

The value of the botany archive of the University of Coimbra (Portugal) to biodiversity research, crowdsourcing and history of science projects

Ana Margarida Dias da Silva, M. Teresa Gonçalves,
Helena Freitas and António Carmo Gouveia

This article highlights the value of the holdings of the Botany Archive of the University of Coimbra (BAUC) in the areas of natural sciences research, citizen science projects and science communication to general audiences. Inheritor of the records of activity of the Faculty of Natural Philosophy and the Botanic Garden of the University from 1772 onwards, BAUC now holds some 250 years of information, mostly originating from the nineteenth and twentieth centuries. It includes textual, iconographic, photographic and film information, from the Botanic Garden (held in part at the University Archive), the Botanic Institute, the Botany Museum (now integrated within the University Science Museum) and the University Herbarium. Much of this material is still unpublished but, in the twenty-first century, the BAUC is being reassessed via several projects. These include online databases (e.g. the "Digital Botanic Library and Archive"), the research project "The history of Botany in the University of Coimbra and its expression in the Portuguese-speaking world," the documentary series "Tracking the Naturalists" and "Plant Letters", a participatory science initiative on the Zooniverse platform. All these projects demonstrate that BAUC offers the university community many opportunities for historical research and communication, and can yield new information when activated from contemporary perspectives.

Ana Margarida Dias da Silva is a PhD student in Information Science in the Faculty of Arts and Humanities of the University of Coimbra, research funded by the FCT [SFRH/BD/132115/2017]. She is a researcher of the *CIC.Digital Porto / CITCEM*.

Faculdade de Letras da Universidade de Coimbra, Largo da Porta Férrea, 3004-530 Coimbra, Portugal; anasilva@fl.uc.pt

M. Teresa Gonçalves is an Assistant Professor at the University of Coimbra (UC), teaching at the Department of Life Sciences. She holds a PhD in Plant Physiology and is a researcher at the R&D unit Centre for Functional Ecology. She is the coordinator of the Botany Archive of the University of Coimbra.

Departamento de Ciências da Vida, Universidade de Coimbra, Calçada Martim de Freitas, 3000-456 Coimbra, Portugal; mtgoncal@ci.uc.pt

Helena Freitas is Chair Holder and General Coordinator of the UNESCO Chair in Biodiversity Safeguard for Sustainable Development. HF is the scientific coordinator of the Centre for Functional Ecology. She holds a PhD in Ecology from the University of Coimbra, in collaboration with the University of Bielefeld, Germany, and she was a Post-Doc at the University of Stanford, USA. She is Full Professor in the fields of Biodiversity and Plant Ecology at the Department of Life Sciences, FCT-UC.

Departamento de Ciências da Vida, Universidade de Coimbra, Calçada Martim de Freitas, 3000-456 Coimbra, Portugal; hfreitas@ci.uc.pt

António Carmo Gouveia is Director of the Botanic Garden of the University of Coimbra. He holds a PhD in Ecology from the University of Coimbra. ACG is a fellow at the UNESCO Chair in Biodiversity Safeguard for Sustainable Development, working closely within the Community of Portuguese-Speaking Countries universities and institutions.

Departamento de Ciências da Vida, Faculdade de Ciências e Tecnologia, Universidade de Coimbra, Calçada Martim de Freitas, 3000-456 Coimbra, Portugal; gouveia.ac@uc.pt

Introduction

The Botany Archive of the University of Coimbra (BAUC) is an encompassing and working repository for the documents and information produced within the activity of the Faculty of Natural Philosophy¹ (later Faculty of Sciences (1911–1972) and today Faculty of Sciences and Technology) and the Botanic Garden of the University of Coimbra (UC),² both created in 1772. It also includes information from the Botanic Institute (predecessor of the Botany Department (1972–2008), currently Life Sciences Department), the Botany Museum (today integrated in the Science Museum of the UC³), the Botany Library (at present included in the Life Sciences Library)⁴ and the Herbarium of the UC (COI).⁵ Thus, the custody and safeguard of the information we assess in this article under the name BAUC, belongs to the Life Sciences Department of the Faculty of Sciences and Technology UC. Although it does not exist autonomously in the organic structure of UC it provides public access on request, all documents have been organized, classified, described and preserved, a large portion has been digitized, and the BAUC website is being modernized for online open access.

