INTERNATIONAL CONFERENCES ON ISLAND BIODIVERSITY 2011

PRESENT AND EMERGING KNOWLEDGE ON THE EVOLUTION, DIVERSITY AND CONSERVATION OF THE CANARIAN FLORA

Jardín Botánico Canario "Viera y Clavijo"–Unidad Asociada CSIC (Cabildo de Gran Canaria)

March 14th-March 18th 2011

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FOREWORD

Further than a haven for lush and unique (but also fragile and increasingly threatened) biota, Macaronesia is a hotspot of ideas about the evolution of life on islands, and thereby a land of opportunity for new research endeavors.

Celebrating the recent award of the UNESCO-Unitwin chair for *Climate change and conservation of Biodiversity in Macaronesia and NW-Africa* to the Jardín Botánico Canario "Viera y Clavijo"-Unidad Asociada CSIC (JBCVC-CSIC, Cabildo de Gran Canaria), the *2011 Fundación Amurga International conferences on island biodiversity* will give an updated account of the existing and developing knowledge on the evolution, diversity and conservation of the Canarian flora in the comparative framework provided by the remaining four Macaronesian archipelagos, other oceanic islands, and continental Mediterranean islands.

Some of the internationally most renowned specialists will share throughout a week in the island of Gran Canaria their worldviews of the past, present and future of insular plant biodiversity under the light of multi-disciplinary scientific research. This year, our contributors will cover a wide range of topics in land plant botany, such as classical and molecular taxonomy, reproductive biology, (phylo)genetic diversity, phylogeny, biogeography, cytogenetics, and their applications to understand evolution on islands or to design informed conservation strategies.

Emphasis will be placed on presenting latest or unpublished scientific-technical results and debating ongoing projects, but also on interacting directly through extended informal discussion periods programmed after each day's sessions.

A special volume will be edited with the lecture contents, which will be fully downloadable without charge through the website of the Jardín Botánico Canario "Viera y Clavijo"-Unidad Asociada CSIC (http://www.jardincanario.org/).

Understanding and preserving biodiversity is only possible through a diversity of approaches. This is a unique opportunity for researchers to offer their outlook, or for interested persons to be updated on ongoing progress.

Either if you are a specialist, a researcher, or a person with a genuine interest on biodiversity, it is my sheer pleasure to invite you, on behalf of the scientific and organizing committee of the *Fundación Amurga International conferences on island biodiversity*, to join us on this new edition.

Juli Caujapé-Castells
Jardín Botánico Canario "Viera y Clavijo"-Unidad Asociada CSIC (Cabildo de Gran Canaria)
Las Palmas de Gran Canaria, Spain
December 2010

RELEVANT DATA

DATES

MONDAY MARCH 14TH - FRIDAY MARCH 18TH 2011

VENUES

MARCH 14th-17th: GABINETE LITERARIO DE LAS PALMAS DE GRAN CANARIA
Plaza de Cairasco, 1
35002 - Las Palmas de Gran Canaria
<http://www.gabineteliterario.com/>

MARCH 18th: JARDÍN BOTÁNICO CANARIO "VIERA Y CLAVIJO"-UNIDAD ASOCIADA CSIC (RESEARCH BUILDING)
Camino al Palmeral 15 de Tafira Alta
35017 Las Palmas de Gran Canaria
<http://www.jardincanario.com/>

CONTACT

- **FOR ANY FURTHER QUERIES REGARDING THE SCIENTIFIC PROGRAMME OF THIS CONFERENCE WEEK, YOU MAY CONTACT DR. JULI CAUJAPÉ-CASTELLS** (julicaujapeATgmail.com).
- **FOR TIPS ABOUT TRAVEL LOGISTICS, LODGING, SUBSISTENCE, OR ANY OTHER MATTER NOT STRICTLY RELATED TO THIS PROGRAMME, PLEASE VISIT THE WEB SITE OF LAS PALMAS TOWN** (http://www.laspalmasgc.es).

PAYMENT INFORMATION FOR ATTENDANTS

PLEASE NOTE THAT ALL THIS INFORMATION IS ALSO APPLICABLE TO CO-AUTHORS OF LECTURES WHOSE BIOSKETCHES DO NOT APPEAR IN THE PROGRAMME

PAYMENT INSTRUCTIONS (Attendance limited to about 200 persons)

- Follow the payment instructions in

  http://amurgaconferences2011.ticketea.com/

  General attendance fee: 70 Euros
  Final dinner (optional): 30 Euros
  Attendance certificate (optional): 25 Euros

OTHER RELEVANT INFORMATION

- For the sessions from March 14th to March 17th, there are plenty of good options for lunch at the Gabinete Literario itself (10 Euros) or around the venue.
- For the sessions of Friday March 18th at the Jardín Botánico Canario "Viera y Clavijo"-Unidad Asociada CSIC, lunch will be catered to all the attendees in the surroundings of the "Guiniguada" building.

ABBREVIATED PROGRAMME

MONDAY, MARCH 14TH 2011
MAIN THEME: ISLAND BIOGEOGRAPHY

8:00-8:30
CONFERENCE OPENING

8:30-9:30
1. The importance of windows of opportunity for long-distance dispersal to oceanic islands: examples from the Macaronesian archipelago

José María Fernández-Palacios[1]*, Mark A. Carine[2], Juli Caujapé-Castells[3]
[1]Universidad de La Laguna, Santa Cruz de Tenerife (Spain); [2]Natural History Museum, London (United Kingdom); [3]Jardín Botánico Canario "Viera y Clavijo"-Unidad Asociada CSIC, Las Palmas de Gran Canaria (Spain)

9:30-10:30
2. Integrative phylogenetic evidence on the origin of island endemics in the Mediterranean region: comparisons between oceanic and continental fragment islands

Elena Conti*
Institute for Systematic Botany, University of Zürich (Switzerland)

10:30-11:00 COFFEE BREAK

11:00-12:00
3. Bayesian biogeography finds its roots

Isabel Sanmartín*
Real Jardín Botánico de Madrid-CSIC (Spain)

12:00-12:30. PRESS CONFERENCE

12:30-14:00 LUNCH TIME

14:00-15:00
4. A comparison of bryophyte diversity in the Macaronesian Islands

Juana María González-Mancebo[1]*, Rosalinda Gabriel[2], Rüdiger Otto[1], Manuela Sim-Sim[2], Leena Luis[2], Cecilia Sérgio[2]
[1]Universidad de La Laguna, Tenerife (Spain); [2]Science Faculty, Lisbon University (Portugal)

15:00-16:00
5. What can the study of island speciation tell us about dispersal and evolutionary rates in early land plants?

Alain Vanderpoorten*
Belgian Funds for Scientific Research at University of Liège, Institute of Botany (Belgium)

16:00-17:30. INTERACTION TIME, WITH FREE DRINKS AND NIBBLES
17:30. END OF THE DAY

TUESDAY, MARCH 15TH 2011
MAIN THEME: GENETIC DIVERSITY AND ECOLOGY IN THE CANARIES

9:00-10:00

6. Sexual systems in the Canarian flora: evolutionary pathways to gender dimorphism and dioecy

Julia Pérez de Paz*, Rosa Febles*, Olga-Fernández-Palacios, Magui Olangua
Jardín Botánico Canario "Viera y Clavijo"-Unidad Asociada CSIC, Las Palmas de Gran Canaria (Spain)

10:00-10:30 COFFEE BREAK

10:30-11:30

7. Islands within islands: historical and ecological constraints explain disjunct distribution between *Navaea phoenicea* populations

Javier Fuertes Aguilar[1]*, Alejandro González Fernández de Castro[1], Juan Carlos Moreno-Saiz[2], Manuel Nogales[3]
[1]Real Jardín Botánico de Madrid-CSIC (Spain); [2]Departamento de Biología, Universidad Autónoma de Madrid (Spain); [3]Grupo de Ecología y Evolución en Islas IPNA-CSIC, La Laguna, Sta. Cruz de Tenerife (Spain).

11:30-12:30

8. Genetic diversity of Canarian endemisms revealed by microsatellites: knowledge after one decade of analysis

Pedro A. Sosa*, Miguel A. González-Pérez*, Edna A. González-González, Elisabeth Rivero
Departamento de Biología, Universidad de Las Palmas de Gran Canaria (Spain)

12:30-14:00. LUNCH TIME

14:00-15:00

9. A tree of life for the Canarian endemic trees: a first step toward the phylogenetic diversity of the archipelago's flora

Ruth Jaén-Molina[1]*, Águedo Marrero[1]*, José María Fernández-Palacios[2], Alain Franc[3], Juli Caujapé-Castells[1]
[1]Jardín Botánico Canario "Viera y Clavijo"-Unidad Asociada CSIC, Las Palmas de Gran Canaria (Spain); [2]Universidad de La Laguna, Santa Cruz de Tenerife (Spain); [3]INRA-UMR Biodiversité, Gènes et Communautés, Arcachon (France)

15:00-16:00

10. DEMO: The *Demiurge* web server for geo-referenced genetic diversity digests, and its genotype matrix analysis & submittal software *Transformer-4* (http://www.demiurge-project.org/)

Izzat Sabbagh*[1], Rafael Ramos[2]*, Juan J. Castellano*[2], Francisco M. Quintana-Trujillo[1], Dailos Medina*[3], Javier Toledo*[4], Juli Caujapé-Castells[5]*
[1]Instituto Tecnológico de Canarias, Pozo Izquierdo, Gran Canaria (Spain); [2]Jablesoft ingenieros de software, Las Palmas de Gran Canaria (Spain); [3]Mr. Bicho dynamic web applications, Las Palmas de Gran Canaria (Spain); [4]The Agile Monkeys, Las Palmas de Gran Canaria (Spain); [5]Jardín Botánico Canario "Viera y Clavijo"-Unidad Asociada CSIC, Las Palmas de Gran Canaria (Spain)

16:00-17:30. INTERACTION TIME, WITH FREE DRINKS AND NIBBLES
17:30. END OF THE DAY

WEDNESDAY MARCH 16TH 2011
MAIN THEME: EVOLUTIONARY PROCESSES

9:00-10:00

11. Contribution of natural hybridization to plant evolution in oceanic islands (and elsewhere). Is a conceptual synthesis possible?

