

**Symposium “Future trends of Taxonomy
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Report of the Brainstorming session

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As part of the symposium on "Future trends of taxonomy" commissioned by EDIT (European Distributed Institute of Taxonomy), a brainstorming session was organized to scope the development of taxonomy in the next decade taking into account the new technologies available, and the biodiversity crisis. The conclusions of the previous 2-day talk and round table sessions were used as a starting point and guideline for the debate. The brainstorming was centred on the opportunities and challenges offered by new technologies with potential use for taxonomy, and on a prospective of how the conceptual challenges faced by taxonomy would be addressed in the next years. The discussion was structured along the following main topics:

Access to technologies

Leading researchers in taxonomy are generally rapidly aware of the potential use of breakthrough technologies to foster their own research, but cannot get access to them until their use becomes widespread enough to be affordable. In order to enhance taxonomic work of excellence, efforts should be made to make possible a fast use of emerging technologies by researchers in at least large taxonomic institutions. The wide access for routine taxonomic work of well-established technologies (DNA sequencing, image analysis) to citizen scientists (amateurs) and taxonomists in advanced developing countries (ADCs) should be equally promoted.

Access to data

The goal of the taxonomic community should be the free and general access of the taxonomic data and primary literature, with a specific mention to the Zoological Records. To accomplish this it will be necessary to adopt and promote the common data structure platforms such as EoL (Encyclopaedia of Life), GBIF (Global Biodiversity Information Facility), and Genbank, as well as free access online to past and current taxonomic literature. The need to link the data to specimens (particularly types) through unequivocal identifiers, similar to the DOIs (Digital Object Identifiers) of common use for digital documents was also stressed. A problem to be considered is that of the long-term maintenance and updating of the databases.

Nomenclature

A consensus opinion among the attendants was that there is no urgent need for radical changes in the current nomenclatorial system (the botanical, zoological and microbial codes of nomenclature), with the periodic adjustments and improvements regulated by their own bodies. A special consideration was made to the nomenclatorial problems introduced by electronic-only publications. The regulation of the nomenclature of higher taxa (above genus-level) is something to be considered, but would need a wide consensus among the taxonomic community. The initiative of Zoobank should be strongly supported by EDIT and all taxonomic institutions, although the enforcement of

the registration, even if desirable as an ultimate goal, would also need the consensus of the taxonomic community. It was noted the introduced difficulty of naming and identifying in a reliable and repeatable way the molecular taxonomic units characterised in initiatives like the barcoding or DNA taxonomy.

Large-scale discovery programmes

The need for large-scale exploration programmes to discover the “unknown world” (an estimated 80% of the current diversity) was widely acknowledged. In particular, there is an urgent need to develop technologies for discovering and inventorying the “small world” (prokaryotes, single-cell eukaryotes and micro-metazoans), such as environmental sequencing or DNA taxonomy. Efforts should be made to overcome CBD (Convention of Biological Diversity) restrictions to taxonomic discovery by strongly supporting the second point of the Buffon declaration (Paris, October 2007), i.e. promoting the facilitation of non-commercial biodiversity collecting and the movement of specimens, was strongly supported. The final goal should be granting free access to the biodiversity for taxonomic purposes (i.e. non-commercial). There is also a need to increase the involvement of ADCs local taxonomists and Institutions in the process of discovering and inventorying the biosphere, as most of the unknown diversity is found in tropical areas.

Training

There is a general lack of data as what is the real status of the funding and training of taxonomy in Europe. A plea was made to compile information on e.g. how many taxonomic PhDs are awarded, which groups are under risk of becoming “orphans”, how many taxonomic positions are made available, or how the existing taxonomic knowledge could be transmitted to future generations. There is also the question of what do we want to train taxonomist for, with the need of separating the training of taxonomy as a tool for identification, or the training (and employment) of taxonomic scientist for studies in an evolutionary framework. The important role of citizen scientists and of local taxonomists in ADCs should be recognised, and EDIT institutions should promote the collaboration and training of this invaluable resource. The taxonomic institutions should also promote the regular updating of their own taxonomists, so they could take advantage of new developments both technological and conceptual.

Raising the profile of taxonomy

Raising the profile of taxonomy seems to be a necessity to be able to fully develop its potential as a 21st century science. This has to be accomplished both as a science, among the scientific community and funding agencies, and as a supporting service, among stakeholders and the general public.

What's next? –Agenda for the future: specific recommendations to EDIT & participating institutions

In the confidence that networking, integration, and visibility to stakeholders of European taxonomists is being achieved successfully through initiatives already ongoing under the umbrella of EDIT, it would be desirable that in the next future EDIT could support as part of its mission the creation of follow-up groups to study the best strategies to develop and ultimately implement the following recommendations:

1. To ensure training of excellence in taxonomy:
 - Compile a “diagnosis” of taxonomic training and transfer of expertise in Europe
 - Establish a career design (from training to employment) for future European taxonomists
 - Support the possibility that large museums award PhDs in taxonomy
 - Promote interdisciplinary training

2. To ensure research of excellence in taxonomy:
 - Promote taxonomic research as an EU scientific priority, with policies being directly designed by scientists under scientific criteria (bottom-up approach like US NSF).
 - Establish specific criteria for the scientific evaluation of taxonomic excellence
 - Make possible fast access of leading taxonomists to breakthrough technologies as well as of citizen scientists and taxonomists in ADCs to well-established technologies.
 - Support and promote large-scale sampling expeditions.

3. To ensure access and integration of taxonomic information:
 - Actively promote and support *Zoobank* and other systems of taxonomic data integration on the web
 - Explore the possibility to make taxonomic information (e.g. Zoological Records, primary literature) truly freely available to the wide taxonomic community

Participants:

Chair:

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Speakers:

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