Documentation from the eighteenth century onwards is held at the Archive of the UC⁶ and BAUC holds the information produced in the nineteenth and twentieth centuries. It comprises about 121 books, eight notebooks, 29 packets, 13 boxes, 23 folders and 7,421 documents, mostly in paper. There are also ca. 2800 photographs, in paper, film and glass slides and one movie, safeguarded at the National Film Archive and Museum (Cinemateca Portuguesa).

In 1873, Júlio Augusto Henriques (1838–1928), Botany professor (1866–1918), was appointed director of the Botanic Garden of the UC, a position he held for 45 years and which encompassed the direction of the Herbarium and Museum. Henriques participated in networks of scientific knowledge and his role is crucial to understand the growth and complexity of the BAUC, from the second half of the nineteenth century onwards. His main objectives were to: 1) increase the exchange of seeds and plants with other botanic gardens, herbaria and similar institutions; 2) develop and enrich the herbarium, the living plant collections and the museum of botany; 3) acquire botany teaching resources and educational materials (3D models, wall charts, microscopes), and 4) to increase the holdings of the Botany Library.

The development of all these activities is reflected in documentation at BAUC, allowing us to delve into the processes and growth of plant sciences at the UC and abroad, as the university gained recognition as a botanical hub during Henriques' tenure.

1 CARVALHO Joaquim Augusto Simões de, *Memoria Historica da Faculdade de Philosophia*, Imprensa da Universidade, Coimbra, 1872.

2 On the Botanic Garden of the University of Coimbra see, e. g., HENRIQUES Júlio Augusto, *O Jardim Botânico da Universidade de Coimbra*, Imprensa da Universidade, Coimbra, 1876; BRITES Joana, 'Jardim Botânico de Coimbra: contraponto entre a Arte e a Ciência' in BERNASCHINA Paulo (coord.), *Transnatural*, Artez, S. l., 2006, pp. 31–69. Website [English] at <https://www.uc.pt/en/jardimbotanico> (accessed 18 Dec. 2019).

3 University of Coimbra, Science Museum website [English] at www.museudaciencia.org (accessed 18 Dec. 2019).

4 University of Coimbra, 'Departamento de Ciências da Vida: Biblioteca' at <https://www.uc.pt/fectuc/dcv/biblos> (accessed 18 Dec. 2019).

5 University of Coimbra, Herbario da Universidade de Coimbra: http://www.uc.pt/en/herbario_digital/ (accessed 18 Dec. 2019).

6 University of Coimbra, "Archive of the University" [English] at <http://www.uc.pt/en/auc> (accessed 18 Dec. 2019).

Aside from the institutional records, briefly described above, BAUC includes personal archives or personal documents from former directors, researchers and staff, with disparate origins. One such example is the Archive of Júlio Máximo de Oliveira Pimentel, Dean of the UC (1869–1884) and 2nd Viscount of Vila Maior, as well as part of his family archive.⁷ The Viscount of Vila Maior set up a collection of grape varieties, “our ampelographic collection”, as he referred to it in a letter to Júlio Henriques, his most privileged confidant. It is probably due to these strong personal ties, that the personal and family archives of Júlio Pimentel⁸ arrived at the Life Sciences Department.⁹

Much of this documentation is still unpublished but, currently, the historical botany archive is being reassessed via several projects, including: the online databases “Digital Botanic Library and Archive”, the research project “The history of Botany in the University of Coimbra and its expression in the Portuguese-speaking world”, the documentary series “Tracking the naturalists” and “Plant Letters”, a participatory science initiative.

The value of BAUC to the botany collections of the UC

An archive can be defined as a set of documents and the relations among them. With the digital technological revolution and the discussion about formats and information concepts, archives can extend relations to information in different formats. Furthermore, the digital environment is the perfect setting to link and bring together information that is physically separated in different units and physical spaces.

The following examples show the importance of relating and linking BAUC information with information in different formats, and held at several sections of the UC, for a comprehensive knowledge of the origin and circulation of plants and seeds for both the Garden and the Herbarium, the existing scientific publications in the Botany Library and the objects in the Botany Museum.

Concerning the Herbarium collections, correspondence exchanged between Júlio Henriques and other botanists, professionals or amateurs, often contributes to gather information on the history of plant specimens and collections. For example, the correspondence between Henrique de Carvalho, Sisenando Marques and Júlio Henriques provided fundamental information on the collection of Angolan plants by Agostinho Sisenando Marques

7 These two archives were studied in the Project: “O Arquivo Pessoal e Familiar do Visconde de Vila Maior – preservar memória, divulgar o passado” financed by Fundação Calouste Gulbenkian. Archival descriptions at: <https://pesquisa.auc.uc.pt/details?id=286505> and <https://pesquisa.auc.uc.pt/details?id=286532> (accessed 18 Dec. 2019).

