INTRODUCTION

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1. KERRY KELTS: A PIONEER OF LAKE STUDIES

Kerry Kelts passed away on February 8, 2001 at the age of 54, after a long and courageous battle with Hodgkins Disease. Kerry was a professor in the Department of Geology and Geophysics at the University of Minnesota, and was the director of the University's Limnological Research Center (LRC) from 1990 to 2000. He received his B.S. in Geophysics from the University of California-Riverside in 1967 and his Diplom (1970) and Ph.D. (1978) from the Swiss Federal Institute of Technology, Zurich (ETH). Kerry became interested in the geological aspects of lakes as a graduate student, and undertook a comprehensive investigation of the large, alpine glacial lakes, Zürich and Zug. This work resulted in classic papers on topics ranging from sedimentary structures and physical processes of sedimentation to the carbonate mineralogy and geochemistry of lake basins. Kerry also participated in three legs of the Deep Sea Drilling Project as a graduate student, where he gained extensive experience in the marine realm. This undoubtedly helped to shape his vision for lake research on a global scale. Kerry was a post- doctoral scholar with the Deep Sea Drilling Project at Scripps Institution of Oceanography from 1978 to 1980, a lecturer at ETH Zurich from 1980 to 1985, and the director of the Geology Group at the Swiss Federal Institute of Water Resources (EAWAG) from 1985 to 1988.

He became the director of the Swiss Institute of Climate and Global Change in 1988, a post he held until moving to Minnesota in 1990.

During the 1980's Kerry initiated what was to be one of his scientific passions: the global study of modern and ancient lake basins. He defined and coordinated the International Geological Correlation Program Project 219 (Comparative Lacustrine Sedimentology in Space and Time) and he was very active in the next Project IGCP 324 GLOPALS (Global Paleoenvironmental Archives in Lacustrine Systems) coordinated by Luis Cabrera and Pere Anadón). Kerry believed strongly that one of the major goals of these programs should be to stimulate lake-related research in some of the more remote parts of the world. To this end he was tireless in his efforts to raise funds that allowed Third World participants to attend IGCP project workshops, sometimes contributing to their travel expenses from his own pocket. This global vision led to the term, "limnogeology " and he can be considered the father of this new and thriving field in the geosciences. He was a founder and first president of the International Association of Limnogeology, and the prime mover behind the first International Limnogeology Congress, held in Copenhagen in August 1995. Four years later, at the second ILC congress in Brest, France, Kerry was awarded the first IAL W.H. Bradley medal in recognition of his pioneering role in defining and promoting the science of limnogeology.

Kerry authored more than 80 publications and co-edited "Lacustrine Petroleum Source Rocks" in 1988, "The Phanerozoic Record of Lacustrine Basins and their Environmental Signals" in 1989, Global Geological Record of Lake Basins, volume 1 in 1994, and "Lake Basins Through Space and Time" in 2000. He has had a major impact on the strategy employed by industry to explore ancient lacustrine basins for new oil reserves. He was the co-founder of the International Decade for the East African Lakes (IDEAL) and most recently provided the driving force for the construction and successful testing of GLAD 800, a portable drilling system that is revolutionizing the field of paleolimnology.

Kerry Kelts always promoted collaboration between continents, between institutions, and between faculty and students. Colleagues from all over the world were fortunate to have met Kerry and have been energized by his zest for life and science. Kerry played a significant role in the development of limnogeological studies in Spain during the last two decades. This book written by his colleagues and friends in Spain pays homage to his contributions to our science.

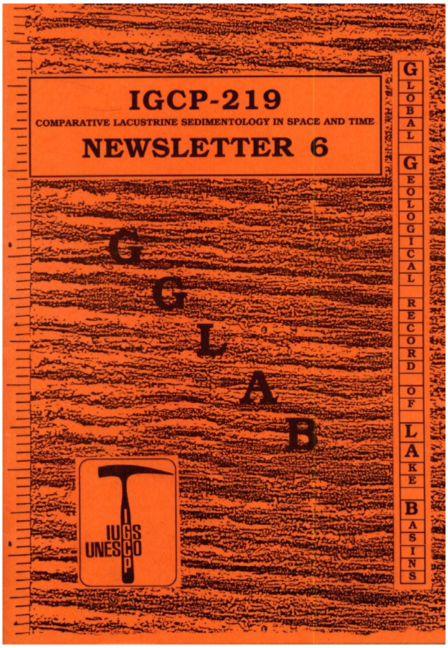
Kerry Kelts came to Spain in 1985 to attend the 6th IAS meeting in Lleida and again the next year to teach a short course in Barcelona in November 1986: "Sedimentology of lacustrine deposits: Application of stable isotopes" (Fig.1). Good wines, crazy schedules, late dinners, hours of conversations, and inspiring rock outcrops were the foundations for his Spanish connection.

Figure 1. The attendees to the short course "Sedimentology of lacustrine deposits: Application of stable isotopes" held in Barcelona in 1986 (Kerry Kelts, fifth from the right in the front row)

Figura 1. Los asistentes al Curso "Sedimentology of lacustrine deposits. Application of stable isotopes", celebrado en Barcelona en 1986. (Kerry Kelts en la primera fila, el quinto desde la derecha).

