



INTRODUCTION

179 ...and Still Counting

No doubt about it: Mexico is one of the most exciting places to be if one is interested in oaks. For the majority of the participants of both the Pre- and Post-Conference Tours (Chassé et al.; Bellili), as well as those of one of the three half-day Field Trips (Haddock; Tyler; Awouters), this was their first time in Mexico. It was a pleasure to see the amazement on many faces as they looked at the landscapes we drove through, as they were introduced to sociocultural specificities, and, most especially, as they met for the first time in situ such amazing creatures as *Quercus conzattii*, *Q. jonesii*, *Q. purhepecha*, *Q. sideroxyla*, *Q. xalapensis* ...the list is too long to include all of them. Many thanks are due to Antonio González Rodríguez and Oscar De Luna Bonilla for accomplishing the extremely difficult task of organizing the logistics of two oak roadtrips of more than forty people each.

Many thanks also to Antonio for accepting to be the Conference Host, to the entire Conference Committee (Amy Byrne, Roderick Cameron, Phil Douglas, Dirk Giseburt, Dan Kostka, and Ryan Russell), to our local partners, Susana Alejandre and Iván Alejandro Ortiz Rodríguez, and to Antonio's colleagues (and former students) Oscar De Luna Bonilla, Ricardo Gaytán Legaria, Sofía Zorrilla Azcué, and María Fernanda Cidel Rocasalvo, who volunteered their time and efforts in helping to make this Conference successful and rewarding.

So, here we are, after the 6th International Oak Society Conference in Puebla (2009). Back in Mexico, in Oaxaca, for the 11th. Back in this extraordinary kingdom of *Quercus*.

And the first question is: just how many subjects are there in this kingdom?

Historically, as Valencia-A. explained in her Keynote presentation, the number has varied between 125 and ...253. The preliminary results of the immense task of reviewing each known Mexican species (and their synonyms) taken on in 2023 by Valencia-A. and her colleagues, are reported here: 179, of which 65% are endemic. Many problems remain, and, knowing oaks, to be sure, the future will deliver some new ones. As Valencia-A. writes, "Solving these problems requires collaborative work, including genetic, population, and phylogenetic studies, as well as fieldwork and herbarium



Photo 1/ *Quercus jonesii*

collections, all of which are difficult for one person to accomplish alone. It necessitates collaboration and the integration of information to ...develop a more robust taxonomy. The history of oak trees is not written by a single individual; it is a collaborative effort by all those passionate about this genus.”

And indeed, this volume represents a fine sampling of work in progress in the different

areas of expertise and interest that she mentions.

Coombes et al. report on the status of *Q. oocarpa*, now confirmed as a species distinct from *Q. insignis*, and De Luna Bonilla et al. report on the hitherto unsuspected species richness in the group that is commonly referred to as the “shrub oaks”. Thanks to this ongoing study, two new species have been recognized ...and it seems likely that a few more will be announced in the not-too-distant future. Though not having to do with a Mexican taxon, hybrids are also not without taxonomic/nomenclatural problems as Cameron et al. show with the story of *Q. ×mazei*. Finally, Jablonski and Russell report on the new cultivars registered in 2025.¹

Althaus et al. raise the question that logically follows the answer – 179 – to the first one: what dynamics were/are involved in the development of this incredible diversity from the first known occurrence of *Quercus* on Axel Heiberg Island, a great place for trees about 45 million years ago, to the *Quercus* explosion that occurred as the genus migrated southward, and especially when it arrived in Mexico? One of the most interesting results of this study is that for the two major oak sections (*Quercus* and *Lobatae*) “migration appears to have been motivated by the availability of new ecological opportunities in Mexico’s emerging mountain landscapes.”