8 SILVA Ana Margarida Dias da, “Pressupostos teóricos e metodológicos aplicados aos arquivos pessoais: o caso do arquivo de Júlio Máximo de Oliveira Pimentel, 2º Visconde de Vila Maior” in SANTOS Eliete Correia dos, SILVA Alzira Karla Araújo, CARVALHO Ediane Toscano Galdino de (org.), *Arquivologia: História, Tipologias e Práticas Profissionais*, Campina Grande-PB, 2017, pp. 99–128; SILVA Ana Margarida Dias da, “De Vossa Excelência admirador e servo humilde: Catálogo da Correspondência recebida de Júlio Máximo de Oliveira Pimentel, 2º Visconde de Vila Maior (1851–1884)” in *Boletim do Arquivo da Universidade de Coimbra*, volume XXX, 2017, pp. 133–268. SILVA Ana Margarida Dias da, (in press) “O Arquivo da Família Oliveira Pimentel, de Torre de Moncorvo (sécs. XVII–XIX) classificação e representação da informação” in *Actas V Congresso A Casa Nobre, Arcos de Valdevez*, 1–3 de Dezembro de 2017.

9 SILVA Ana Margarida Dias da, GONÇALVES, Maria Teresa, GOUVEIA António, *Visconde de Vila Maior: o arquivo (s)em reserva. Catálogo da exposição documental.*, Sociedade Broteriana, Coimbra, 2016, p. 4.

during the Expedition to Muata-Ianvo (1884–1888) and the specimens currently held at the University Herbarium. Moreover, the correspondence between Júlio Henriques and European taxonomists concerning the study of this same African plant material, highlights the networks established between Coimbra, Berlin and London Herbaria, among others, and details the circulation of botanical knowledge during the late-nineteenth century colonial occupation campaigns in Africa.¹⁰

In another example, we can analyse a collection of more than 600 items from Macao, China and East Timor (1880–1882), corresponding mainly to ethnographic objects produced with plant materials, held today at the Science Museum of UC. Uncovering the origin and the process of collecting items, actors and the pathway of objects into the UC museums was made possible through primary sources at BAUC (for example, detailed lists of items, and the correspondence between Júlio Henriques and José Alberto Côrte Real, secretary-general of Macao at the time).¹¹

Through a case study in the work of Gouveia¹² one can understand how the scientific activity of Júlio Henriques, and the networks where he participated in were fundamental to the development and growth of plant collections in the garden and herbarium, library and botany museum. The author assesses the naming of a new species – *Pandanus thomensis* Henriq., an endemic plant of S. Tomé and Príncipe, based on information about this plant species in several formats, and safeguarded in different units in the UC. First and foremost, the plant material that constitutes the type specimen held at the Herbarium of the UC and, later, the scientific description of this new species (*P. thomensis*, n. sp.) made by Júlio Henriques, published in the *Bulletin of the Broterian Society*.¹³ Plant products (dried leaves and fruits) and ethnographical objects (hand-woven mats) made out of *P. thomensis* were exhibited in the Botany Museum collection, and are today included in the collections of the Science Museum. The relation between Júlio Henriques and the *P. thomensis* collectors, Adolpho Möller and Francisco Quintas, is recorded in the letters they exchanged, and are housed at BAUC. Furthermore, of the new plant species Júlio Henriques described throughout his career, *Pandanus thomensis* Henriq is the only one for which a contemporary photograph is known, also at BAUC.¹⁴

10 PERPÉTUO Natacha Catarina, GONÇALVES Maria Teresa, SALES Fátima, “Sisenando Marques e Júlio Henriques: A coleção de plantas angolanas no Herbário da Universidade de Coimbra” in *Memórias de um explorador – A coleção de Henrique de Carvalho da Sociedade de Geografia de Lisboa*. Lisboa: Sociedade de Geografia de Lisboa, 2012, pp. 221–233 (ISBN 978-989-96308-4-0).