Gonzalo Nieto-Feliner*
Real Jardín Botánico de Madrid-CSIC (Spain)

10:00-10:30 COFFEE BREAK

10:30-11:30

12. Long-distance dispersal by wind

Jesús Muñoz*, Ángel M. Felicísimo
Real Jardín Botánico de Madrid-CSIC (Spain)

11:30-12:30

13. The surfing syngameon hypothesis: implications for the genetic and taxonomic diversities of the present Canarian flora

Juli Caujapé-Castells*
Jardín Botánico Canario "Viera y Clavijo"-Unidad Asociada CSIC, Las Palmas de Gran Canaria (Spain)

12:30-14:00 LUNCH TIME

14:00-15:00

14. Phylogenetic investigations of correlated diversification between plants and their associated arbuscular mycorrhizal fungi in Macaronesia

Robert K. Jansen[1]*, Michael Gruenstaeudl[1], Christine Hawkes[1], Arnoldo Santos-Guerra[2]
[1]Section of Integrative Biology, University of Texas at Austin, Austin, TX 78712, USA; [2]Unidad de Botánica Aplicada (ICIA), Jardín de Aclimatación de La Orotava, Tenerife (Spain)

15:00-16:00

15. Does the Linnean shortfall explain the Azores diversity enigma?

Mark A. Carine*
The Natural History Museum, London (United Kingdom)

16:00-17:30. INTERACTION TIME, WITH FREE DRINKS AND NIBBLES
17:30. END OF THE DAY

THURSDAY MARCH 17TH 2011
MAIN THEME: PLANT LIFE OUT OF MACARONESIA

9:00-10:00

16. Comparative reproductive biology of the Canaries and Pacific archipelagos, especially Juan Fernández

Daniel J. Crawford[1]*, Gregory J. Anderson[2], Gabriel Bernardello[3], Arnoldo Santos-Guerra[4]
[1]Department of Ecology & Evolutionary Biology, and Biodiversity Institute, University of Kansas, Lawrence (USA); [2]Department of Ecology & Evolutionary Biology, University of Connecticut, Storrs (USA); [3]Instituto Multidisciplinario de Biología Vegetal, CONICET-Universidad Nacional de Córdoba (Argentina); [4]Unidad de Botánica (ICIA), Puerto de la Cruz, Tenerife (Spain)

10:00-10:30 COFFEE BREAK

10:30-11:30

17. Genetic diversity and phylogeography in Western Mediterranean islands: what we do know and what we should know

Josep A. Rosselló[1,2]*, Alberto del Hoyo[2], Maria Mayol[3]
[1]Jardín Botánico, Universidad de Valencia (Spain); [2]Jardí Botànic Marimurtra-Fundació Karl Faust, Blanes, Catalonia (Spain); [3]CREAF (Center for Ecological Research and Forestry Applications), Autonomous University of Barcelona (Spain)

11:30-12:30

18. What can tell us genome organization about plant evolution in Mediterranean continental islands?

Marcela Rosato*[1], José A. Galián[1], Josep A. Rosselló[1,2]
[1]Jardín Botánico, Universidad de Valencia, (Spain); [2]Jardí Botànic Marimurtra-Fundació Karl Faust, Blanes, Catalonia (Spain)

12:30-14:00. LUNCH TIME

14:00-15:00

19. Contrasting patterns of plant evolution in the Canarian and Galápagos islands: the origin of dispersal and colonization

Pablo Vargas[1]*, Manuel Nogales[2]*, Anna Traveset[3]
[1]Real Jardín Botánico de Madrid-CSIC (Spain); [2]Instituto de Productos Naturales y Agrobiología, CSIC, Tenerife (Spain); [3]Instituto Mediterráneo de Estudios Avanzados CSIC, Mallorca (Spain)

15:00-16:00

20. West and East African disjunctions focused in Canarian vs. Socotoran flora

Arnoldo Santos-Guerra*
Unidad de Botánica Aplicada (ICIA), Jardín de Aclimatación de La Orotava, Tenerife (Spain)

16:00-17:30. INTERACTION TIME, WITH FREE DRINKS AND NIBBLES
17:30. END OF THE DAY

20:30. FINAL DINNER

FRIDAY MARCH 18TH 2011
MAIN THEME: MACARONESIAN FLORAS

8:30-9:00

OFFICIAL INAUGURATION OF THE RE-FURBISHED MOLECULAR LABORATORIES OF THE JARDÍN BOTÁNICO CANARIO "VIERA Y CLAVIJO"-UNIDAD ASOCIADA-CSIC

9:00-10:00

21. Taxonomy of island plants: a proposal for a Flora of Macaronesia

David Bramwell*
Jardín Botánico Canario "Viera y Clavijo"-Unidad Asociada CSIC, Las Palmas de Gran Canaria (Spain)

10:00-10:30 COFFEE BREAK

10:30-11:30

22. SW Morocco: An obvious step for understanding the Canary Islands Flora.

Alfredo Reyes*, Arnoldo Santos-Guerra
Unidad de Botánica Aplicada (ICIA), Jardín de Aclimatación de La Orotava, Tenerife (Spain)

11:30-12:30

23. Conservation strategies for the Azorean priority taxa: what are the molecules telling us?

Mónica Moura*
Universidade dos Açores en Ponta Delgada (Portugal)

12:30-14:00 LUNCH TIME

14:00-15:30

24. A phylogeny for the Macaronesian flora and how we can use it to predict potential invaders and identify hotspots of genetic diversity

Hanno Schaefer*
Department of Organismic and Evolutionary Biology, Harvard University (USA)

16:00-17:00

25. Comments on the Vascular Flora of Madeira: History, recent advances and relations with other Macaronesian archipelagos

Miguel Menezes de Sequeira*[1], Jorge Capelo[2], Roberto Jardim[1,3], Aida Pupo[1]
[1]Centro de Ciências da Vida, Universidade da Madeira, Campus da Penteada, Funchal (Portugal); [2]USPF, L-INIA, INRB, Oeiras (Portugal); [3]E. S. Francisco Franco, Funchal (Portugal)

17:00-18:00

26. A review of recent advances in the study of the endemic flora from Cape Verde Islands

María Romeiras*, María Cristina Duarte
Tropical Research Institute (IICT), Tropical Botanical Garden, Lisbon (Portugal)

18:00 – CLOSING CEREMONY

18:30 – END OF THE *AMURGA INTERNATIONAL CONFERENCES ON ISLAND BIODIVERSITY 2011*

ABSTRACTS AND BIOGRAPHICAL SKETCHES OF SPEAKERS

1. The importance of windows of opportunity for long-distance dispersal to oceanic islands: examples from the Macaronesian archipelago

José María Fernández-Palacios*[1], Mark A. Carine[2], Juli Caujapé-Castells[3]
1: Island Ecology and Biogeography Research Group, La Laguna University (Spain)
2: Natural History Museum, London (United Kingdom)
3: Jardín Botánico Canario "Viera y Clavijo"-Unidad Asociada CSIC, Cabildo de Gran Canaria (Spain)

The current species composition of entire oceanic islands or specific insular ecosystems is the result of a complex scenario where several historical and ecological processes, including long-distance dispersal (LDD), subsequent colonization, speciation (within or among islands) and extinction may have played an important role. A window of opportunity for a long-distance dispersal (LDD) event could be defined as the time interval throughout which the different factors controlling LDD became simultaneously functional or available. Usually, the occurrence of LDD windows of opportunity is analyzed in retrospect; for instance, when palaeobiogeographers try to reconstruct the past events that may have enabled a present bizarre (fossil or extant) species distribution. Among the items that have to be checked for hypothesizing the existence of such window(s) we should consider: i) the existence in the proper historical moment at the continental margins of the ecosystems where the focal species or taxa thrived, of ecosystems that may have later persisted or disappeared *in situ* (as was the case for the Tethyan Palaeotropical Geoflora in Iberian and North Africa in respect to Macaronesia), ii) the existence of islands available to be reached and subsequently colonized (which may as well have later persisted or vanished under the sea, as was the case for several Palaeo-Macaronesian islands), or iii) the historical occurrence of the proper agents for facilitating the dispersal event, that may be still present today or not (for instance, palaeo-sea-currents or palaeo-wind systems). Also crucial for the understanding of the progression-rule colonization that may have shaped the archipelago species composition are the iv) temporal availability of stepping stones, for instance, due to eustatic sea-level transgressions that permitted the emersion of non-subsided flat-topped seamounts (guyots) facilitating dispersal, or v) the existence of peak periods, i.e. the simultaneous occurrence of high islands that may have facilitated, through island hopping, the persistence of endemic species before the disappearance due to erosion and subsidence processes of the mountain and summit ecosystems of the island where they were once present. These windows of opportunity for long-distance dispersal can be hypothesized as well for explaining retro-colonization events, i.e. the colonization of the mainland by insular species derived from mainland ancestors, when climate changes have transformed in the past the sea-currents and wind systems nowadays prevailing in the focal zone. This is actually the case for several Iberian and North African species with a clear Macaronesian origin, whose insular ancestors have been able to disperse from Macaronesia to the mainland during the prevalence of the Westerlies winds at the mid latitudes (20-30 degrees), which occurred several times during the different Pleistocene glaciations maxima events.

José María Fernández-Palacios (Las Palmas de Gran Canaria, 1958) is Professor in Ecology at La Laguna University since 1996 and S*enior Research Associate* of the Oxford University. He is as well head of the Island Ecology and Biogeography Group of La Laguna University, integrated by ca. 20 teachers and researchers, which is active in several research projects and contracts. He has supervised 8 PhD Thesis and authored or co-authored 60 research papers in JCR Journals as well as 10 books dealing with Island Ecology and Canarian Ecology, among them one edited by Oxford University Press (Island Biogeography. Ecology, Evolution and Conservation, 2nd Ed.). His research lines include palaeoecology, pine and laurel forest dynamics, ecological restoration and island ecology. Since 2005 is member of the *Editorial Board* of *Journal of Biogeography*, a high ranked Journal published by Wiley-Blackwell.

2. Integrative phylogenetic evidence on the origin of island endemics in the Mediterranean region: comparisons between oceanic and continental fragment islands.

Elena Conti*
Institute of Systematic Botany, University of Zurich

Ever since Darwin's seminal studies on the Galapagos archipelago, islands have played a key role in the development of biogeographic theory. One under-explored issue concerns the influence of geologic origins on processes of island colonization and speciation. The Mediterranean Region sensu lato provides an ideal setting to study this issue, because it includes both continental fragment (e.g., Corsica and Sardinia) and oceanic islands (e.g, the Canarian archipelago). Recent improvements on molecular dating and ancestral area reconstruction methods now allow for a more effective integration of phylogenetic evidence with knowledge on past geologic (i.e., microplate movements, formation of temporary corridors, island formation) and climatic events (i.e., onset of the Mediterranean climate). We analyzed the origin of island endemics in Araceae, Boraginaceae, and Rutaceae. The results supported the single colonization, followed by *in situ* diversification, of the Canarian archipelago by both *Echium* (Boraginaceae) and *Ruta* (Rutaceae) during the Miocene, likely after the formation of the oldest island about 20 Mya and well before the onset of the Mediterranean climate in the Pliocene. Additionally, the colonization of islands within the archipelago does not appear to conform to the classic stepping-stone model in *Ruta*. The origin of Corso-Sardinian endemics is likely explained by the fragmentation of the Hercynian massif in the early Oligocene for *Helicodiceros muscivorus* (Araceae), by the separation of the Corso-Sardinian microplate from the Apulian microplate in the middle Miocene for *R. lamarmorae*, *R. corsica* (Rutaceae), and *Arum pictum* (Araceae), by temporary land connections with neighboring landmasses during the Messinian Salinity Crisis for *Borago*, and by long distance dispersal during the Pliocene for *Anchusa* (Boraginaceae). Altogether, our studies highlight the key role of both tectonic and eustatic processes of marine transgression-regression for the origin of endemics in the continental fragment islands of Corsica and Sardinia and the importance of identifying discrete time windows for colonization for the origin of endemics in the oceanic Canarian archipelago.

