris*, 27, 1, 303-340.
- Strasser, B., de Chadarevian, S. (2011), The Comparative and the Exemplary: Revisiting the Early History of molecular Biology. *History of Science*, 49, 317-336.
- Tancoigne, E. (2011), *Évaluer la santé de la taxonomie zoologique. Histoires, méthodes et enjeux contemporains*, Thèse de systématique et évolution, Muséum National d'Histoire Naturelle de Paris, sous la direction d'Alain Dubois, Paris, 231 p.
- Vernon, K., (1993), Desperately seeking status: Evolutionary Systematics and the taxonomists' search for respectability 1940-60, *BJHS*, 29, 207-27.
- Waterton C. (2010), Barcoding nature: strategic naturalization as innovatory practice in the genomic ordering of things. *The Sociological Review*, 58, 152-171.
- Wheeler, Q. D. (ed.), (2008), *The New Taxonomy*, CRC Press.
- Will, K., Mishler, B. D., Wheeler, Q. D. (2005), The perils of DNA barcoding and the need for integrative taxonomy, *Syst. Biol.* 54, 844-851.

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