11 MIRANDA Maria Arminda, MARTINS Maria do Rosário, MADUREIRA Tânia, GONÇALVES Maria Teresa, CASALEIRO Pedro, “Coleções da China e Macau no Museu da Ciência da UC (1880–1882)” in *Catálogo do Sul ao Sol*, 2013, pp. 31–37. MIRANDA Maria Arminda, MARTINS Maria do Rosário, PERPÉTUO Natacha Catarina, GONÇALVES Maria Teresa, “Origem e constituição da coleção oriental (1880–1882) do Museu da Ciência da Universidade de Coimbra: da Botânica à Antropologia” in *Boletim da Sociedade de Geografia de Lisboa*, nºs 1–12, Série 134, 2016, pp. 117–136.

12 GOUVEIA António, “Do nome à imagem: percursos de uma planta tropical de São Tomé numa fotografia do final do século XIX” in VICENTE Filipa Lowndes (org.). *O Império da Visão – fotografia no contexto colonial português (1860–1960)*, Edições 70, Lisboa, 2014, pp. 183–194.

13 HENRIQUES Júlio, “Contribuições para o estudo da Flora d’África. Catálogo da Flora da ilha de S. Thomé” in *Boletim da Sociedade Broteriana*, vol. 5, 1887, pp. 196–232.

14 SILVA Ana Margarida Dias da, MARQUES Maria Beatriz, GONÇALVES M. Teresa, GOUVEIA António Carmo, The Botanic Garden of the University of Coimbra as a Complex Information System in MATOS Ana Cardoso, CANDEIAS António, NUNES, Maria de Fátima, ALBUQUERQUE Sara, FERREIRA Teresa (eds.),

The knowledge about botany teaching materials from the late nineteenth century profited from data crossing with the sources at BAUC. Indeed, information contained in letters, invoices, receipts and books of income and expenses of the Botanic Garden yielded accurate data about how Professor Júlio Henriques acquired the information about the most modern teaching materials such as 3D models and wall charts over several decades. These materials were purchased soon after being made available by the most well-known European manufacturers, such as the large and remarkable collection of flower models made of papier-maché by Robert and Reinhold Brendel (currently held in the Science Museum UC).¹⁵

Silva and Gouveia used the BAUC as a primary source to trace the significative enlargement of the Botany Library collections. In particular, the authors aimed at “evaluating the amount of periodical scientific publications entering by exchanges with the first series of the *Bulletin of the Broterian Society* [Bol. Soc. Brot.] (1883–1920) and contributed to the construction of the botany library of UC.” They concluded “that the exchange system with other specialized journals, national and international, was significant for the growth of the botany library and for the scientific update of botany themes at the University of Coimbra.” Silva and Gouveia analysed 4,693 letters, dated between 2 March 1870 and 7 December 1925, and manuscript catalogues from the Botanic Garden Library (1881–1920), held at the BAUC.¹⁶

The examples above show the relevance of BAUC to the multiplicity of UC botanical collections.

Biodiversity research, crowdsourcing and history of science projects: new opportunities for BAUC

Although the immediate and most common use for an archive should be its awareness and use by its producing institution, in this case the academic community (professors and students, internal or external), it is our understanding that primary sources must be made available for society at large.

Described below are the several projects and examples of how the scientific community, internal and external to the UC, has been using BAUC as a source of information. A project that deserves a special mention is *The Botany Digital Library*, a first initiative to give visibility and open access to archival information, following the principle that “Content that has been digitized and can be accessed online via the Internet is by nature open and can be shared.”¹⁷

Web of Knowledge: A Look into the Past, embracing the Future, Editora Sílabas & Desafios, Faro, 2019, pp. 105–108.

15 CASTRO Sílvia, SALES Fátima, GONÇALVES Maria Teresa, “To bee or not to bee: botanical models for exploring plant pollinator ecology” in *Libro de Resúmenes XXII Bienal de la Sociedad Española de Historia Natural: Los Mapas de la Naturaleza*, Coimbra, 6–9 de septiembre 2017, p. 355. GONÇALVES Maria Teresa, ABRANTES Isabel, SALES Fátima, “A Cadeira de Botânica na Universidade: apresentação de Júlio Henriques no Congresso Hispano-Português-Americano (1892)” in *XXII Reunião Bienal da Real Sociedade Espanhola de História Natural*, 6–9 Setembro 2017, Coimbra. Livro de Resumos, p. 419.