Since 1984, Kerry Kelts was very active in advocating and promoting research groups at both national and international scales, a task that was supported by IUGS-UNESCO Projects IGCP-219 ("Comparative Lacustrine Sedimentology in Space and Time") and IGCP-324 ("Global Paleoenvironmental Archives in Lacustrine Systems") (Fig. 2). There are one- or two- generations of Spanish geologists touched by his enthusiasm and the way he practiced this ancient art and science of geology in lakes.

Even when he was sick, Kerry participated actively in the first two meetings of the Southern European Group of the European Lake Drilling Program. The first one was held in Zaragoza (Fig. 3) in November 1999; the second one in Lisbon one year later. As he had done years before with the GGLAB and GLOPALS programs, he helped to create networks and scientific liasions among scientists.



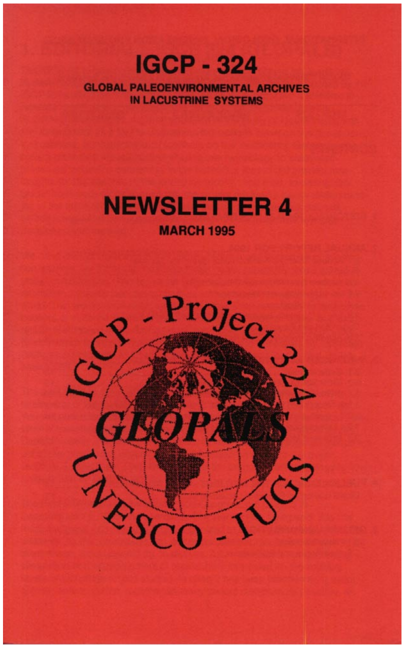


Figure 2. The newsletter of the IGCP-219 and IGCP-324 projects provided a fluid network of communications among hundreds of scientists in the world. Spanish geologists participated in the activities of both programs during the late 1980´s and 1990´s.

Figura 2. El Boletín Informativo de los proyectos IGCP-219 y IGCP-324 proporcionaron una red de comunicación fluida entre cientos de investigadores en todo el mundo. Los geólogos españoles participaron activamente en las actividades de ambos programas en las décadas de los 80 y 90.

Today, limnogeology is an established branch of the Earth Sciences; the scientific community he foresaw is organized with specific journals (the 100th issue of the *Journal of Paleolimnology* has been published), regular meetings (International Limnogeology Congress), and international associations (International Association of Limnogeology). He also encouraged the establishment of the Limnogeology Division of the Geological Society of America. Lakes are no longer an obscure scientific topic, but a thriving one. And finally, the community has the tools to conduct the lake research as the marine people have been doing for years: GLAD800 (Called the Research Vessel Kerry Kelts) is a reality scientifically and technically tested, the Lake Core Repository at the University of Minnesota is up and running… future generations of scientists will look back at these days as the dawn of a new era in lake research.

Figure 3: Kerry Kelts during his visit to Zaragoza in 1999 to participate in the 1st Workshop of the Southern European Working Group of the European Lake Drilling Program. Picture taken in the Aljaferia Palace´s gardens. José Mateus organized the 2nd workshop in Lisbon the following year which Kerry also attended. (From right to left: José Mateus, Kerry Kelts, Rosemary Valero-O´Connell and Loren Hoppe).

Figura 3. Kerry Kelts durante su visita a Zaragoza en 1999 para participar en el 1er Taller de trabajo del Grupo de Europa del Sur del Programa Europeo de Sondeos en Lagos. Fotografía en los jardines del Palacio de la Aljaferia. José Mateus organizó el Segundo Taller de Trabajo en Lisboa al siguiente año en el que Kerry también participó. (De derecha a izquierda: José Mateus, Kerry Kelts, Rosemary Valero-O´Connell y Loren Hoppe).

Kerry´s life was a great example of the quest for knowledge and adventure, as expressed by the Greek poet Constantine Cavafy in his poem Ithaka. Kerry Kelts was a sailor, a warrior, an artist and a philosopher…similar to some of the 19th century Spanish geologists who played politics, mapped the mountains and the plains, enjoyed good wine and good company, and created a school of researchers. Thank you, Kerry for sailing with us for a while in this vast ocean of life and the many small lakes of science.

2. THE DEVELOPMENT OF LIMNOGEOLOGY IN SPAIN: FROM THE "COMISIÓN DEL MAPA GEOLÓGICO" TO THE "KELTSIAN AGE"

Abundant Tertiary lacustrine formations and relatively few modern lakes may explain the peculiar historic development of limnogeologic studies in Spain. Pre-Quaternary lacustrine deposits are volumetrically important in Spain. They cover significant time slices of the stratigraphic record, particularly during the Late Paleozoic (Stephanian and Permian), the Mesozoic (mostly Cretaceous formations) and the Tertiary. Spanish lake systems have also been important for the country´s economy because of their economic potential: diatomite, sepiolite, palygorskite, bentonite, alabaster, sulfates and other salts, coal, oil shale, and raw construction materials. Easily accesible outcrops in the Ebro, Tajo, and Duero Basins have inspired several generations of geologists. The literature on Spanish lacustrine formations of all geologic periods is very extensive, both in Spanish and in English. As an example, the large numbers of papers dealing with Spanish formations in both books edited by Beth Gierlowski-Kordesch and Kerry Kelts (1994, 2000) and the numerous references contained in the recently published book "The Geology of Spain" (Gibbons & Moreno, 2002). On the other hand, the more restricted occurrence of modern lakes – particulary of large size - may partly explain the late development of limnology in Spain.