Elena Conti's fundamental research goal is to understand the origin and evolution of plant diversity. To achieve it, she integrates different aspects of plant evolutionary biology into an explicit phylogenetic framework, addressing fundamental questions in biogeography and plant reproductive biology. In biogeography, she is using both phylogenetic/phylogeographic and population genetic approaches to investigate the origin of Alpine taxa, the link between secondary contact after glacial retreat and allopolyploid speciation, the role of geological events in shaping patterns of distribution in Mediterranean plants, and whether island colonization is linked with changes of genetic diversity and ecological preferences. She is investigating this last question by comparing oceanic (Macaronesian archipelago) and continental islands (Corsica and Sardinia). In plant reproductive biology, she is studying whether the evolution of heterostyly was the main driver of increased diversification rates in Primulaceae and whether the interaction between floral morphology and pollinators contributes to modulating gene flow between hybridizing species of *Primula*. She is also starting to explore whether island colonization is linked with switches from heterostyly to homostyly, bringing together her interests in reproductive biology and island biogeography.

3. Bayesian biogeography finds its roots

Isabel Sanmartín*
Real Jardín Botánico de Madrid-CSIC (Spain)

Markov chain Monte Carlo (MCMC) Bayesian inference techniques have become very popular in phylogenetic inference because of the relative ease with which these techniques allow us to infer evolution using more complex and realistic models. However, it has taken much longer time to transfer Bayesian techniques, and in general statistical inference methods, to the field of Biogeography, where parsimony has been the favourite mean of inferring the past. This reliance on parsimony has made it difficult to incorporate relevant evidence other than the tree topology and species distributions to biogeographic analyses, for example: the times of divergence between lineages or information on the connectivity of geographical areas through time. Here I present a Bayesian statistical approach that integrates phylogenetic and biogeographic uncertainty to estimate carrying capacities (equilibrium frequencies of species diversity) and rates of dispersal/ biotic migration between geographically isolated areas, using DNA sequence data and species distributions. An advantage of the method is that biogeographic parameters can be estimated across groups differing in their age, evolutionary rate, and/or dispersal capabilities, so it can be used for inferring significant patterns or trends at regional level. The BIB model has been used so far in an island context (i.e., areas separated by oceanic barriers) to infer colonization patterns in the Canary Islands. Here, we show that the BIB model may be useful in a continental setting where areas are separated by ecological barriers, and where the number of inferred dispersal/migration events between areas is low. We explore its use for disentangling the evolutionary origins of a continental-scale floristic pattern (the 'Rand Flora') that evolutionarily relates disjunct floras along the margins of the African continent, such as those of Macaronesia and the Horn of Africa-Southern Arabian region. We also revisit the Canary Islands study to show how this approach can be used to compare diversification patterns in the endemic flora and fauna, as well as to infer the role of punctual extinction events.

Isabel Sanmartín is a senior scientist at the Real Jardin Botanico (CSIC) in Madrid. Her research interests concern the development of analytical tools in biogeographical inference - especially model (process)-based approaches - and the application of these methods to identify evolutionary processes that have shaped the distribution of biodiversity over time. More specifically, the interplay between geologically-mediated vicariance and lineage-dependent dispersal in different biogeographic scenarios, ranging from inter-continental geographical disjunctions to colonization patterns in islands.

4. A comparison of bryophyte diversity in the Macaronesian Islands

Juana María González-Mancebo[1]*, Rosalinda Gabriel[2], Rüdiger Otto[1], Manuela Sim-Sim[2], Leena Luis[2], Cecilia Sérgio[2]

[1]Universidad de La Laguna, Tenerife (Spain),

[2]Science Faculty, Lisbon University (Portugal)

Bryophytes represent an important plant group in the Macaronesian islands in terms of richness and singularity of the species composition. Nevertheless, comparing with other plant groups mosses and liverworts has received much less attention, especially because the difficulties to obtain an adequate data basis. Bryophyte richness in the Macaronesian islands has been mainly correlated with altitude and precipitation, factors highly correlated with habitat diversity. However, habitats from individual islands have rarely been compared between islands, within or between biogeographic regions, even for higher plants. In this study, we present a comparison of richness and diversity of this plant group, in the five most important habitat types in the Macaronesian islands. We evaluate the importance of different factors discussed in the literature in predicting the species diversity per island and selected habitats, including area, isolation, climatic factors, age and human influence. We try to quantitatively document patterns of bryophyte species distribution across islands and the selected habitats. We addressed the following research questions:

1- What factors predict diversity of bryophyte species on different islands and habitats types in the Macaronesian islands?
2- How similar are bryophyte floras between different habitats in these islands?

As a result of recent research, distinct biogeographical patterns were observed for mosses and liverworts (including hornworts) in the Macaronesia, we address these questions for both groups jointly and also individually.

Juana María González-Mancebo (Ecuatorial Guinea 1960) is *Profesor Titular* of the Department of Botany at the University of La Laguna (Tenerife, Canary Islands). She obtained her PhD on colonization and recovery of bryophytes, lichens and vascular plants on recent lava flows in the Canary Islands at the University of La Laguna (1991). Her research has been mainly orientated to ecology, distribution patterns and biogeography of the bryophyte flora in the Macaronesian islands. Her research about conservation has been mainly focused on the effects of forest disturbance on bryophytes of the Canary laurel forest and herbivore effects of threatened vascular plants in pine forests. Currently, her research has focused in the study of threatened bryophyte species in the Macaronesian Islands, analyzing the main distribution patterns and rarity causes of the species in these islands. A usual reviewer for scientific journals, she has published more than 60 scientific papers/book chapters/books, directed several PhDs, and participating in 30 research projects that were mainly focused in distribution, ecology, conservation and biogeography processes in the bryophyte flora of the Macaronesian Islands and NW-Africa.

5. What can the study of island speciation tell us about dispersal and evolutionary rates in early land plants?

Alain Vanderpoorten*
Belgian Funds for Scientific Research at University of Liège, Institute of Botany (Belgium)

Recent advances in phylogenetics and, in particular, molecular dating indicate that transoceanic dispersal has played an important role in shaping plant and animal distributions, obscuring any effect of tectonic history. Taxonomic sampling in biogeographic studies is, however, systematically biased towards vertebrates and higher plants and the possibility remains that a much stronger signature of ancient vicariance might be evident among other organisms, particularly among basal land plants. In fact, analyses of worldwide bryophyte distribution patterns contrast with the idea that, in spore-dispersed organisms, dispersal obscures evidence of vicariance. Extant species distribution patterns, which at first sight are congruent with the expectations of the continental drift theory, may, however, conceal a complex mixture of relictual distributions and more recent dispersal events, making it necessary to set vicariance events within an explicit time frame. The scarcity of the fossil record in non-vascular organisms like bryophytes hampers, however, the possibilities of calibration of the molecular clock. Even when fossils exist, their use to calibrate phylogenetic trees is limited because their morphology often does not allow for their definitive placement in the phylogeny, hence increasing the error associated with the estimate of the divergence dates. In this context, calibration dates derived from major geological events assumed to have been responsible for lineage divergence, and the use of island neo-endemic speciation events in particular, appears as a promising alternative possibility. Therefore, island biogeography provides the appropriate framework for describing and understanding evolutionary patterns and processes in bryophytes and in particular, the significance of dispersal and cryptic diversification.

Alain Vanderpoorten leads a research group of one post-doc, 6 PhD students, 1 Msc student and 2 lab technicians, focusing on the biogeographic history of bryophytes. >80 publications in international, peer-reviewed journals, one book and >10 book chapters. He receives funding from the Belgian Funds for Scientific Research (FNRS), Fonds Léopold III, Académie Royale des Sciences de Belgique, Ministry of the Environment, European Distributed Institute of Taxonomy.

6. Sexual systems in the Canarian flora: evolutionary pathways to gender dimorphism and dioecy

Julia Pérez de Paz*, Rosa Febles-Hernández*, Olga-Fernández-Palacios, Magui Olangua
Jardín Botánico Canario "Viera y Clavijo"-Unidad Asociada CSIC, Las Palmas de Gran Canaria (Spain)

The flower is one of the fundamental elements of systematics, but its integrated function still remains largely unknown. Notably, such knowledge is essential to understand the reproduction, transmission of genetic diversity to offspring, population maintenance, diversification, or infra-generic speciation of island plants. Islands, which are widely seen as natural laboratories for evolutionary studies, are also particularly rich in taxa with unisexual flowers (dioecious, monoecious and polygamous), and are considered especially relevant for the study of the evolution of dioecy, because identification of putative colonizing taxa with molecular phylogenies can preclude the detection of early and transitional intermediate insular stages representing the possible evolutionary pathways and selective forces involved (Webb 1999). Our research on sexual systems in the Canarian flora bolsters the hypothesis of a high phylogenetic component influencing sex expression, which determines the response of colonising taxa to local selective forces (pollination and dispersal), not only directed towards xenogamy, but also to sexual selection, to a better investment of male and female resources, and to progeny's vigour. In our assessment of endemics with unisexual flowers (still largely under-estimated), Canarian genera with subdioecy and functional dioecy represent at least a 10%, and polygamous genera with hermaphroditic and unisexual flowers ca. 7-8%, with populational dimorphism (gynodioecy or androdioecy). Applying Webb's (1999) evolutionary scheme in the Canarian flora, we have recognized possible pathways to dioecy from: (i) Monoecy via sub-dioecy with inconstancies on one sex and fundamentaly anemogamous syndromes (*Myrica, Rumex, Phyllis, Bencomia, Marcetella, Dendriopoterium*), entomogamous syndrome (*Bosea, Salix, Ilex, Whitania, Bryonia, Semele, Tamus),* or via para-dioecy with inconstancies on both sexes (*Maytenus, Rhamnus, Mercurialis*), (ii) Co-sexuality via gynodioecy with transitional stages of masculinity in hermaphrodite plants (*Plocama, Silene*) and ambiguous situations, or stable gynodioecy (*Echium*), (iii-iv) Cosexuality via androdioecy associated with heterodichogamy (*Neochamaelea*), and (v) Heterodichogamy (*Persea*) and polygamy (*Olea, Picconia*).