16 SILVA Ana Margarida Dias da, GOUVEIA António Carmo, “A Permuta de Periódicos Científicos e a Difusão do Conhecimento Botânico: O exemplo do ‘Boletim da Sociedade Broteriana’ na construção da biblioteca de botânica da Universidade de Coimbra (1883–1920)” in *Fronteiras: Journal of Social, Technological and Environmental Science* 7(1), jan.–april 2018, pp. 84–123. DOI <https://doi.org/10.21664/2238-8869.2018v7i1.p84-123>

17 GROENBOEK Martin von Haller, “GLAMorous remix. Openness and sharing for cultural institutions” in SANDERHOFF Merete (ed.) *Sharing is caring. Openness and sharing in the cultural heritage sector*, Statens Museum for Kunst, Copenhagen, 2014, p. 142.

The Botany Digital Library project started in 2006 and was first presented publicly in 2008. It was a pioneer open access on-line project at the University of Coimbra that made resources universally available and free, namely, antique books and manuscripts of botanists, including handwritten correspondence, photographs, drawings and audio-visual material. It aimed to aggregate information from the collections of the Botany Library and the Broterian Society¹⁸ with ongoing projects of the Herbarium, the Museum and the Garden (namely projects which included collections digitization), integrating related information in disparate physical spaces. For example, it is possible using the subject field related to the taxonomy of the plants to find references wherever they are represented in the collections of the Digital Herbarium. *The Botany Digital Library* provides open access to 1,890 letters, 1 film (*Missão Académica: Alguns aspectos cinematográficos da viagem realizada em Angola, 1929*), iconographic documents (such as botanical illustrations, maps, plans and national and foreign scientists' *cartes de visites*), 88 books, six handwritten documents and the almost complete scanned collection of the *Bulletin of the Broterian Society* (published between 1883 and 2004), a total of 100,000 images.¹⁹

The research project "The history of Botany in the University of Coimbra and its expression in the Portuguese-speaking world" (2009) continued to develop the *Botany Digital Library*, as it pursued the digitization of primary, printed, handwritten and iconographic sources. Since 2011, within this project an archivist was integrated to work in several projects. From that date onwards, BAUC has increased visibility, within and outside its parent institution. The project enabled the acquisition of preservation material both for paper documents and photographs in paper, glass and film.

The *Digital Botany Archive* aims to be a digital repository of botanical knowledge. It is a platform with the purpose of linking different databases related to Botany in the UC: i) the Botany Digital Library, ii) the Botany Archive, iii) the Herbarium, iv) the Botanic Garden and v) the Botany Museum (presently in the Science Museum of UC). This synergy is a challenging task but bringing metadata and related content together online is a way for promoting and enriching the experience of archival information.

Furthermore, the focus on content (information) "eliminates physical distinctions between types of records and thus, presumably, the need for organizational distinctions in the management of the systems within which these records are handled."²⁰ Thus, having a single access point for all botanical collections at UC regardless its custody of physical location strengthens our open access philosophy. Cultural institutions, whether they work with art, data, archives, stories, or any other form of culture, besides collecting should have as a primary goal "to disseminate as much knowledge and insight it possibly can."²¹

In 2016, *Tracking the naturalists*, a series of four one-hour documentaries premiered on Portuguese national television. These audio-visual products were produced within a

18 Sociedade Broteriana, at <http://sequoia.bot.uc.pt/sbroteriana/index.php> (accessed 18 Dec. 2019).

19 SOUSA Jorge Pais de, GONÇALVES Maria Teresa, PERPÉTUO Natacha Catarina, PEREIRA Paula, COSTA Maria de Fátima, 'Bibliotecas digitais e o acesso à informação sobre história da ciência' in *Actas do Congresso Luso-Brasileiro HC (CLBHC)*, Coimbra, 2011, pp. 1576–1588, at: [http://www.uc.pt/congressos/clbhc/actas_congresso/](http://www.uc.pt/congressos/clbhc/actas_congresso/#http://www.uc.pt/congressos/clbhc/actas_congresso/) (accessed 15 Jan. 2019).

20 TIMMS Katherine, "New partnerships for old sibling rivals: the development of integrated access systems for the holdings of archives, libraries, and museums" in *Archivaria* 68 (Fall) 2009, p. 68.