Hipp tells us the story of the “biological species concept” that has been the paradigm in studies of evolution since the first half of the 20th century (i.e., a species is a species because it only reproduces with individuals of the same species). An important part of his story is that the biological species concept may not be a particularly good fit for oak species, which exchange genetic alleles at a fairly high rate while maintaining their distinctiveness, in other words, what makes them recognizable to us. Further, that this exchange of genetic alleles is a more important resource for natural selection than genetic mutations.

In 1962, Thomas Kuhn (*The Structure of Scientific Revolutions*)² defended the idea that scientific revolutions are “non-cumulative developmental episodes in which an older paradigm is replaced in whole or in part by an incompatible new one.” Both Hipp and Althaus et al. make me think (though not for the first time over the past few years) that we are living such a moment, and that our Conference reflected this. Understanding the ecological versatility of the members of the genus – knowing where they live, knowing which species share living quarters, and how this “collaboration” is a driving force of evolution – was the subject of more than one presentation.

Cavender-Bares, using spectral biology to reveal lineage-level differences in leaf chemical traits, is contributing to our understanding of the role of leaves as drivers of ecosystem assembly and function, above and below ground. Hernández Leal et al. show that spectropic data from dried leaves of the seven species in section *Virentes* reveal adaptive differentiation and evolutionary history at genetic and phylogenetic levels, thus linking phenotype, environment, and evolutionary processes in long-lived plant lineages.

Continuing on the subject of understanding how it is that oak communities are more often than not composed of a number of different oak species, López Méndez et al. look into this aspect of the evolution of the genus by studying populations composed of 13 species in different environments in the Sierra de Santa Rosa in Guanajuato. Their

★1. This was not the subject of an oral presentation at the Conference but, as the IOS is the International Cultivar Registration Authority (ICRA) for the genus *Quercus*, it is important that it be included here.

★2. Kuhn, T.S. 1970. *The Structure of Scientific Revolutions*. Second Edition. In *International Encyclopedia of Unified Science*, edited by O. Neurath, R. Carnap, and C. Morris. Chicago: University of Chicago Press.

findings suggest that the marked difference in water use between species, as well as their distribution in different local environments, explain the coexistence of closely related species.

Naranjo Bravo and Rodríguez Correa use the expression of functional traits in *Q. insignis* to determine whether variations between populations can be attributed to



Photo 2/ *Quercus macdougalii*

where they are located, which, in turn, contributes to explaining differences in adaptive strategies. Pacheco Cruz et al., working with the microendemic *Q. macdougalii*, highlight the importance of integrating genomic, functional, and environmental data in order to understand the adaptability of species with very restricted distributions. Zorrilla Azcué et al. investigate how environmental heterogeneity has contributed to the evolution of *Q. insignis*. Their results show moderate genetic diversity and high population structure,³ indicating long-term isolation of different populations.

Ochoa Álvarez et al. study the associations of insect herbivory with leaf traits and phenology (biotic characteristics), and with environmental traits (abiotic characteristics) in different populations of *Q. castanea*. Mendoza Juárez et al. explore the hidden diversity of foliar endophytic fungi in coexisting Mexican oaks in order to better understand the essential role they play in oak-community ecology. Moskow tells the story of the vital ecological, and therefore evolutionary, role played by the relationship between mycorrhizal fungi and California's oak communities, along with an account of Indigenous community practices in tending beneficial fungi. Pearse and Durkee explore the evolutionary relationships between oaks and gall

★3. The total amount of genetic variation in a population is referred to as “genetic diversity”. How this variation is distributed is what “population structure” refers to.

wasps, and Miller reports on the variable suitability of different oak species to spongy moth.

Given the great diversity of the membership of the IOS – a kind of mirror image of the genus itself – the presentations of our triennial Conferences span a vast array of fields of interest, and this one was no exception.