Julia Pérez de Paz is a civil servant biologist at the Jardín Botánico Canario "Viera y Clavijo" (Cabildo de Gran Canaria) since 1977, and head of this institution's research division. She obtained her PhD (with honors) with the subject *Pallinology, sistematics and biogeography of genus Echium in Macaronesia, and Lobostemon (Boraginaceae)*, which deserved the *Viera y Clavijo* award in sciences. She has authored some 30 scientific publications, two book chapters, about 50 participations in congresses (with several invited lectures), and co-organized two meetings. She participated in six R+D projects (in two of them as the PI), and in 2 Interreg projects. A supervisor of ca. 10 projects in pallinology, reproductive biology and genetic diversity of Canarian endemics (e.g., *Limonium, Echium, Neochamaelea, Plocama*, etc), she has co-directed two PhD's on *Parolinia* (January 2010) and *Argyranthemum* (2011), and participated in doctoral committees at the Universities of León, Barcelona and Las Palmas. She co-directed and taught four courses (*Introduction to Scanning Electron Microscopy, pallinology, systematics and evolution*, *Introduction to numeric taxonomy and reproductive biology*) in the doctoral programme of the ULPGC *Biodiversity and plant conservation* during 1994-96 and 1997-99. She was a professor of the *First seminar about conservation biology of threatened plants*.

Rosa Febles-Hernández is a civil servant biologist at the Jardín Botánico Canario "Viera y Clavijo" (Cabildo de Gran Canaria) since 1983. She obtained her PhD (with honors) with the subject "*Cytogenetic and evolutionary analysis in endemic species of the genera Gonospermum, Lugoa and Tanacetum (Compositae: Anthemideae) in the Canary Islands*. She has authored or co-authored some 20 scientific publications, about 50 participations in congresses. She participated in three R+D projects and in two Interreg projects. A supervisor of ca. 10 projects in cytogenetics, reproductive biology and genetic diversity of Canarian endemics (e.g., *Limonium*, *Echium*, *Neochamaelea*, *Plocama*, etc), she has co-directed two PhD's: on *Parolinia* (January 2010) and *Argyranthemum* (2011), and participated in doctoral committees at the University of Las Palmas. She co-directed and taught two courses on *Plant cytogenetics: phylogeny and evolutionary applications*, and on *Introduction to numeric taxonomy* in the doctoral programme of the ULPGC Biodiversity and plant conservation during 1994-96 and 1997-99.

7. Islands within islands: historical and ecological constraints explain disjunct distribution between *Navaea phoenicea* populations

Javier Fuertes Aguilar[1*], Alejandro González Fernández de Castro[1], Juan Carlos Moreno-Saiz[2], Manuel Nogales[3]

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The Canary Islands represent one of the best studied models on oceanic island biogeography. However, the phylogeography of their endemic species is still in a earlier stage. *Navaea phoenicea* (Vent.) Webb & Berthelot (Malvaceae), an arborescent mallow endemic to the island of Tenerife, is a monotypic isolated lineage, sister to the *Lavatera-Malva* clade, as revealed by ITS and cpDNA studies, suggesting the Tertiary relict condition for this Macaronesian species. Its present distribution, restricted to Teno and Anaga massifs, shows a recurrent biogeographic pattern common in other endemic lineages. An integrative approach based on molecular population genetics (AFLP), reproductive biology and ecological modeling techniques is helping to understand the origin of such pattern. The ecological study demonstrates that, despite a potential niche larger than the presently occupied by the species, the gap between Teno and Anaga of *Navaea* is also present in their potential niche distribution, as shown in niche modelling based onm bioclimatic variables. The results from populational and demographic studies show an East –West negative gradient in genetic diversity allelic richness values in populations. Floral morphology and physiology of *Navaea* exhibit a marked assemblage of traits adapted to ornithophily. The pollination study indicates that no restriction is observed in the fruit and seed set induced by the pollination efficiency of different vectors (mostly birds). Germination rates, seed dispersal and seedling recruitment, suggests however an ongoing active process of population depauperation due to a high rate of seedling mortality by herbivory. The results of our study lead us to conclude that while past historical events (volcanism, landslides) in Canary Islands have greatly influenced the present distribution patterns in plants, the effects of current events mediated by human activities (land reclamation, invasive species) not only obscure such patterns, but can most likely conduct *Navaea* towards rapid extinction.

Javier Fuertes Aguilar is a Senior Scientist at the Real Jardín Botánico (RJB-CSIC). First trained as a Tropical Botanist, after receiving his Ph.D. in Biology in 1993 at the University of Salamanca, he was a Postdoctoral Fellow at the University of Texas at Austin (1994-1996). In 1997, he joined the RJB, where he set up the Molecular Systematics Lab. Since then, his research has primarily been focused on the use of molecular markers in the study of Plant Evolution and Diversity. His recent interest in *Navaea* was born from his previous works on the Systematics and Evolution of Malvaceae and his fascination after the contact with the Canarian Flora. He has been principal investigator in several projects related to the Macaronesian Flora and is presently responsible for a research project centered in the origin of morphological novelties associated to ecological niche shifts in several lineages of Canarian plants funded by the Spanish National Plan of R&D&I.

8. Genetic diversity of Canarian endemisms revealed by microsatellites: knowledge after one decade of analysis.

Pedro A. Sosa*, Miguel A. González-Pérez*, Edna A. González-González, Elisabeth Rivero
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Our research group has studied the genetic diversity and structure of different endemics species from the Canary Islands using diverse molecular markers. Species as different as, *Myrica rivas-martinezii* (Myricaceae)*, Sambucus palmensis* (caprifoliaceae)*, Bencomia exstipulata* (Rosaseae)*, Silene nocteolens* (Caryophyllaceae)*, Sorbus aria* (Rosaseae)*, Ilex perado, Phoenix canariensis (*Arecaceae), *Stemmacantha cynaroides* (Compositae)*, Viola cheiranthifolia* (Violaceae), among others, have in common that most are threatened and have little or limited number of individuals. So it is necessary to develop a program for genetic conservation of natural populations. Microsatellites have demonstrated to be an excellent tool to analyse population genetics and to apply in conservation genetics. The results obtained have already been applied in some conservation management programs developed by National and Regional institutions. Although it is necessary to increase the number of studies before confirming the generality of the genetic diversity levels detected, Canary Islands flora seem to show high genetic diversity levels in regard to those described in other oceanic islands. In this sense, microsatellite analyses have corroborated previous evidence (allozyme , RAPD, etc.). We present here a summary of the results obtained after ten years of applying microsatellite analyses to natural populations of endangered species, and its application in the genetic conservation of these species. Moreover, a compilation of the information generated with microsatellites and other molecular markers (allozyme and RAPD) is currently being hosted in the Bank of Molecular Markers of the Macaronesian Flora (BANMAC). BANMAC is a webpage integrated in DEMIURGO, a European project funded by Transnational Cooperation Programme – Madeira-Canarias-Azores (FEDER).

Pedro A. Sosa is a graduate in Molecular Biology at the University of La Laguna (Canary Islands, Spain), and has a PhD in Marine Sciences. He is a Professor of Botany at the University of Las Palmas de Gran Canaria (ULPGC) and Director of the Research group Biogeography, Conservation and Territory from the ULPGC. He has centered his scientific career in the area of Botany, on the genetic characterization of natural populations of endangered endemic plants from the Canary Islands, and its application to conservation biology, especially in Conservation Genetics. He has participated in different national and international research projects, being principal investigator in at least 15 research projects. Highlighting, the project Biodiversity and Genetics of Algae Populations, supported by the MAST-III European program, where he was the lead/head scientist for the Spanish group. He has directed three PhD theses, and has set up and implemented the laboratory of Molecular Biology and Conservation Genetics at the University of Las Palmas de Gran Canaria.

Miguel Ángel González-Pérez graduated in Biology at the University of La Laguna (Canary Islands, Spain) and is a doctorate from the University of Las Palmas de Gran Canaria (Canary Islands, Spain). His PhD thesis was awarded with different research prizes. He did short-term postdoctoral research in the Jodrell Laboratory, (Royal Botanic Gardens, Kew, UK) with Dr. Michael Fay, in order to develop microsatellites for an endangered endemic species from the Canary Islands (*Bencomia exstipulata*). Currently, he is working in the research group of Biogeography, Conservation and Territory at the University of Las Palmas de Gran Canaria, where he participates in different research projects oriented to evolutionary and conservation biology of plants endemic to the Canary Islands. Likewise, he is head of the laboratory of Molecular Biology and Conservation, and co-director of several PhD theses. At the moment, he is working with several endangered endemic species from the Canary Islands using a wide range of molecular techniques (allozymes, RAPDs, microsatellites) for the study of population genetics, systematics and evolution. The research group shows a strong personal interest in endangered and endemic Canarian flora and is committed to its conservation. At the moment, he has multiple scientific publications in international journals, a book, several book chapters, and more than 30 congress communications. He is also a referee of several scientific international journals.

9. A tree of life for the Canarian endemic trees: a first step toward the phylogenetic diversity of the archipelago's flora.

Ruth Jaén-Molina[1]*, Águedo Marrero[1]*, José María Fernández-Palacios[2], Alain Franc[3], Juli Caujapé-Castells[1]

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The sequence of a given DNA region is usually invariable and accessible throughout an organism's lifetime and (in non-extreme environmental conditions) even after death. Furthermore, sequences are directly comparable across different individuals by virtue of orthology (i.e., the common origin from an ancestral sequence). Thus, beyond their usefulness in phylogenetic and genetic diversity research, some DNA regions often contain relevant information on an individual's specific identity that may complement morphological traits for taxonomic purposes. We use the two currently accepted Angiosperm "barcode" cpDNA sequences (*rbcL* and *matK*) to assess their usefulness to identify any Canarian endemic tree species, and to detect eventual cases of cryptic species, with a special focus on *Myrsine-Pleiomeris* (Myrsinaceae). We also use the *rbcL* sequences to (i) assess the genetic diversity of endemic trees relative to non-tree endemics in the Canarian Flora, (ii) build a preliminary tree of life for the Canarian endemic trees (including available outgroups from other geographical regions), and (iii) estimate Phylogenetic Diversity (PD, an essential parameter to define *in situ* conservation strategies and priorities) for the Canarian endemic trees; critically, trees in general are perhaps the organisms with a lower capacity of adaptation to the current global changes, due to their long generation times. The DNA bank at the JBCVC-CSIC contains at present 7,017 samples that represent ca. 70% of the Canarian endemic flora (i.e., at least one population per taxon, though not every island of occurrence is sampled in all cases). Ongoing strategic sampling aims at presenting the first robust PD estimates for at least 85% of the endemic flora in two years. Given the clear implications of these results in taxonomy, biodiversity conservation and management, such objective presents great potential for diverse scientific and practical applications related to the mission of this institution. These results are part of the project arBOL-Can, funded by the Gobierno de Canarias.