21 GROENBOEK Martin von Haller, "GLAMorous remix", p. 141.

project from the Centre for Functional Ecology focused on the botanical expeditions to Africa undertaken by naturalists from the University of Coimbra (from the philosophical travels of the eighteenth century to 1960's botany expeditions). A team of biologists, anthropologist, archivists, directors and producers was assembled for this interdisciplinary project. Documents, photographs, maps and the film from BAUC were a pivotal information source, allowing for a critical reassessment of botanical expeditions and their colonial contexts. These historical endeavours were used as a starting point to talk about plant diversity and ecology, tropical ecosystems functioning and the relations between human beings and their environment in Angola, Mozambique and São Tomé and Príncipe, in collaboration with institutions and scientists from these countries.²²

In 2019, *Visão do Império (Visions of the Empire)*, a documentary on the Portuguese colonial domain, is expected to broadcast. This project will focus on visual representations of the “empire”, as portrayed in photographs from late nineteenth century until the 1974 revolution (that ended the dictatorial regime that ruled Portugal).²³ This 54-minute documentary is making use of the photographic collections from BAUC, among others, as primary sources. In particular, photographs from the expedition of Júlio Augusto Henriques to S. Tomé island in 1903, and the more than 700 images produced within Luís Wittnich Carrisso expeditions to Angola, in 1927, 1929 and 1937.

The “digitisation and the internet allow cultural institutions to realise even their wildest dreams about maximum accessibility and exposure to a maximum number of users.”²⁴ In fact, participatory science projects, leveraging the power of the masses to quickly and reliably extract data from a vast amount of information, suit perfectly the goals and missions of archives. One of the most recent and encompassing uses of the information from BAUC is the project *Plant Letters*, a crowdsourcing transcription project. It is promoted by the UNESCO Chair in Biodiversity Safeguard for Sustainable Development, in collaboration with the Botanic Garden of the UC, and the Life Sciences Department. Its main corpus of information is the 5,000 letters received in the Botanic Garden and the Botanic Institute of UC between 1870 and 1925. Using the collaborative platform, Zooniverse,²⁵ users are requested to engage with the archive and transcribe mostly handwritten letters in several languages, giving dimension to our continuous efforts of promoting open and widespread access to information.

In addition to all the aforementioned projects, the information at BAUC has supported several scientific publications, thesis and dissertations, national and international conferences and exhibitions.

In a 2017 Filipe Correia in a Master's dissertation in Biology entitled “Carnivorous Plants in the University of Coimbra – Collections, Conservation and Science communication” systematized the information present in several UC archives, including the BAUC, on these fascinating and sometimes endangered plant species. The author compiled and connected archival information with historical data from different Portuguese herbaria to reconstruct the past history of native carnivorous plants, including historical distributions, “to be able to

22 <http://naturalistas.pt/> (accessed 18 Dec. 2019).

23 MATTOSO José (dir.), Portugal em transe: 1974–1985. *História de Portugal*, Vol. 8, Círculo de Leitores, Lisboa, 1993.

24 GROENBOEK Martin von Haller, “GLAMorous remix”, p. 142.

25 Plant Letters project at Zooniverse, <https://www.zooniverse.org/projects/catedraunesco/plant-letters> (accessed 18 Dec. 2019).

preserve both these historical resources and biological resources.”²⁶ This dissertation shows the value of historical biological data to conservation planning.

In 2018, celebrating the centenary of Júlio Henriques’ retirement at the age of 80, an exhibition entitled “Centenário da Jubilação de Júlio Henriques: recordar o homem, celebrar a obra” was held in the Life Sciences Department. Close to a hundred objects were featured in the exhibition.

Discussion

“All cultural institutions should endeavour to be as open as possible in the sense that as many people as possible should have the easiest access possible to the institution’s content. At the same time the institution should seek to ensure that the freely available content is shared, enriched, and processed by users, whether they are citizens, students, scholars, researchers, or commercial ventures.”²⁷

Currently, a digital perspective on information has become a central tenet to the study and work of archivists, inducing the increase in potential to generate content for the world wide web.²⁸ At the same time, there is an increase in the expectations and demands of users (increasingly digital) and archives seek to gain visibility and improve the quality of access to information, as only open access justifies and legitimizes custody and preservation.²⁹

In an interconnected, technological and globalized world, the recent projects making use and highlighting the wealth of information at BAUC, were realized based on digitized content and an open access philosophy – providing availability and access, reuse and redistribution and universal participation to its products.³⁰ As is noted by Effie Kapsalis in a paper on open access, “as crowdsourcing initiatives gain traction in the cultural heritage space, it is the organisations that are most open (releasing collections as public domain or CC when possible) that are reaping the benefits.”³¹

For instance, *Plant Letters* project evokes the Web 2.0 spirit, which is defined as “a change of attitude, more than a new technology, where active and collective participation are present in the creation, edition and publication of content”.³² In fact, for many authors, the real revolution lies in the change of attitude in which users are no longer only information consumers but stakeholders in the development and management of content. The

26 CORREIA Filipe, “As Plantas Carnívoras na UC – Coleções, Conservação e Comunicação de Ciência” [Carnivorous Plants in the University of Coimbra – Collections, Conservation and Science communication]. University of Coimbra, unpublished Master’s dissertation, 2017. Available from University of Coimbra research repository at <http://hdl.handle.net/10316/83414> (accessed 18 Dec. 2019).

