POINT OF VIEW

Capacity building in taxonomy and systematics

Gideon F. Smith & Estrela Figueiredo

H.G.W.J. Schweickerdt Herbarium, Department of Plant Science, University of Pretoria, Pretoria, 0002 South Africa / Centre for Functional Ecology, Departamento de Botânica, Universidade de Coimbra, 3001-455 Coimbra, Portugal; smithg@sanbi.org (author for correspondence); estrelafigueiredo@hotmail.com

Needs-driven capacity building is required as a matter of urgency to overcome the present lack of taxonomists and systematists who are skilled in natural history and collections. This must necessarily include the training of the next generation of taxonomists, appropriate leadership for natural history collections and the involvement of practicing taxonomists to change the perception of taxonomy by decision-makers.

KEYWORDS: capacity building, systematics, taxonomy

NEED FOR TAXONOMISTS WITH A NATURAL HISTORY BACKGOUND

Today all spheres of life, it would seem, are burdened by a clutter of catch phrases. Taxonomy and systematics have not gone unscathed and one of the most regularly raised topics in the hallowed halls of herbaria and natural history collections is *capacity building.* The intention is mostly to act on the need—or, more accurately, the *imperative*—to ensure that there will be a next generation of taxonomists who are able to discover, study, document, describe, name, and cast into a classificatory framework, components of the living world. And, of course, quite justifiably this has to be the most basic aim of capacity building.

In addition to ensuring the emergence of a cadre of systematists appropriately skilled in herbarium- and museum-based collections methodology as well as laboratory techniques, emphasis must increasingly be placed on training in natural history. There is a dire need for systematists who can interpret the results of their scientific endeavours *in a natural history framework.* Systematists with a firm understanding of interpretive taxonomy therefore who are able to generate biodiversity data and information and package them into various knowledge parcels to respond to the needs of end-users and enable a sustainable relationship with the living world (Smith & al., 2008). Twenty years ago, if a molecular biologist required the collaboration of a taxonomist, there was a large group from which to select. The wheel has turned though, and increasingly molecular systematists are experiencing difficulties when the inevitable taxonomic input is required in their work. Of course, taxonomists need to be trained and skilled in aspects of natural history during their formative years in early and senior tertiary education. But who will do this if the university lecturing staff had no training in taxonomy? Lecturers are unable to teach taxonomy, the students they deliver are uncomfortable (and therefore inevitably disinterested) in taxonomy. Following their academic training, the students are often employed in collections but unable to identify material and reluctant to get to know the unknown (read: living and preserved) material. A vicious, downward spiral. Or are we well and truly headed towards a situation where natural history-educated taxonomists will increasingly originate as highly-skilled amateurs from society at large? They will be self-taught and undoubtedly make high-impact contributions to taxonomic knowledge. Is this sufficient though?

CAPACITY BUILDING IN SCIENTIFIC LEADERSHIP

It has been acknowledged by the Convention on Biological Diversity (CBD) that a *taxonomic impediment* is hampering its implementation by participating (and other) countries (Klopper & al., 2002). This impediment consists of a lack of taxonomists and identification tools, and difficulties in accessing information. To remove or reduce it, the Global Taxonomy Initiative (GTI) was launched in 2002 (Smith & Klopper, 2002). Some progress has been made, particularly in the electronic dissemination and access to both specimen and species information. However, seven years later the impediment still exists and in fact appears to have been exacerbated, with taxonomic expertise still lacking globally (see, for example, the report on Systematics and Taxonomy in the United Kingdom at http://www.publications.parliament.uk/pa/ld200708/ldselect/ldsctech/162/162.pdf). It goes without saying that efforts to build capacity in these activities must be diversified and intensified.

Is securing the next generation of taxonomists really the only capacity that has to be built in systematics? Certainly not. A second group requiring urgent and intense building of capacity (including an understanding of, and appreciation for, collections of preserved biodiversity artefacts held in herbaria and natural history collections) are the Directors, soon-to-be-Directors and Research Managers of institutions that hold or are custodians of natural history collections. A new generation of leaders are being appointed to lead these institutions and many have a background that excluded comprehensive exposure to the significance of collections and collections-based research. Importantly, a situation must be prevented where collections are perceived as an unfortunate drain on already dwindling resources.

It is usually the institutional Directors, not the scientists, who interact with their governmental and political peers. They therefore represent the first port of call when policy makers and implementers require information to inform environmental decision-making. Although requests for such information are usually cascaded down the institutional command chain, it is critically important that Directors understand, and credit, that which can be provided by taxonomists and generated from collections, including associated e-products.