Ruth Jaén-Molina has been combining different activities as a researcher of the Department of Molecular Biodiversity in addition to managing the DNA Bank of the Canarian Flora at the Jardín Botánico Canario "Viera y Clavijo"-Unidad Asociada CSIC (since May 2005). Her research interests are in molecular systematics, molecular phylogeny, molecular taxonomy, biogeography, and diversification of island plants, particularly from Macaronesia. The majority of the projects in which she participates have a multidisciplinary approach and the conservation of the species as a priority aim. Some examples of the emblematic groups that she has been studying are *Matthiola* R.BR, *Parolinia* Webb*, Dracaena* Vand. ex L.*, Minuartia* L.*, Heberdenia* Banks ex A.DC.*, Myrsine* L.*, Echium L.,* etc. The main goals of her research are to use molecular tools (DNA sequencing but also ISSR and microsatellites) to better understand the origin, evolution and biogeographical patterns of mainly, but not only, the species of the Canary Islands. For the past few years, she has been involved in projects to explore and develop the potential of DNA barcoding (*matK* & *rbcL*) as a practical tool for species identification as complementary to the classical taxonomy (Projects "Garajonay", "Tree-Bol" and "arBOL-Can").

Águedo Marrero Rodríguez is curator of the Herbarium of the JBCVC (LPA). He devoted his first research period to cytogenetics, generating contributions on the Macaronesian *Sideritis*. Later on, he moved his research focus to the areas of nomenclature, taxonomy, systematics and biogeography of the endemic Canarian and Macaronesian floras. He has developed an intense botanical prospection task across the entire Canarian Archipelago, discovering several hundred new populations of threatened or endangered taxa, re-discovering taxa that were feared extinct, and describing about 20 new taxa. He has contributed to numerous projects on Conservation Biology and Natural Spaces, and is an advisor for numerous initiatives related to recovery Plans of threatened species. He has published ca. 45 scientific papers and participated in many R+D projects funded by national and international agencies. He has been a most decisive collaborator in the DNA Bank of the JBCVC since its inception in 2005.

10. DEMO: The *Demiurge* web server for geo-referenced genetic diversity digests, and its genotype matrix analysis & submittal software *Transformer-4* (http://www.demiurge-project.org/)

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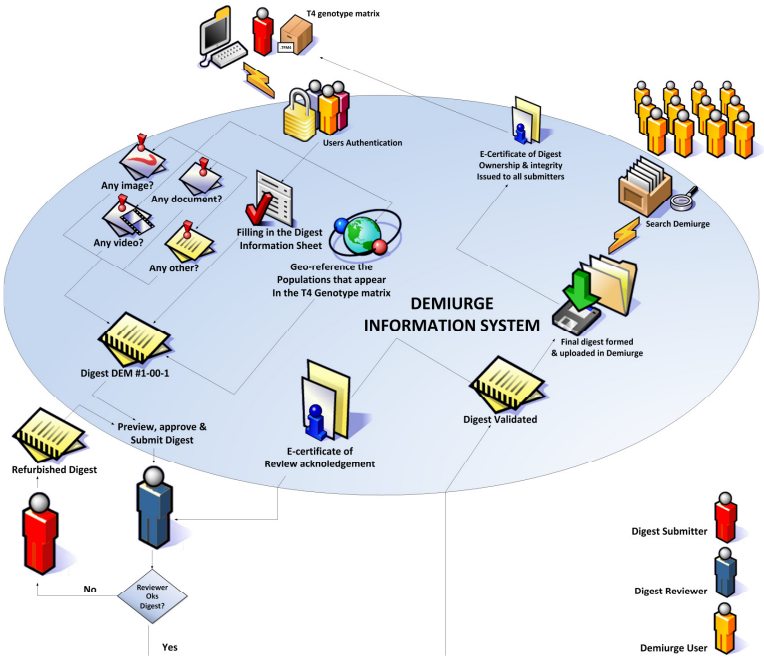
Scientific journals have logical space constraints that impede their attaching genotype matrices associated with all the empirical molecular population genetic investigations that they publish. This limitation entails that, each day, important and expensive genetic diversity knowledge is irreversibly frozen in papers that process the information contained in genotype matrices to a very limited extent, usually under only one of many presently possible conceptual scopes. Critically, the absence of a public web repository to make those genotype matrices publicly available in a universal standard that facilitates a versatile statistical analysis prevents many further applications of these data to estimate parameters not considered in the published papers, to use alternative present or future statistical approaches, or to enhance our current understanding of evolutionary change through proper standardization and meta-analysis. Indeed, estimates of genetic variation that help to substantiate hypotheses in scientific papers are only an aliquot of the total knowledge contained in the genotype matrices wherefrom they derive. Other potentially useful genetic diversity data either are never published, or they are found in difficultly accessible media, thus forming a knowledge limbo unattainable for the down-to-earth objectives of most researchers. Such is the case of internal reports, some PhDs, and many other investigation efforts. Substantial amounts of knowledge on biodiversity's genetic diversity remain thus dormant in the entrails of private computers scattered throughout our planet. We present *Demiurge*, created to (i) host and disseminate genetic diversity digests (i.e., geo-referenced genotype matrices plus relevant ancillary information), and (ii) allow an efficient use of all existing knowledge on biodiversity's genetic diversity with the help of the software platform *Transformer-4*. We believe that it may also represent a very powerful resource for educators, scientific journals and peer review. *Demiurge* was created with activities of the project “Demiurgo” (PCT-MAC/1/C020) which were co-funded by the JBCVC-CSIC and ITC.



11. Contribution of natural hybridization to plant evolution in oceanic islands (and elsewhere). Is a conceptual synthesis possible?

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Real Jardín Botánico, CSIC. Plaza de Murillo 2. 28014 Madrid, Spain.

It has been known for long that hybridization is a common process in plants. With the incorporation of molecular markers into biodiversity studies, the last two decades have witnessed a large number of cases documenting hybridization or introgression, some of them previously unexpected. The most frequent types of evidence revealing hybridization and introgression are phylogenetic incongruence between sequence data from differently inherited genes and fingerprinting data (AFLPs, RAPDs). Yet, at present only a low number of case studies involving hybrid speciation have been convincingly documented. The talk discusses such apparent paradox by describing a range of situations that can be framed within the hybridization/introgression umbrella, some of which are difficult to detect but are likely to be frequent. The situation in oceanic islands is also examined in the light of recent conceptual and methodological developments and specific biogeographic questions.

Gonzalo Nieto Feliner (PhD. 1984, Univ. Complutense Madrid, Spain) is a Research Professor of the Spanish National Research Council (CSIC) since 2003 and Director of the Royal Botanical Garden of Madrid, CSIC (2006-present). Past president of the International Organization of Plant Biosystematists, IOPB (2004-2007), vice-president of the Ibero-Macaronesian Association of Botanical Gardens (2006-present). Member of international committees such as Flora Europea Trust (2001-2003) or the Stebbins Medal committee (2007-present). Editor and contributor to *Flora Iberica* for c. 15 years. Supervisor of seven already defended PhD theses, organizer of two international scientific meetings, 125 scientific publications. His overall research interests are patterns of diversity and processes behind them in angiosperm groups. Specifically, he has worked in the role of hybridization in plant evolution (including the effects of reticulation in phylogeny reconstruction), phylogeography of angiosperm groups particularly in the Mediterranean Region and phylogeny reconstruction using molecular and morphological data. In previous years he has also worked in biosystematics of genera such as *Armeria, Arenaria, Erysimum, Daphne, Epilobium*, etc.

12. Long-distance dispersal by wind

Jesús Muñoz*, Ángel M. Felicísimo
Real Jardín Botánico de Madrid-CSIC (Spain)

Global wind patterns influence dispersal and migration processes of aerial organisms, propagules and particles, which ultimately affect colonizations, invasions or spread of pathogens. However, studying how wind-mediated movements actually happen has been hampered so far by the lack of high resolution global wind data as well as the impossibility to track aerial movements. Although small organisms -or their propagules- are the best suited to use wind as dispersal vehicle, to demonstrate it by direct observation or experimentation is actually very hard. We have used shared species by remote areas in the Southern Hemisphere, and subsequently several big-relative to cryptogams or small invertebrates-birds, to test if wind is a more general dispersal vehicle than traditionally accepted. Our studies demonstrate that wind is crucial to explain why remote islands share so many species, and also that model organisms can be used to study why continents, areas with a much more complicated biogeographical history than isolated islands, have also a wealth of humble organisms in common.

Jesús Muñoz's current research interests are mainly three: moss systematics, ecological modeling, and long-distance dispersal. In his studies of moss systematic, he uses classical and new tools to study moss relationships. Quite different, although related, are his interests on ecological modeling and climate change consequences on biodiversity. He integrates museum data (presence-only) and survey data (presence/absence) with remote-sensing data to examine individual species' distributions that, combined, are used to explore richness patterns. Finally, his interest in long-distance dispersal by wind derives from the striking fact that localities separated by immense spans of ocean share many species of cryptogams as well as small animals. His group has demonstrated that landmasses in the Southern Hemisphere share more species of mosses, liverworts, lichens, pteridophytes, and tardigrades if they are connected by "wind highways", and that Gondwana breakup sequence shows no correlation with the number of shared species. Now his research group is replicating the experiment on the northern Atlantic, an area where they can also use, besides the number of species in common between landmasses, genetic similarity of a set of target species.

13. The surfing syngameon hypothesis: implications for the genetic and taxonomic diversities of the present Canarian flora

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The interpretation of the current genetic databases for the Canarian terrestrial flora in the light of the known tectonic-climatic changes in the Atlantic basin reveals an extremely dynamic scenario of recurrent island colonization, dispersal, speciation and extinction, developed in several discrete time periods after the emergence in the Miocene of the oldest, Easternmost islands (Fuerteventura and Lanzarote), where reciprocal biodiversity and genetic interchange with mainland NW-Africa was probably not uncommon. Consistently, the largest population genetic database so far (allozymes) reveals significantly higher genetic variation levels in Fuerteventura, Lanzarote and Gran Canaria than in the westernmost islands. Although different combinations of factors could contribute to the explanation of this finding in each particular case, it further intimates that closeness to the mainland, the higher ecological uniformity and the much lesser geographic complexity of Fuerteventura and Lanzarote in the last few million years could have fostered the formation of syngameons, (i.e., populations of incipient species that still retain crossing compatibility, and where abundant genetic admixture/swamping occurs). Whilst rife gene flow among genotypes that might have been previously isolated in the mainland must have aided to maintain species cohesion and to promote rapid monophyly in the Easternmost islands, the resulting high genetic variation levels could also have favored in some lineages the colonization of the westernmost islands, where more complex orographical and ecological features feasibly promoted selection processes, cessation of gene flow and a decline of intra-population genetic diversity levels. The genetic discontinuity predicted by this “surfing syngameon” hypothesis entails that higher levels of gene flow (within the islands, and with the mainland) should stall evolutionary change in Fuerteventura, Lanzarote, and part of Gran Canaria. In contrast, the prevalent influence of drift and, eventually, selection on the Westernmost island colonizers would tend to exacerbate their genetic differences relative to easternmost congeners.