27 GROENBOEK Martin von Haller, “GLAMorous remix”, p. 142.

28 ACUÑA María José de, AGENJO Xavier, Archivos en la era digital: problema (y solución) de los recursos electrónicos. *El profesional de la información* 14(6), 2005, pp. 407–413.

29 SILVA Armando Malheiro da, *A Informação: da compreensão do fenómeno e construção do objecto científico*, Edições Afrontamento, Porto, 2006.

30 KAPSALIS Effie, “The Impact of Open Access on Galleries, Libraries, Museums, & Archives” Conference paper, Smithsonian Emerging Leaders Development Program, April 27, 2016. http://siarchives.si.edu/sites/default/files/pdfs/2016_03_10_OpenCollections_Public.pdf (accessed 15 Jan. 2019).

31 Ibid.

32 SILVA Ana Margarida Dias da, BORGES, Leonor Calvão, MARQUES Maria Beatriz, Crowdsourcing in history projects in local archives of Portugal and England: a comparative analysis, in *Proceedings of the International Conference on Information Society and Smart Cities*, 2018, ISBN: 978-1-912532-02-5, at: <http://www.isc-conference.org/index.php/proceedings> (accessed 15 Jan. 2019).

connection to users, no longer passive actors but interveners in the process of knowledge construction, has had a great impact on the development of new services.³³

The Web 2.0 concept, which may be the source of a new communication model, has changed the way information institutions work by including a philosophy of openness, inclusion, tolerance for disorder and valuation of the “amateur” contribution. *Plant Letters* seeks from users, both experts or simply curious, a source of participation in the construction of knowledge, making use of collective intelligence, in a lively exchange of information, experiences and knowledge. These collaborative tools allow for anyone to be simultaneously both an information consumer and producer.

Despite these perceived advantages, some memory institutions are reluctant about the exploitation of collective intelligence and the use of non “official” applications, like those from Web 2.0.³⁴ If some “information professionals aren’t ready for a paradigm change”, professional flexibility is seen as “distinct advantage in LAM [Libraries, Archives and Museums] collaborations”.³⁵ Thus, we agree that “LAM professionals who understand issues surrounding different types of collections and collecting institutions, and who are not rigidly wedded to their own professional traditions, bring an open-mindedness that allows them to embrace ideas from other professions in the interests of the collaboration.”³⁶

By providing access, both physical and online, this multiplicity of projects has enabled BAUC information to be disseminated and take advantage of the Web 2.0 tools (e.g. blogs, Facebook, Instagram, Twitter, Flickr, Zooniverse). And while not specifically designed for the purpose of disseminating institutional information, collaborative tools are being used by memory institutions to disseminate their digitized collections, in order to engage a broader audience in the construction of knowledge.³⁷ Furthermore, the digital environment where “bits and bytes are all equal” broke the “traditional boundaries between various cultural heritage institutions – archives, libraries and museums.”³⁸ Thus, the digital technological revolution has raised the discussion about supports and information concepts and promoted the paradigm shift towards a post-custodial, dynamic, informational and scientific view of information.³⁹

The idea of a platform with a single access point – the Botany Digital Archive – for all

33 MARGAIX-ARNAL Didac, Conceptos de Web 2.0 y biblioteca 2.0: origen, definiciones y retos para las bibliotecas actuales. *El profesional de la información* 16(2) (marzo–abril 2007), pp. 95–106.

34 NOGUEIRA Marta, ‘Archives in Web 2.0: New Opportunities’ in *Ariadne* 63, April 2010, at: www.ariadne.ac.uk/issue63/nogueira (accessed 15 Jan. 2019).

35 SILVA Ana Margarida Dias da, BORGES, Leonor Calvão, MARQUES Maria Beatriz, ‘Crowdsourcing in history projects in local archives of Portugal and England’, p. 13.

