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OUR REFERENCE

Dear Dr. Cortada,

In response to your kind invitation of 9th September 2024 to collaborate with the Open Doors Fellowship Programme, I am delighted to inform you that the Systematic and Evolutionary Botany lab at Ghent University will join under Modality A and open its doors to a fellow in the field of systematic and evolutionary botany. Please find enclosed the completed project template.

We are looking forward to work with the Open Doors Fellowship Programme. Please do not hesitate to contact me should you need any further information.

Kind regards,



Prof.dr. Lars Chatrou

OPEN DOORS FELLOWSHIP PROGRAM- APPLICATION TEMPLATE FOR RECEIVING LABORATORIES IN FLANDERS

APPLICATION MODALITY A: This modality has been conceived for research institutions in Flanders' higher education institutions or research centres looking for new scientific partners in Africa and willing to explore new joint research streams with their counterparts.

Objective: The application presented by the candidate ODFP fellow shall align with the scope and the requirements of open slots offered by the Flemish research laboratories and published on the ODFP web page.

Examples of the testimonies and open slots offered by the Belgian research laboratories are published [on the ODFP web page](#).

Information from the hosting institutions in Belgium

Contact details of a focal point	✉: lars.chatrou@ugent.be ☎: +32 9 264 50 14
Name of the research or academic institution	Ghent University
Name of the research group	Systematic and Evolutionary Botany lab
Website of institution /research group	www.seb.ugent.be

Present the group's research line(s) and activities, including a list of commonly used technologies (e.g. bioinformatics, genetic engineering, chromatography, sequencing, metabolomics, metagenomics).

Bioinformatics, herbarium management including digitization, Illumina sequencing, phylogenetics, Sanger sequencing, taxonomy

Describe the primary hard and soft skills desirable from the awarded ODFP fellow to deliver the task at hand.

- Proficient in these hard and soft skills, depending on the type of project.
Taxonomic projects: [hard skills] herbarium techniques, GIS techniques, scientific inquiry; [soft skills] problem solving, critical thinking, adaptability, team work

Phylogenetic projects: [hard skills] phylogenetic inference methods; [soft skills] problem solving, critical thinking, adaptability, team work

- Somewhat conversant in these hard and soft skills: For both types of projects mentioned above, basic knowledge of R would be helpful.
- Language preferences: English, French, Spanish
- Interpersonal skills: sense of responsibility, motivation, ability to combine the strengths of team work (diverse perspectives, support and engagement) with the strengths of individual work (autonomy, ownership).

Indicate the short- and long-term outputs and synergies that the PI in Belgium would like to see arising from this collaboration.

Expected Short-term synergies	Expected Long-term synergies
- Joint herbarium work in the major European herbaria for African plant biodiversity (Brussels, Paris, Leiden) - Setting up collaboration with the major centers for biodiversity research on Annonaceae (Ghent University, l'Institut de Recherche pour le Développement (IRD) Montpellier). - Sharing of expertise in herbarium management, including collection databasing and digitization, and exploring possibilities of digitizing African herbaria. - Disclosure of African biodiversity by describing new plant species based on natural history collections in Europe.	- Submission of, at least, one project proposal to foster sustainable North-South research and educational activities before termination of Phase 2 of the ODFP (20 months). - Sign a formal agreement with the Fellow's institution to promote North-South exchange of collections, conduct joint field work for collecting and for teaching plant diversity with UGent and the Annonaceae network. - Promote the exchange of staff and students between home institution of the Open Doors Fellow and Ghent University. - At least, one co-authored research paper or presentation at an international conference.

Summarise (between 400 - 800 words approx.) the research project(s) or activities where the ODFP fellow would contribute to her/their research.

Tropical rainforests are home to an astonishing species diversity in almost any group of organisms. Unlike in temperate areas, a significant part of the tropical diversity is still to be discovered and described. A robust knowledge framework of the systematics of tropical plants is important, especially in this era of species extinction and decline of biodiversity.

In July 2024, the [Madrid Declaration](#) was issued during the 20th International Botanical Congress in that city. The declaration calls for actions to mitigate the degradation of plant life by human activities. It acknowledges the importance of collaboration across disciplines and across countries, which is essential to better understand and communicate the importance of plants, and address the biodiversity crisis in creative and impactful ways.

The Systematic and Evolutionary Botany lab at Ghent University is reaching out to African botanists to collaborate in the spirit of the Madrid declaration. Our research focuses on the diversity and evolution of Annonaceae, a plant family that is represented in Africa by several hundreds of species of trees and lianas (e.g. Hoekstra, et al. 2021; Fonseca, et al. 2024). During more than 20 years of phylogenetic research on this family, we have established that all genera of Annonaceae are monophyletic, making them realistic subjects for research projects in terms of investment of resources.