Juli Caujapé-Castells (Barcelona 1965) is head of the *Departamento de Biodiversidad Molecular y Banco de ADN* at the Jardín Botánico Canario “Viera y Clavijo”-Unidad Asociada CSIC (JBCVC-CSIC). Starting in the Karl Faust Foundation (Blanes, February 1990), his career has been always linked to research/management in several Spanish Botanic Gardens; he is responsible for the creation and/or scientific activity of molecular facilities in some of them, and in universities. Juli obtained his PhD on population genetics at the University of Barcelona’s Dept. of Genetics (1995), and did post-doctoral research on phylogenetics at the Section of Integrative Biology, University of Texas, Austin. His group at the JBCVC-CSIC integrates molecular information in collaborative multi-disciplinary approaches to (i) address problems about the evolution, diversity, conservation, and links of the Canarian flora, and (ii) create bioinformatic tools to enhance the knowledge on biodiversity’s genetic diversity (http://www.demiurge-project.org/). A usual reviewer for scientific journals and governmental agencies from various countries, he has (co-)authored/co-edited more than 70 scientific papers/book chapters/books, co-directed several PhDs, led 20 research projects. He coordinates the UNESCO-Unitwin chair for *Climate change and conservation of Biodiversity in Macaronesia and NW-Africa* at the JBCVC-CSIC, and is a co-founder of the *Global island plant conservation network* (http://www.bgci.org/ourwork/islands/).

14. Phylogenetic investigations of correlated diversification between plants and their associated arbuscular mycorrhizal fungi in Macaronesia

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Mycorrhizal associations are crucial to plant life. More than 80% of vascular plants form symbiotic associations with one group of mycorrhizas, the arbuscular mycorrhizal (AM) fungi. AM fungi are obligate symbionts that rely on plant-assimilated carbon, typically in exchange for some benefit to the plant such as improved nutrient uptake, drought tolerance, or protection from pathogens. Recent studies suggest that the composition of arbuscular mycorrhizas is partially determined by partner preference, raising the possibility of correlated diversification between the two symbionts. Discriminating the relative importance of phylogenetic history, ecology, and geography for the evolution of plant-AM relationships requires examination of the mycorrhizal composition of closely related species, occurring in both similar and different ecological zones. Due to their rapid plant radiations, strong ecological zonation, and geographical isolation, the Macaronesian archipelagoes provide a model system to test for correlated diversification between AM fungi and their plant hosts. To understand reciprocal effects of plants and AM fungi on species diversification, we are examining phylogenetic relationships among AM fungi and their plant hosts in Macaronesian island endemics from two genera of angiosperms, *Tolpis* (Asteraceae) and *Plantago* (Plantaginaceae). Both genera include species endemic to Macaronesian archipelagoes, islands or specific ecological zones, enabling analyses of isolation- and habitat-dependent diversification. For phylogenetic analyses we are utilizing a series of independent molecular markers for both the AM fungi and plants but we are also beginning to explore next-generation sequencing technology to enhance our sampling of both taxa and genome space. Preliminary results suggest that mycorrhizal diversification is primarily correlated with ecological zonation: fungal symbionts are shared more often between plants of the same ecological zone, regardless of their phylogenetic affinity or geographic proximity. Results of the present investigation are among the first to indicate reciprocal influence in AM fungal and plant evolution.

Bob Jansen is the S.F. Blake Centennial Professor of Systematic Botany and Chair in the Section of Integrative Biology at The University of Texas at Austin. He received his Ph.D. in Botany in 1982 at Ohio State University. Prior his appointment at UT-Austin in 1991, Bob did postdoctoral research at the University of Michigan and was an Assistant Professor at the University of Connecticut. He studies plant molecular systematics and evolution with a primary focus on comparative genomics of plastids and its utility for understanding genome evolution, phylogenetic relationships of angiosperms, and origin and evolution of the Macaronesian endemics. He has served on the editorial boards of several journals, including BMC Evolutionary Biology, Plant Systematics and Evolution, Journal of Plant Biology, and Biochemical Systematics and Ecology. He is serving or has served on the Council for the American Society of Plant Taxonomists, the Scientific Advisory Board of Seacology, Advisory Committee of Biodiversity Research Center, Academia Sinica, and the Elections Committee for the Botanical Society of America.

15. Does the Linnean shortfall explain the Azores diversity enigma?

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Isolated oceanic archipelagos have long been considered natural laboratories for the study of evolution, ideally suited for in-situ studies of speciation processes. The recent availability of checklist data for many archipelagos worldwide has stimulated research on the macroecology and evolution of island biota and this has led to the development of new models to explain the distribution of endemic diversity on islands. Intriguingly, the Azores angiosperm flora is not readily accommodated by such models and this is because it is distinctive both in terms of the low number and extent of evolutionary radiations and in the widespread distribution of a high proportion of its endemic species. Hypotheses previously proposed to explain the distinctive diversity patterns in the Azores flora (island age, age of endemic lineages, ecological diversity), at least considered individually, fail to adequately explain the patterns observed. As a result, three new hypotheses have recently been proposed: (i) *the palaeoclimate hypothesis* which hypothesises that differences in climatic history across the Macaronesian region may have resulted in different rates of morphological speciation in the different archipelagos (ii) *the dispersal-extinction hypothesis* which hypothesises that Azorean endemic lineages have high dispersal ability and that this fact, coupled with the impact of human-mediated extinctions may explain the distribution patterns observed in the archipelago and (iii) *the Linnean shortfall hypothesis* which hypothesises that inadequacies in taxonomic knowledge of the region's flora may help to account for the differences observed. This talk considers the extent to which these hypotheses explain the patterns observed in light of new and existing data.

Mark A. Carine studied for a BSc in Botany at The University of Reading and a DPhil in Plant Systematics at the University of Oxford. Since 2001 he has worked as a Researcher in the Botany Department at the Natural History Museum in London. His research has two main foci, namely Convolvulaceae systematics and the systematics and biogeography of island plants. In the Macaronesian region, his research aims to integrate field work, traditional taxonomic approaches and molecular systematics to investigate patterns of endemic diversity and understand the processes responsible for generating those patterns.

20. The Reproductive Biology of Island Plants: Pacific Archipelagos and the Canaries

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[4]Unidad de Botánica (ICIA), Puerto de la Cruz, Tenerife (Spain)

Knowledge of the reproductive biology, in all of its facets, is fundamental to understanding successful colonization and subsequent evolution of plants in oceanic archipelagos. We compare the reproductive biology of plants of the Canary Islands with those from several Pacific archipelagos and speculate on reasons for differences. Breeding system and pollination biology are two major aspects of plant reproductive biology, and will be the central focus. The source areas, dispersal agents, and disseminules of the colonizing ancestors will be summarized and compared for different archipelagos. The breeding system of the progenitors of island lineages will be inferred to assess the usual interpretation (successful colonists are self-compatible, SC, i.e., Baker's Law) for establishment and diversification of island lineages and the alternative of a mixed breeding system ('leaky' self-incompatibility, SI) will be explored. We will review the diverse mechanisms promoting outcrossing in SC hermaphroditic island species (SI, protogyny, protrandry, dioecy, etc.). Pollination vectors for insular plants and their continental ancestors will be compared, and an assessment made of whether current floral forms reflect features from colonizing ancestors or selection in the islands. The often limited range of pollinators available to new island colonists force adaptations to new syndromes, and those syndromes are not necessarily obviously reflected in the morphology (presence/ absence of nectar) of extant plants, and lack of critical studies of current island floras can lead to misunderstandings. The importance of reproductive biology to the establishment of effective island conservation programs will be touted, along with an analysis of the impact of invasive plants and pollinators on endemic species. It will be argued that, in light of their importance to basic studies of floral evolution and to conservation biology, that very little is known about the reproductive biology of island lineages. High priority areas for future studies will be suggested.

Dan Crawford has held faculty positions at the University of Wyoming, The Ohio State University and the University of Kansas. He has served in a variety of professional organizations, including the presidencies of the American Society of Plant Taxonomists and the Botanical Society of America. His interests are the systematics and evolution of the tribe Coreosideae, especially the genus *Coreopsis* (Asteraceae), and the origin and evolution of plants endemic to oceanic islands. He has been involved in broadly-based collaborative studies of the flora of the Juan Fernández Islands, Chile for 30 years. A current research interest, in collaboration with workers from the US and the Canaries, is the genus *Tolpis* in the Canary Islands. These studies are focused on producing a phylogenetic hypothesis for *Tolpis*, inferring its biogeography in the Canaries, and elucidating the evolution of breeding systems and isolating factors during the radiation of the lineage in the archipelago.

16. Genetic diversity and phylogeography in Western Mediterranean islands: what we do know and what we should know

Josep A. Rosselló*[1,2], Alberto del Hoyo[2], Maria Mayol[3]
[1]Jardín Botánico, Universidad de Valencia (Spain)
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[3]CREAF (Center for Ecological Research and Forestry Applications), Autonomous University of Barcelona (Spain)

The numerous islands present in the Mediterranean constituted major refugial areas, and are nowadays a significant component of its plant diversity, with a large number of narrowly endemic taxa. In addition, the highly fragmented insular landscapes have promoted geographical and genetic isolation among plant populations, favouring allopatric speciation via selection and/or genetic drift. In spite of the central role that islands play to understand the evolution of plant biodiversity in the Mediterranean, and despite a long tradition of studies based on the endemic species, it is only recently that the Mediterranean islands have regained interest from evolutionists, as shown by several studies on the evolution of the Aegean, the Balearic, and the Corso-Sardinian floras. There have been very few studies on levels of intraspecific cpDNA differentiation in narrowly distributed plants from the Mediterranean islands. The scarcity of these records is due to the persisting perceptions that (i) rare species show, on average, low levels of overall genetic variation, (ii) insular species tend to show low values of genetic diversity compared with close continental relatives, and (iii) the cpDNA genome is an unsuitable target for assessing genetic markers for intraspecific analysis due to its relative slower mutation rate compared with nuclear DNA. However, these general expectations seem to be lineage-specific and the detected levels of cpDNA variation depend to a large extent on the recent evolutionary history of the species. The currently available studies suggest that (i) plant endemics from Mediterranean islands are not genetically depauperated and have conspicuous genetic diversity levels, which are also highly structured, indicating that (ii) gene flow is scarce, even within species with a high dispersal capacity, thereby highlighting a predominant role of drift on the observed diversity patterns. This work has been funded by projects CGL2010-22347-C02-01 (Ministerio de Ciencia e Innovación) and 2009 SGR 608 (Generalitat de Catalunya, Agaur).