As a number of the presentations revealed, the cultural importance of oaks in human society is unquestionable. The history of acorn-based food in Morocco, and



Photo 3/ *Quercus castanea*

the role that it still has, to a certain extent, in the modern diet (El Khatib et al.); the sacred oaks of Serbia that stand witness to their long and symbolically charged relationship with *Homo sapiens* (Živanović et al.); the trail-marker trees created by Native Americans who bent saplings to point in a specific direction so travelers could find their way (Azotea and Pinto); the creation of programs to encourage youngsters to be curious about the oak woodlands that surround them, to make this a part of their life which, as adults, they will be able to make responsible decisions about (Wyly); the possibility of a unique kind of cultural exchange that Joel has been exploring for some time now: how the traditional Iberian *dehesa*, an oak-based agro-silvo-pastoral system of extraordinary ecological and cultural sophistication, offers design inspiration for regenerative land use in Australia's Mediterranean-climate regions; the experience of an artist's (Nowak) encounter with oaks and how, working with two dendrologists, she has come to the conclusion that botanical illustration can serve as a bridge between art and science. And, last but not least, oak collections.

As Amory writes, "Oak collections, querceta, are often, if not always, the product not just of careful taxonomy, of scientific cultivation and propagation, but of passion, obsession, and love." One has to admit that that sentence pretty much sums up the motivation of a handful of individuals, some 30 years ago, that led to the creation of the International Oak Society. And the tale Amory tells of the history of the Chevithorne Barton Arboretum (UK), created by his father, Michael Heathcoat Amory, is proof that the passion, obsession, and love has gone from one generation to the next, albeit for various reasons and with different goals. Today, more than ever, private oak collectors should be recognized for their contributions to research, for their successes in building functional ex-situ collections (a long time before they were called that), for the invaluable information stored in their accessions files, and for sharing the passion for the genus *Quercus* they have kept (and continue to keep) alive. Crim shares with us an account of the efforts of the Limeledge Botanical Garden and Arboretum (New York) to build an oak collection taking advantage of the varied soils and topography of the Garden to plant oaks with vastly different requirements and of varying conservation concerns.

Given the current state of the world, many of the oral presentations focused, in one way or another, on conservation issues. Both implicit and explicit throughout the presentations was the significance of fundamental field work, mentioned at the beginning of this



Photo 4/ *Quercus kingiana*

Introduction – fundamental in the sense that, if we don't know exactly what species we are looking at and how they live and function together, how can we make predictions and develop strategies about who to save and why and how? A question that Janet Backs asks in *International Oaks* Issue No. 35, "Should the (conservation) focus change from saving an individual endangered species to preserving the habitat of which that species is a part?"⁴ comes to mind.

As Good et al. point out in their conservation gap analysis, "Despite the incredible diversity of Mesoamerican oaks, for many species little is known regarding population size, distribution, or threats. There is an urgent need to coordinate and prioritize conservation actions for both wild populations and living collections in botanic gardens." Contributing to this need for information, Arenas Navarro et al. conducted extensive field work, over a two-year period, as part of an extinction risk assessment for five endemic Mexican oaks, *Q. centenaria*, *Q. cualensis*, *Q. tuitensis*, *Q. mexiae*, and *Q. nixoniana*. Martínez León et al. attempt to clarify the situation of *Q. mulleri*, endemic to the Sierra Sur of Oaxaca, currently not categorized as being at risk in Mexico although considered Critically Endangered by the IUCN. Similarly, Wu et al. attempt to assess climatic suitability and conservation priorities for the Endangered but little-known *Q. kingiana*, which suffers from high fragmentation of populations primarily due to anthropic pressure. Sork et al. discuss the climate-change vulnerability of oaks and their ecosystems based on results of a long-term provenance study of *Q. lobata* and a landscape genomics study of *Q. douglasii* (two Californian endemics). Latorre Cárdenas and González Rodríguez stress the importance of landscape genomics⁵ in understanding the spatial distribution of genetic variation and local adaptations, which, in turn, helps to identify areas of high conservation value currently endangered by anthropic pressures. Schulze reports on a multi-year study to monitor populations of the Critically Endangered *Q. hinckleyi*. The results show that the species is irreversibly on the road to extinction, stressing the need for ex-situ conservation. The conclusions point out that if today's surviving populations occupy the harshest spots in the landscape it is likely that they are relicts of populations from a time when, as the climate became cooler and wetter, the species migrated to higher, drier, and more exposed locations. Berrini et al. present recent progress by the San Diego Zoo Wildlife Alliance on the ex-situ conservation of six rare and endangered oaks in California (*Q. engelmannii*, *Q. dumosa*, *Q. pacifica*, *Q. tomentella*, *Q. parvula*, and *Q. cedrosensis*). Wiener Castillo reports on progress in the restoration of the Magdalena Atlitic Oak Forest, which "is a significant and recurrent example of ecological fragility in a territory (with) urban pressures, agrarian tensions, and limited coordination between agrarian authorities and local governments." Toledo Aceves et al. report on