Earlier in the first decade of the 21st century, when the taxonomic impediment was being mooted, it was proposed from several quarters that the way forward was to transform institutions holding biological collections by adapting them to more closely resemble companies faced with a market-driven economy. Taxonomists were criticised for failing to bring real fiscal value to institutions, and were perceived as being a financial burden. Why did they not charge handsomely for identifications and extracting information from their databases? This mindset often led to the appointment of business people or marketing-oriented non-scientists as senior managers in charge of biological collections. As in business, new paradigms were applied that changed the original purpose of these institutions. It was expressed in a pervasive jargon where words such as maximization of productivity, five-year strategic plans, annual business plans, integrated system models, cross-cutting activities, rapid computerization of primary and meta-data, management of internal conflict and dissent, were common. The taxonomist's expertise was no longer considered an invaluable service to society, but much rather a product to be marketed. Natural history museums and herbaria as institutions to which a young person interested in natural history could take a specimen for identification and maybe meet an expert and see the museum behind the scenes and later become a taxonomist, began to disappear. Enter a new era in which the real content and purpose of the collections have been replaced with a fairground where selling services and products are some of the top priorities and the scientists are nowhere in sight.

If research in taxonomy is to be led by financial experts, sales people and marketing strategists instead of creative scientists, it cannot be expected that the taxonomic impediment will ever be removed. In other areas of science this change of leadership is being held responsible for the decline in quality scientific output (see for example the much discussed recent decline in the U.S.A.'s scientific credibility, which appears to be due partly to the appointment of non-scientists to positions of authority over scientific institutions and policy (e.g., http://www.scienceblog.com).

The change of leadership did not result in any progress with overcoming the taxonomic impediment. Taxonomic expertise did not increase, on the contrary, the decline became more accentuated. The one aspect of the impediment that seems to be improving, namely access to information, appears to be a consequence of initiatives that emanated from bureaucrats, not institutional leaders. In fact, the new non-scientist institutional leaders with their vision of profiteering from information often prefer not to release data freely for the benefit of the world (as has been done by taxonomists for centuries) but to sell it instead. Some new Directors have been toying with the idea of putting a price on information held in natural history collections. The barrier to data release which is so often blamed on individual scientists, lies, in fact, in the hands of ill-informed leaders who object to signing the necessary authorisations and agreements as they see data release as a loss to their institution ('information is power') if there is no monetary pay-off.

CAPACITY BUILDING FOR PRACTISING TAXONOMISTS

We have at our disposal several international vehicles: the GTI, regional networks (e.g., in BioNET), previously successfully implemented networks such as the Southern African Botanical Diversity Network (SABONET), the African Plants Initiative (API), the European Distributed Institute for Taxonomy (EDIT), and several more. But we must not allow ourselves to be lulled into a false sense of security. These bodies seem to be insufficiently used and inadequate on their own to advocate the value of collections and natural history-based research.

Essentially, we need taxonomists. Soon. Who else will construct keys to aid the identification of biological organisms? Identify and name organisms that are being barcoded? Describe new ones being identified through barcoding (or any other means for that matter)? Can we make scientifically based progress with, for example, informed conservation planning, while being unable to base

such decisions on comprehensive biodiversity complements? Ideally we should not. But it is happening. Even more reason why we as taxonomists cannot sit back and idly twiddle our thumbs. On the contrary.

Are we headed into a world where biological specimens—both living and preserved—can ultimately only be identified by machines? To a large degree this happened in arithmetic, with most school learners no longer able to do (even simple) calculations without a calculator. This may be deemed a time-saving improvement in mathematics, but can it be risked in natural history? And if in arithmetic the background reasoning required to derive an answer to a question may be less than relevant, in natural history it is not. Lacking knowledge of biological organisms, their environments and biology make them alien, often resulting in no appreciation of their role in ecosystem functioning. This does not bode well for the future where all components of biodiversity must be viewed as integral parts of the living world to which we all belong equally. In the long run this may have disastrous consequences for the conservation of biodiversity and for protection of the Earth. It is our view that taxonomists must fight this trend. Even though we are often known to be rather introspective, non-communicative and less-than-perfect in emphasising the importance of our science outputs, who are better positioned to market our critical value to science and society than ourselves? Therefore, the third group whose capacity in science advocacy requires *immediate* building, is the practising taxonomists themselves.

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