Studying the diversity and evolutionary history of Annonaceae has implications beyond the biology of this plant family. The distribution of the ca. 2600 species of Annonaceae is almost exclusively confined to tropical rain forests, and is correlated significantly with temperature and rainfall patterns that govern the occurrence of this hyperdiverse biome (Punyasena, et al. 2008). In other words, **Annonaceae diversity and evolution can serve as a proxy for the evolutionary dynamics of tropical rain forests, both in the past as well as in the future.**

To a large extent, the taxonomy and evolutionary history of African genera of Annonaceae has been studied (e.g. Dagallier, et al. 2023). However, two major genera of liana species present notable exceptions: *Artabotrys* and *Uvaria*. Both genera have a distribution in Africa (including Madagascar) and Asia, and it has been established that they originated during the Late Oligocene – Early Miocene (Thomas, et al. 2015). **Knowledge of species delimitation, species diversity and distribution of African species of *Artabotrys* and *Uvaria* is woefully outdated and is in urgent need of revision.**

The table below summarizes the number of collections for both genera in major European herbaria housing collections of African plants. The figures outnumber the collections of any herbarium in Africa, indicating the colonial heritage that is embodied in the global distribution of plant collections (Park, et al. 2023).

	<i>Artabotrys</i>	<i>Uvaria</i>
Brussels	ca. 950	ca. 1200
Paris	ca. 350	ca. 50
Leiden	ca. 400	ca. 850

We acknowledge this colonial legacy of herbarium collections and would like to **foster a collaboration with an Open Doors Fellow focusing on African plant diversity, to be led by an African botanist, while recognizing the contribution of indigenous peoples and local botanists to the culture, science and natural history of African plant diversity thus far.** Given the preponderance of collections in European herbaria, a connection with European herbaria is a start of the process towards mitigating this historical imbalance.

A project centered around the origin and maintenance of species diversity of *Artabotrys* or *Uvaria* would provide an excellent opportunity to alleviate the disparity that is present in the global distribution of herbarium collections, while at the same time engaging into cutting-edge research on the plant diversity and its evolutionary origin. This project could include the following techniques, the prioritization of which would be established after discussion with the Open Doors Fellow.

- Morphological studies of herbarium specimens
- Preparation of identification keys
- GIS techniques to study geographic distributions
- DNA sequencing techniques (Illumina sequencing, either by 'genome skimming' or a bait kit approach)
- Bioinformatic tools for sequence assembly
- Phylogenetic methods

References

- Dagallier L-PMJ, Mbago FM, Couderc M, Gaudeul M, Grall A, Loup C, Wieringa JJ, Sonké B, Couvreur TLP. 2023. Phylogenomic inference of the African tribe Monodoreae (Annonaceae) and taxonomic revision of *Dennettia*, *Uvariadendron* and *Uvariopsis*. *PhytoKeys* 233:1-200.
- Fonseca LHM, Asselman P, Goodrich KR, Nge FJ, Soulé V, Mercier K, Couvreur TLP, Chatrou LW. 2024. Truly the best of both worlds; merging lineage-specific and universal probe kits to maximize phylogenomic inference. *Applications in Plant Sciences* 12:e11615.
- Hoekstra PH, Wieringa JJ, Maas PJM, Chatrou LW. 2021. Revision of the African species of *Monanthotaxis* (Annonaceae). *Blumea* 66:107-221.
- Park DS, Feng X, Akiyama S, Ardiyani M, Avendaño N, Barina Z, Bärtschi B, Belgrano M, Betancur J, Bijmoer R, et al. 2023. The colonial legacy of herbaria. *Nature Human Behaviour* 7:1059-1068.
- Punyasena SW, Eshel G, McElwain JC. 2008. The influence of climate on the spatial patterning of Neotropical plant families. *Journal of Biogeography* 35:117-130.
- Thomas DC, Chatrou LW, Stull GW, Johnson DM, Harris DJ, Thongpaiboj U, Saunders RMK. 2015. The historical origins of palaeotropical intercontinental disjunctions in the pantropical flowering plant family Annonaceae. *Perspectives in Plant Ecology, Evolution and Systematics* 17:1-16.

Are there additional resources relevant to the work/project related to the short research stay (e.g. articles, videos, project documents and summaries, repositories) that would help the fellow have a broader background of the intended project? If so, please list them below.

A database of taxonomic baseline data:

<http://herbarium.botanik.univie.ac.at/annonaceae/listTax.php>

A website collecting photos and taxonomic information on the family (discontinued, however)

<https://annonaceae.myspecies.info/content/dr-thomas-couvreur-o>

A special issue on the natural history of Annonaceae, published in Botanical Journal of the Linnean Society in 2012. All papers are Open Access:

<https://academic.oup.com/botlinnean/issue/169/1>

An official letter from the Principal Investigator of the Belgian receiving group confirming the collaboration with the ODFP should be sent together with this form duly filled.

Applications can be submitted electronically to IPBO@vib-ugent.be (The application form must be named as follows: “**ODFP_ModalityA_name of research group**”). Please send the application form and supporting letter as a **single PDF file**.