Josep A. Rosselló's early research was devoted to the taxonomic and evolutionary knowledge of the Balearic vascular flora (especially as regards the diversification of the endemics) and, later on, he specialized in the study of different genera of particular evolutionary interest (e.g., *Limonium*, *Armeria*). The ease with which these taxa hybridise and beget agamospermic species makes it difficult to address their evolutionary study through solely morphological characters. Consequently, he complements his studies with molecular markers (multiple- and single-copy nuclear markers, diverse intergenic chloroplastic spacers), with classical and molecular cytogenetics techniques, and with the determination of genomic DNA contents. He also applies molecular methodologies to the taxonomic study of plants with an agronomic interest, and to the characterization of processed plants in food, being the author of a patent. In the last decade, he has been a PI in four projects in the national Spanish calls of R+D+R, all of them related to micro-evolutionary aspects of Balearic plants or their relationships with Macaronesian congeners. Likewise, he participated in another project related to the Thyrrenian islands. He became staff of the Universidad de Valencia eighteen years ago, and he is also the first scientific director of the Jardí Botànic Marimurtra (since 2008).

18. What can tell us genome organization about plant evolution in Mediterranean continental islands?

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The general patterns that might explain microevolutionary processes underlying plant speciation in continental islands have been rarely explored. Such absence of data is most surprising in an enclave like the Western Mediterranean basin, where the endemicity rate on major islands far outnumbers a minimum of 10%. Only recently, a critical review about karyological evolution on the Balearic endemic component has been tackled (Rosselló & Castro 2008), revealing that (i) the origin of the islands (continental or oceanic) is not an accurate predictor of the proportion of polyploid component in the flora, (i) there are no apparent unifying processes that explain the evolution of ploidy levels on insular endemics, and (i) the levels of autochthonous polyploidy (i.e., developed *in situ*) on continental islands are higher than on oceanic islands, where the percentage of polyploidy evolution on insularity conditions is comparatively low. Nevertheless, other important genomic and karyotypic aspects that might be linked to the patterns and processes of insular speciation have not been yet assessed. In this talk we discuss the patterns of insular speciation and differentiation linked to changes at deep genomic levels, i.e., in the distribution and structure of repeated DNA, and the nuclear DNA content (1C values) in the endemic element of the Balearic Islands. Specifically, we assess whether genome reorganization, involving amplification or loss of multigene families and satellite DNA, is one of the undetected cryptic events that have acted on the endemic component of continental islands. This would allow discuss to what extent similar selective pressures at the genome level are involved in the speciation processes occurring in oceanic and continental islands. This work has been funded by the CGL2010-22347-C02-01 (Ministerio de Ciencia e Innovación) and 2009 SGR 608 (Generalitat de Catalunya, Agaur) projects.

Marcela Rosato has a wide interest in plant evolution and speciation in narrowly distributed Mediterranean plants, especially those from the Western Mediterranean islands. She uses DNA sequencing from non coding regions of the cpDNA genome and molecular cytogenetics to assess the phylogeographic structure of endemic plants from the Balearic Islands, Corsica, Sardinia, and surrounding territories.

19. Contrasting patterns of plant evolution in the Canarian and Galápagos islands: the origin of dispersal and colonization

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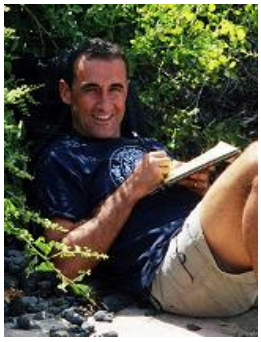
[2]Instituto de Productos Naturales y Agrobiología, CSIC, Tenerife (Spain)
[3]Instituto Mediterráneo de Estudios Avanzados CSIC, Mallorca (Spain)

Evolution on islands is so simplified that Humboldt (1817) and Darwin (1859) developed theories of vegetation and organic evolution on the basis of cursory observations in the Canary and Galápagos archipelagos. Since then, scholars have been providing solid data and results confirming that the oceanic islands are living laboratories for plant evolution. Flora accounts and checklists tell us of major biodiversity differences between oceanic islands (c. 500 native species of angiosperms in Galápagos; c. 1000 spp. in Hawaii; c. 1500 in the Canary Islands). The knowledge of disharmonic floras is not only caused by differential biotic and abiotic characteristics since archipelago origins but also by different scientific interest in the last two centuries. For instance, the Canary Islands are the most profoundly studied in terms of phylogenetic reconstructions. Nevertheless, common features lead us to interpret evolutionary forces responsible for common trends: morphological-character release, sex separation, woodiness, radiation, adaptive radiation, endemism, among others. Results accumulated in the last decades confer the empirical basis to reformulate the theories of island biogeography and island relictualism. Geological, climatic, ecological and evolutionary characteristics are herein compiled in order to contrast general patterns of insular evolution. In addition, we show plant groups from the Canarian and Galápagos islands that illustrate all these concepts and evolutionary patterns.



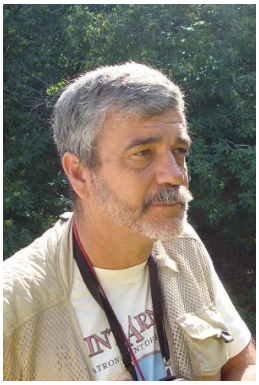
Pablo Vargas (Real Jardín Botánico, CSIC) leads projects on the evolution and molecular systematics of primarily Mediterranean and oceanic island plant groups. Although a majority of his publications supports a carrier devoted to Iberian and Mediterranean angiosperms, his first phylogenetic studies (1998-2000) were undertaken in angiosperms from Hawaii and Macaronesia (*Sanicula*, *Saxifraga*, *Hedera*, *Olea*). Further projects and collaborations resulted in an ongoing investigation on plant evolution of Macaronesia and Galápagos, including genetic diversity and evolution of particular genera (*Cistus*, *Olea*, *Carex*, *Reseda*, *Echium, Juniperus, Galvezia, Linum*). New points within the theory of relictualism and theory of island biogeography have also been proposed to the scientific community.

Manuel Nogales finished his PhD at the University of La Laguna in 1990. He was a lecturer of this University during 16 years, and since 2004 is a tenured researcher in the Spanish National Research Council (CSIC). His CV has been focused on the evolutionary ecology of organisms that have evolved on islands, having an important activity in animal-plant interaction. Although the Macaronesian Islands constitute the base of most of his research, he has also worked in other oceanic islands, such as Galápagos, Hawaii or the Mascarene islands.

20. West and East African disjunctions focused in Canary Islands vs. Socotoran flora.

Arnoldo Santos-Guerra*
Unidad de Botánica Aplicada (ICIA). Jardín de Aclimatación de la Orotava. Puerto de la Cruz, Tenerife(Spain)

The Canary Islands flora is linked to Africa by a large number of taxa with a disjunct distribution. The analysis of one of these disjunct patterns (between West an East Africa) supports the hypothesis of fragmentation of a once continuous vegetation belt throw Northern Africa. In this talk we review the taxa with a disjunct distribution with one partial area in Canary Islands (including Western Africa) and one partial area in Eastern Africa (including Socotora).

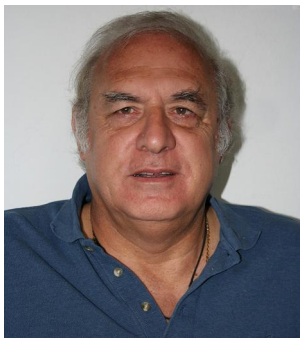


Arnoldo Santos-Guerra is a researcher at the Instituto Canario de Investigaciones Agrarias, Tenerife. His interests are in plant systematics, flora diversity and phytosociology, with a particular focus on Macaronesia sensu lato where He has been working for more than 4 decades. From 1995 he is involved identifying the evolutionary processes in a large number of endemic groups to this area. Other interests are in phytogenetic resources and plant conservation. He has also studied extensively the history of botanical exploration in Macaronesia which has led him to travel many herbaria in different countries in search of sheets collected throughout this region.

21. Taxonomy of island plants: a proposal for a Flora of Macaronesia

David Bramwell*
Jardín Botánico Canario "Viera y Clavijo"-Unidad Asociada CSIC, Las Palmas de Gran Canaria (Spain)

In the early 1970`s a small group of botanists with an interest in the Macaronesian flora attempted to set up a programme for the preparation of a “Flora of Macaronesia”. Unfortunately the Project failed to obtain financial support and only preliminary checklist was produced by the Scandinavian participants. Perhaps, in view of the progress that has been made in the study of the Macaronesian flora over the past 35 years or so, the failure of the project was a blessing in disguise as the scientific basis for preparing a Flora is a much more solid one. With regard to the none-endemic flora there have been major advances including the completion of Flora Europaea, Flora de Andalucia Occidental and, of course, the monumental Flora Iberica Project which is now in an advanced stage of completion. With regard to the endemic Macaronesian flora, we are now scientifically in a much better position to justify the preparation of a comprehensive account. We have morphological, micromorphological, reproductive biology and molecular data that can be used to help define species in a better way, to understand their genetic diversity and their biogeographical and taxonomic relationships though we still have a long way to go on this latter subject. However, one major point for debate is what kind of species concept to apply? The advantages and disadvantages of broad and narrow species concepts will be discussed from both practical taxonomic and conservation points of view. This will be mainly for the endemic flora as the non-endemic species wil generally have been covered and defined in the Floras mentioned above. Preparing a Macaronesian Flora will still not be an easy task but the author considers that the moment is right especially as European funding from programmes such as INTERREG might well be available for such a Project.



David Bramwell is Director of the Jardín Botánico Canario “Viera y Clavijo”. His current research interests include the monitoring and mapping of wild populations of threatened species, the preparation of a Flora of Macaronesia, mapping species decline world-wide, molecular studies of genetic diversity in island populations and the effects of climate change on island plants.

22. SW Morocco: An obvious step for understanding the Canary Islands Flora.

Jorge Alfredo Reyes-Betancort*, Arnoldo Santos-Guerra
Unidad de Botánica Aplicada (ICIA), Jardín de Aclimatación de La Orotava, Tenerife (Spain)

Similarities regarding flora and landscape between SW Morocco and the Canary Islands are highlighted. The open sclerophyll forest dominated by argan (*Argania spinosa*) from mainland are comparable with *Juniperus turbinata* ssp. c*anariensis* and *Olea europaea* ssp. *cerasiformis* groves from the Canary lslands. Both succulent scrubs dominated by *Euphorbia* spp., and sandy and rocky coastal scrubs show strong affinities as well. In addition a number of interesting endemic species are shared between these two areas. These similarities suggest that this region were an important reservoir for plant evolution in the Canary Islands probably encompassed with the same phenomena in the Mediterranean Basin. Therefore, future phylogeographical researches should better consider the biogeographical links between the Canary Islands and the South West Morocco regions that play a key role for understanding the evolution of Canary Islands diversity.

