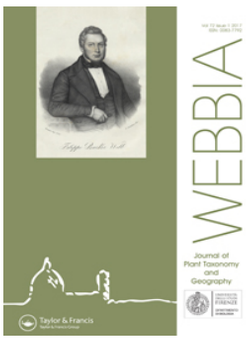

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Past, present and future in tropical botany: taxonomy, data archiving and genomics

R.M. Baldini

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FOREWORD

Past, present and future in tropical botany: taxonomy, data archiving and genomics

A Symposium organized by Centro Studi Erbario Tropicale-Tropical Herbarium FT of the University of Florence and held at the Auditorium of "Fondazione Cassa di Risparmio di Firenze" in Florence on 21 October 2016

In the last few years we have seen an incredible increase of knowledge in plant systematics, especially due to molecular investigations at any taxonomic level. The first outcome has been a "revolution" in the interpretation of traditional taxa with the consequence that, many times, we are astonished and do not recognize what we studied as young students. Perhaps for this reason, today, the job of the plant taxonomist requires some courage and patience. Since 1753, when Linnaeus' *Species Plantarum* was published, even though the inclusive and hierarchic Linnaean method is still valid, or at least, still used, except for the obvious abandonment of the Latin, our vision of plant taxonomy has definitely changed. Phylogenetic relationships are viewed from a different perspective, focused on global and interdisciplinary goals. One of the main aspects of plant taxonomy comprises the assembling of huge amounts of historical information and the latest acquisitions of molecular phylogenetic investigations. We cannot ignore any type of information if we want to try to bring order to the apparent chaos of Nature. This last aspect is becoming essential for the new generations of systematic botanists, often dedicated to research that goes beyond basic historical, nomenclatural and taxonomic information. This Symposium is intended as a continuation of that held in Copenhagen (19–21 May 2015) at The Royal Danish Academy of Sciences and Letters titled "*Tropical plant collections: legacies from the past? Essential tools for the future?*". The beneficiaries of the Symposium presented here were mostly young students interested in plant taxonomy, or in systematics, as a tool for understanding nature, in a context of integrated information systems.

Hence the title of the Symposium: "*Past, present, and future in tropical botany: taxonomy, data archiving and genomics*". For this purpose, it was interesting to compare various standpoints on different subjects, from the organization of basic taxonomic and nomenclatural information and its availability at a global level, to various examples of taxonomic investigations in the Tropics that still rely heavily on historical information, through new methodologies in herbarium genomics and finally to herbarium data archiving as a new frontier for a widespread diffusion of the important data contained in herbarium collections.

The Symposium, after the introduction by the Academic Authorities of the University of Florence and the Cassa di Risparmio di Firenze Foundation, began with the talk by Ib Friis from the University of Copenhagen, who provided a detailed historical review titled "*Old tropical botanical collections: how to improve their availability, comprehensibility and use in modern taxonomy*". This report has been a very good opportunity to demonstrate the importance of old botanical collections in modern taxonomy, which has been totally forgotten or underestimated in many recent investigations. Ib Friis introduced the need for an integrated system of management of old botanical collections to make them more available either in traditional monographs or in phylogenetic molecular studies. He also illustrated a new method of digitization of herbarium specimens comprising a conveyor-based scanning of specimens, surely an important development in herbarium management, but with some limitations, such as its high cost that covers indiscriminately the entire collections in a herbarium, when, an alternative solution would be to assign the digitization to well-defined specimens such as types, and historical material as well.

The following talk was given by Fred Stauffer of the Conservatoire et Jardin Botaniques de la Ville de Genève, with a talk titled "*Past, present and future of West African palms (Arecaceae) studies*". Also in this second talk by F. Stauffer, the connection between past and present was treated with a future perspective, opening new horizons in a complex topic such as the taxonomy and biogeography of African palms and their economic importance.

Jenny Menjívar from the Museo de Historia Natural de El Salvador introduced us to the state of the art of the knowledge of El Salvador flora, which is still in need of further in-depth analyses, and with an old and fragmentary research history. The talk titled *Desafíos de la Botánica en El Salvador* and here presented in English as "*Towards a better understanding of El Salvador flora*" pointed out the problems arising in studying and updating a flora in a territory subjected in past decades to dramatic socio-political events, as well as to a massive human settlement, and how much still has to be done for the knowledge of Salvadorian flora. Jenny Menjívar has shown with her enthusiasm not only that human and natural events cannot stop botanical research, but also how important it is to reorganize historical and current information for understanding and updating flora.

With Freek Bakker of Wageningen University, we have witnessed how herbarium specimens, including

Figure 1. The introduction of the academic authorities of the University of Florence to the Symposium: (from the left to the right) Riccardo M. Baldini, Marco Bazzicalupo, Pierluigi Rossi Ferrini, Paola Bruni and David Caramelli.

Figure 2. The participants attending the Symposium: in the front row (from the left to right), Otto Huber, Ricarda Riina, Freek Bakker, Fred Stauffer, Ernst Vitek, Ib Friis, Heimo Rainer and Jenny Menijvar.

historical ones, can be used in genomic studies. The talk titled "*Herbarium genomics: skimming and plastomics from archival specimens*" was a turning point in the Symposium. To imagine that an old historical specimen can be used in a genomic investigation opens new horizons in plant taxonomy. The amount of experimental data illustrated by

Figure 3. A moment during the Symposium: Ib Friis's illustrating his introductory lecture on "Old tropical botanical collections: how to improve their availability, comprehensibility and use in modern taxonomy".

Figure 4. A moment during the discussion in the afternoon between the speakers and the students.

Freek Bakker during his talk was very impressive; indeed, some days later, my students still appeared to be struck by the potential outcomes of this kind of research. The methodological and applied outcomes of herbarium genomics are fascinating and can lead to thoroughly rethinking the meaning and management of botanical collections.

Alessio Papini from the University of Florence, with a talk titled "*The phylogeny of family Bromeliaceae and the*

continental drift" illustrated how to interpret the global distribution of Bromeliaceae with special reference to their morphology, reproductive biology, and distribution in the Tropics as a result of a comparative synthesis of data: very stimulating from a methodological point of view.

The Symposium then ended with Heimo Rainer (we apologize but the text was not received by the Author), Naturhistorisches Museum, Wien, who presented a talk titled "*Botanical collections in modern research environments: the role of herbaria in the context of monographic and floristic studies past and present*", where all methodological aspects concerning the realization of monographic studies using botanical collections has been treated in the light of the new archiving tools with special reference to the possibility to realize international networks of herbaria. Heimo Rainer introduced, as an example, the JACQ network, in which many European herbaria take part, including Centro Studi Erbario Tropicale (FT), the only one in Italy. JACQ offers the opportunity to provide a botanical collection that is freely available to users around the world through an archive where all information about single herbarium specimens is stored, including types, specimen metadata and images, taxonomy and bibliographic references.

The presentations were followed by a discussion between the speakers and the audience. In particular, Italian and foreign students showed a clear and sincere interest and a stimulating and engaging debate took place.

Two years after the event dedicated to the Centenary of the FT herbarium (Centro Studi Erbario Tropicale) in Florence, we may conclude that this second event, organized with the financial support of the Cassa di Risparmio di Firenze Foundation, was an opportunity to stimulate and encourage new generations of life sciences students. In particular, we hope that the proposed combination of tradition and innovation succeeded in showing how enjoyable research in tropical botany can be, and how crucial this combination will be for the achievement of new goals in plant taxonomy.

Riccardo M. Baldini
Centro Studi Erbario Tropicale, Dipartimento di Biologia, University of Florence, Italy