★4. Backs, J. 2025. The Benefits of Gene Flow: Hybridization and Introgression in the Genus *Quercus*. *International Oaks* 35: 79-94.

★5. Genomic data in a spatial ecological framework.

a study involving 60 restoration plantings of 8 oak species in the tropical montane cloud forests in Mexico, where, of the 47 species documented in this biotope, 33 are considered Threatened.

There are various opinions on the subject of assisted migration (or assisted gene flow) of tree species, the goal of which is to save them, as well as the forest industry, from extinction in the face of climate change. On this subject, Kremer presents results of two different recent studies using *Q. petraea*, the first, assessing temporal genetic changes over different time frames, and the second, tracking genetic changes in two successive generations during current ongoing climate change. Both of these studies are an attempt at observing genetic shifts of various adaptive traits to understand the mechanisms driving temporal genetic changes which may contribute to resilient responses. Lados et al., focusing on *Q. cerris*, question the currently accepted notion that in Central Europe assisted gene flow should involve sourcing from populations in the southeast since these populations are thought to have evolved under warmer and drier conditions. The results of this study, based on population genetic analyses, show greater diversity in the northwest, implying, on one hand, that large-scale, long-distance transfers of reproductive material may risk altering local genetic structures and allele compositions through introgression over the long term, and on the other, that the observed gradient in genetic diversity runs counter to the currently accepted assisted migration strategy in



Photo 5/ *Quercus engelmannii*

Central Europe based on transfers from the southeast to the northwest.

Essential to these efforts in our endless search to comprehend the world of oaks are others that seek to ameliorate laboratory techniques such as increasing the purity of extracted genomic DNA (Brooks), improving tissue culture propagation protocols (Philpott et al.), and developing our understanding of in-vitro propagation for, in this case, the preservation of germplasm of five endangered Southeastern US oak species (*Q. acerifolia*, *Q. arkansana*, *Q. boyntonii*, *Q. georgiana*, and *Q. oglethorpensis*) (Li et al.).

I hope these Proceedings succeed in bringing up good memories of moments spent together learning things (for those of you who were able to join us in Oaxaca) and that they offer to each and every one of you now reading them the opportunity to delve at a calm pace into subjects that arouse (or aroused, as the case may be) your curiosity and interest.

As most of you probably know already, the 12th International Oak Society Conference (2028) will be in Lusitania. We have lots of time to remind you about this, but I hope that the idea of attending is already firmly rooted in the minds of more than one.

This issue of *International Oaks* is dedicated to Guy Sternberg, who some 30 years ago, with a few other folks, sowed the acorns of what was to become the IOS, and who, for the first time since then, could not attend a Conference.

Photographers. Title page: Roderick Cameron. Photo 1: John Leszczynski. Photo 2: Jean-Baptiste Bellili. Photos 3, 5: Béatrice Chassé. Photo 4: Yan Wu.

Béatrice Chassé
Editor
Conference Chair

A handwritten signature in blue ink, appearing to read 'Béatrice Chassé', with a large, stylized loop at the top.