Jorge Alfredo Reyes-Betancort is a researcher at the Instituto Canario de Investigaciones Agrarias, Tenerife. His ongoing research focuses on the study of the diversity of Canary Islands vascular flora, with emphasis on taxonomy, phytosociology, and biogeography. This had led to him the study of the flora of surrounding areas (Macaronesia *sensu lato*). He is also interested in the autochthonous phytogenetic resources and plant conservation. More recently He is involved identifying the evolutionary processes in some groups (*Matthiola*, *Helianthemum* and *Minuartia* among others).

23. Conservation strategies for the Azorean priority taxa: what are the molecules telling us?

Mónica Moura*
Universidade dos Açores en Ponta Delgada (Portugal)

The vascular flora of the Azores comprises about 1,000 taxa, of which no more than 200 are considered native and about 72 endemic. The number of endemic taxa has increased in the last decade, since several taxa, previously considered as native, were found to be endemic, while new subspecies have also been described. A recent evaluation categorized the Azorean vascular plants based on rarity and taxonomic uniqueness, on the knowledge about the threats pending, their ecological role, social interest, and the feasibility of their recovery. As a result of this review, the number of endangered taxa defined as priority for conservation is currently of about 90, which consist of a 50% increase comparing to a decade ago. In order to define a successful conservation strategy for the Azorean priority taxa it is of the utmost importance to understand the degree and distribution of genetic diversity of the existing populations. Since several cases of taxa with low number of effectives were identified, the knowledge of the population genetic structure is particularly important whenever reintroduction actions are required. With the use of molecular genetics techniques we have started to complete information already available on propagation methodologies of some of these priority taxa, developing a populations structure knowledgebase, and pinpointing critical cases of low genetic variability, which will contribute to a more complete understanding of the populations dynamics and to the definition of global conservation plans. Information obtained about genetic diversity patterns is also uncovering clues on these species evolutionary history, providing means to access future risk of diversity reduction.

Mónica Moura has been lecturing in the University of the Azores since 1991 where she has obtained her PhD in Plant Physiology. Since 1993 she has been working in the field of propagation of endemic plants by in vitro culture and seed. More recently she has started taking interest in molecular genetics, and is currently developing research in the areas of systematics and population genetics of Azorean endemic taxa.

24. A phylogeny for the Macaronesian flora and how we can use it to predict potential invaders and identify hotspots of genetic diversity

Hanno Schäeffer*
Department of Organismic and Evolutionary Biology, Harvard University (USA)

In the past 20 years, molecular phylogenies have become the most important tool of modern Systematics and their use has greatly improved our understanding of relationships in angiosperms and other groups of organisms. More recently, this 'molecular revolution' has also led to new approaches at the community level ('community phylogenetics') where we now use phylogenies to analyse the composition of vegetation zones, plant communities and the plant groups that invade these communities. The Macaronesian region is ideal for this kind of studies because its islands and archipelagos allow testing at several scales and with independent replicates. We produced phylogenies for single islands, archipelagos and the entire Macaronesian region using supertree approaches and DNA data. We show that phylogenies can be an extremely valuable tool to identify introduced plants that might become invasive, to find hotspots of genetic diversity and even to test theories of island biogeography. While complete sequence data sets for the Azores are already available, the data sets for Madeira, the Canaries, and Cabo Verde are still very incomplete. We anticipate to close these gaps through collaborations with colleagues based in these archipelagos.

Hanno Schaefer studied Biology with a focus on Biogeography and Systematics at the Universities of Wuerzburg and Regensburg, Germany. In 1998 he started working in the Azores archipelago. He published the first fieldguide for the Azores in 2002. In 2003, he defended his PhD on the 'Chorology and Diversity of the Azorean flora' (supervisor: Prof. Peter Schoenfelder) and then moved to Susanne Renner's group at University of Munich, Germany. In Munich, he started working on molecular phylogenies and became interested in the gourd family, Cucurbitaceae, for which he produced several genus-level phylogenies and revisions and a new classification based on morphology and DNA data. In 2008, he won a Marie Curie fellowship that enabled him to move to Imperial College London, where he spent two years in Vincent Savolainen's group. In London, he was working mainly on a phylogeny for the complete Azorean flora and on different approaches to identify potentially invasive plant species. Since May 2010, he is at Harvard University, Cambridge (USA), where he works on new phylo-geographic approaches using next-generation sequencing but also continues to study Cucurbitaceae and the Macaronesian flora.

25. Comments on the Vascular Flora of Madeira: History, recent advances and relations with other Macaronesian archipelagos

Miguel Menezes de Sequeira*[1], Jorge Capelo[2], Roberto Jardim[1,3], Aida Pupo[1]
[1]Centro de Ciências da Vida, Universidade da Madeira, Campus da Penteada, Funchal (Portugal)
[2]USPF, L-INIA, INRB, Oeiras (Portugal); [3]E. S. Francisco Franco, Funchal (Portugal)

The recent publication of a Checklist for the vascular plants of Madeira and Selvagens archipelagos, allowed not only an analysis of Madeira Flora, in what concerns taxonomic and origin among the islands, but also a comparison with previous published Checklists for Canary Islands, Azores and Cape Verde. Even more recently (2010) a new approach to the Portuguese vascular plant diversity (including Azores and Madeira Archipelagos) was developed under ALFA coordination. In this contribution the historical background of the Madeira Flora study is shortly introduced and the main contributions to the study of Madeira flora analyzed. These introductory aspects are followed by the presentation and comments on the patterns of diversity starting from the 1204 *taxa* of vascular plants currently recognized. The Madeiran flora includes 154 exclusively endemics, 74 Macaronesian endemics, 546 native *taxa* and 430 introduced *taxa*. As expected Madeira Island comprises 94.4% of the total *taxa* and 89.6% of the endemics from the archipelagos of Madeira and Selvagens, while the Selvagens have the lowest proportion, with only 8,7% of total *taxa* and 8,4% of endemics. The analysis of this Checklist and those previously published for the other Macaronesian archipelagos, concluded that Madeira Island is the third in higher number of exclusive endemics (94) and the second in higher density of exclusive endemics. Pre-description extinction is hypothesized as the main explanation for patterns like the lack of exclusive endemics in large islands (e.g. some islands from the Azores and Cape Verde), due to extreme landscape use and overexploitation of natural resources since the XV century. Some insights on the study of Landscape History are presented that support a correlation between long-term survival rate of natural vegetation and topography. Finally new results on the study of the Desertas and Selvagens Flora are briefly presented and main trends on these new additions are presented along with comments on taxonomy and on new introduced *taxa*.

Miguel Menezes de Sequeira (April 1964) is currently Assitant Professor at the University of Madeira (UMa). His primary research interests are Plant taxonomy (Madeiran and Macaronesian Flora, Poaceae), History of Science (Botany) and Plant Ecology (Phytosociology). PhD 2/2004 [(Biosystematics of the genus Holcus L. (Poaceae)]. Biology Department Vice-President (September 2004-2006). Member of: ALFA (President 2006-); OPTIMA; IAPT; AAJBM (President 2006-).

Top 4 recent publications:

1. Menezes de Sequeira, Santos-Guerra, Jarvis, Oberli, Carine, Maunder, & Francisco-Ortega 2010 Sir Hans Sloane's Madeiran visit: seventeenth century specimens from Macaronesia. *Taxon* 59 598–612.
2. Menezes de Sequeira, Capelo, Costa & Jardim 2008 *Teucrium francoi* M. Seq., Capelo, J.C. Costa & R. Jardim, a new species of *Teucrium* gr. *Scorodonia* (Lamiaceae) from Madeira. *Botanical Journal of the Linnean Society* 156 639–647.
3. Menezes de Sequeira & Castroviejo 2007 *Holcus azoricus* M. Seq. & Castrov. (Poaceae) a new species from the Azores Islands. *Botanical Journal of the Linnean Society* 154 259–267.
4. Menezes de Sequeira, Jardim, Silva & Carvalho 2007 *Musschia isambertoi* M. Seq., R. Jardim, M. Silva & L. Carvalho (Campanulaceae) a new species from the Madeira Archipelago. *Anales del Jardin Botánico de Madrid* 64(2) 135-146.

26. A review of recent advances in the study of the endemic flora from Cape Verde Islands

María Romeiras*, María Cristina Duarte
Tropical Research Institute (IICT), Tropical Botanical Garden, Lisbon (Portugal)

In the last years, several molecular phylogenetic analyses of Macaronesian plant groups have provided valuable insights into the relationships among the region's endemics, however, little is known about the origin and evolution of the Cape Verde endemic flora. Cape Verde encompasses the southernmost islands of Macaronesia, and belongs to a vast African region of semi-arid sahelian climate. As a result, the archipelago's native flora is definitely peripheral to Madeira-Canary patterns of diversity, although some related endemic taxa do occur especially in the mountain areas. The endemic vascular flora of Cape Verde comprises 82 *taxa*, most of them consisting of threatened species. In this study, we provide a brief overview of plant diversity in these Islands, namely the taxonomic knowledge of the native species, its conservation status and the available molecular studies performed with Macaronesian endemic flora. Our study indicates that molecular phylogenies published were mainly based on Azores, Canaries and Madeira floras, being frequent a limited taxon sampling among the Cape Verde endemic species. So, there is an urgent need for additional taxonomic, ecological and molecular studies, in order to understand the origin and colonization patterns of some genera that show a wide diversification within this archipelago (e.g. *Tornabenea*, *Diplotaxis*, *Lotus*). Moreover, these studies would help to re-evaluate the taxonomic status of some taxa (e.g. *Campylanthus*, *Echium*, *Frankenia*, *Kickxia*, *Lobularia*) for which several species and subspecies were described based on a presumed morphological variation according to the altitude where they occurred. Finally, it is pointed out that more information regarding population size, distribution, threats and conservation status of each endemic species is urgently required, in order to update the preliminary Cape Verde Red List.

Maria Romeiras has a BSc in Biology from the Faculty of Science of Lisbon, an MSc in Integrated Pest Management from Technical University of Lisbon, Institute of Agronomy, and a PhD. in Molecular Biology from University of Lisbon (2005). She did her doctoral training at Plant Molecular Biology & Biotechnology Laboratory, where she studied the genetic diversity of endemic species from Cape Verde Islands. Maria's research has been supported by several grants and fellowships, including those from the Portuguese National Science Foundation (FCT). Since 2009, she has a Research position at the Tropical Research Institute (IICT), and currently, she is Vice Director of the Tropical Botanical Garden of IICT. Maria is also a member of Center for Biodiversity, Functional & Integrative Genomics (BioFIG). She is author of chapters in books and papers in peer-reviewed journals, and has participated in several International Conferences and research projects, some of them in collaboration with other Portuguese-speaking countries. She has also participated in field-sampling trips, namely in Macaronesian Islands. Her research interests are focused on Plant Systematics and on Tropical Biodiversity, addressing questions of classification, biogeography, phylogeny, and island evolution, especially in the study of the origin of the Cape Verde Flora.

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