36 ZORICH Diane, WAIBEL Günter, ERWAY Ricky, *Beyond the Silos of the LAMs: Collaboration Among Libraries, Archives and Museums. Report produced by OCLC Research*, p. 27 at: <https://www.oclc.org/content/dam/research/publications/library/2008/2008-05.pdf> (accessed 15 Jan. 2019).

37 SILVA Ana Margarida Dias da, BORGES, Leonor Calvão, MARQUES Maria Beatriz, “Crowdsourcing in history projects in local archives of Portugal and England: a comparative analysis” in *Proceedings of the International Conference on Information Society and Smart Cities*, 2018, pp. 1–13. Retrieved from: www.isc-conference.org/index.php/proceedings (accessed 15 Jan. 2019).

38 TIMMS Katherine, “New partnerships for old sibling rivals”, p. 68.

39 SILVA Ana Margarida Dias da, MARQUES Maria Beatriz, GONÇALVES M. Teresa, GOUVEIA António Carmo, The Botanic Garden of the University of Coimbra as a Complex Information System in *Web of Knowledge: A look into the Past, embracing the Future* (eds. MATOS Ana Cardoso, CANDEIAS António, NUNES, Maria de Fátima, ALBUQUERQUE Sara, FERREIRA Teresa). Editora Sílabas & Desafios, Faro, 2019, pp. 105–108.

Botany UC collections is inspired by the ubiquity of the Internet where users who “don’t care who manages the stuff, they just want access to it” can get all information, regardless of where the material is held, and by whom.⁴⁰

The call for citizen participation comes with the opinion that archivists can no longer work alone as content creators for researchers. Therefore, cooperation and multilateral cooperation have become new philosophies in archival work.⁴¹

Conclusions

All the aforementioned projects, academic works, publications and exhibitions are evidence that the information at BAUC offers the university community and the general public many opportunities for using in a wide range of scientific areas, and can yield new information when activated from contemporary perspectives. Providing access to the archive data is a guarantee of its usefulness and a possible way to draw attention and institutional support for BAUC’s survival. At same time, BAUC data is of great value for present and future plant conservation actions.

The projects discussed above also show that BAUC is not a passive record-keeper or repository of documentation but a dynamic memory institution. Altogether, the projects concluded and ongoing, the interdisciplinary collaborations, and the exhibitions show an increase of collections study, and are a valuable contribution to BAUC visibility. BAUC stimulates collaborative and shared scientific knowledge with and for society, and one can conclude that it is possible to do the traditional archival work (organization, management, preservation and communication) and still endeavour to support open access, open science and collaborative projects.

Historical repositories such as this archive, but also the biological and museum collections and objects that it documents, imply also added responsibilities to its custodians, as the information contained within the documentation, pertains not only to a country (in this case Portugal), but also to its developing historical roles and actions. As a colonial power for many centuries, the records of Portuguese scientific activity and occupation strategies of overseas territories, in Africa, South America, Asia and the Pacific, are also documented, and its valuable data (e.g. historical biological records) is of crucial importance to these now independent countries. Received correspondence is a great source to understand the process of knowledge creation and circulation in the plant sciences, including botany and agriculture,⁴² as well as the scientific colonial practices and their implication for the amassing of biological collections at the UC.⁴³

40 ZORICH Diane, WAIBEL Günter, ERWAY Ricky, *Beyond the Silos of the LAMs: Collaboration Among Libraries, Archives and Museums*. Report produced by OCLC Research, at p. 6 and p. 13.

41 FOLCH María Lidón París, ‘Conectados: Experiencias de Cooperación y Transversalidad en el Archivo de la Universitat Jaume I’. *RUIDERAE: Revista de Unidades de Información*, 11 (1^{er} semestre 2017), pp. 1–10.

42 PERPÉTUO Natacha Catarina, GONÇALVES M. Teresa, SOUSA Jorge Pais de, GOUVEIA António Carmo, “O contributo de Júlio Henriques para o conhecimento da diversidade vegetal da ilha de S. Tomé” in *Actas do Colóquio Internacional São Tomé e Príncipe numa perspectiva interdisciplinar, diacrónica e sincrónica*, 2012, pp. 611–631.

43 PERPÉTUO Natacha Catarina, GONÇALVES M. Teresa, SALES Fátima, “Sisenando Marques e Júlio Henriques: a colecção de plantas angolanas no Herbário da Universidade de Coimbra” in *Catálogo da Exposição Memórias de um Explorador. A colecção Henrique de Carvalho da Sociedade de Geografia de Lisboa*, Sociedade de Geografia de Lisboa, 2012, pp. 221–233.