The geologic study of lakes and lacustrine formations started in Spain in the mid 19th century. The early works by Bowles (1775) and Palassou (1784) contained some notes about the "Pyrenean Red Sandstones", already identified as nonmarine rocks. Charpentier (1823) defined the "grès rouge pyrénéen", and described several outcrops in the Aragonese Pyrenees. In his geographic description of the Pyrenean valleys, he noted the presence of basins located at different altitudes containing some small lakes (glacial lakes behind moraines) and described some other basins currently with no water, but with evidence of higher water levels in the past.

The existence of fossil lake deposits was already know by the Spanish geologists at the time Lyell described ancient calcareous lake deposits in his *Principles of Geology* (1830). In 1849, following the advice of a Spanish geologist Bravo Murillo, Queen Isabel II founded the "Comisión encargada de formar el mapa geológico de la provincia de Madrid y el general del Reyno". One year later, this Committee was renamed as "Comisión del Mapa Geológico de España" and the goal was expanded to produce a state-of-the-art geological survey of the country. During the second half of the 19th century, several provinces in Spain were mapped and a number of lacustrine formations were identified, particularly of Tertiary age. The quality of these early descriptions varies and the depositional interpretation of some of these formations may seem too simplistic today. Geologists mostly described the occurrence of the different kinds of lacustrine rocks, their thickness, and stratigraphic relations. However, these early workers laid out some of the principles of lacustrine facies analyses. The significance of the work by the "Comisión del Mapa Geológico de España" would be similar to the work by the US Geological Surveys of the Great Basin and the discovery of Tertiary and Quaternary nonmarine outcrops in the North American West (Davis, 1882; Russell, 1885).

As a result of the work done by this Committee, several significant papers and monographs were published during the mid and late 19th century. To acknowledge only some of them, - Maestre (1845) and Aldama (1846) already recognized the existence of different Tertiary lacustrine deposits in Aragón. The two main lacustrine units in the Ebro Basin of Eocene and Miocene age were clearly identified by Donayre (1873), Mallada (1878), and Palacios (1893). The Tajo Basin was defined and its stratigraphy described with some detail by Ezquerra del Bayo (1845). Similar mapping and surveying expeditions occurred in the Duero Basin (see references in Armenteros, 1986) and Ebro Basin (see references in Arenas, 1993). Outside the main Tertiary lacustrine basins, other lacustrine formations were discovered during this period. Lucas Mallada (1878) described the geology of the Huesca province and the Eocene lacustrine rocks in the Pyrenees. Similar lacustrine limestone formations was found in the Catalonian Pyrenees (Vidal, 1893) and correlated with those typical of the Paris Basin. During the late 19th century and the early 20th century, numerous stratigraphic, lithologic and mapping surveys were conducted in the Tertiary continental basins due to the economic significance of some of their deposits (see references in Armenteros, 1986, Alonso Zarza, 1989; Arenas, 1993), and in some Upper Carboniferous coal-bearing lacustrine formations (Valero-Garcés, 1992).

The contribution of the French geologists was also important during this period. Verneuil and Collomb (1852) describe the unconformity between the lacustrine Miocene formations and the Triassis red sandstones in the Valencia region. The memoir written by Verneuil and Collomb after their trip to Spain in 1852 and the included reference list provide an external view of the situation of Spanish geology in the mid 19th century. In their own words: " *Quelques personnes peu familiarisées avec les progrès des sciences a l´etranger, s´imaginent que l´Espagne reste en dehors du movement scientifique et que la géologie particulièrement y est tout à fait nègligée. A leur yeux, ce serait un champ inculte, una terre nouvelle 'terra incognita', où tout serait encore à découvrit. Rien n´est plus contraire à la vérité* ". The reference list included more than 150 references, half of them by Spanish geologists. Another reference list published in 1874 by Fernández de Castro included about 1500 papers, notes, and contributions of the Spanish geologists during th e period 1850-1870.

Since the beginning, the Spanish tradition was essentially devoted to unravelling basin stratigraphies and to describing in detail lithologies and facies. The climatic, tectonic and environmental implications of lake deposits were secondary aspects, in constrast with Gilbert´s work on the Pleistocene Lake

Bonneville (1890). Gilbert defined the principles of lacustrine, shoreline and delta facies analyses, and inaugurated the use of lacustrine deposits as evidence for climate change and large hydrologic fluctuations in the past. This tradition was continued with the work on the Eocene Green River Formation in the early 20th century (Bradley, 1929).

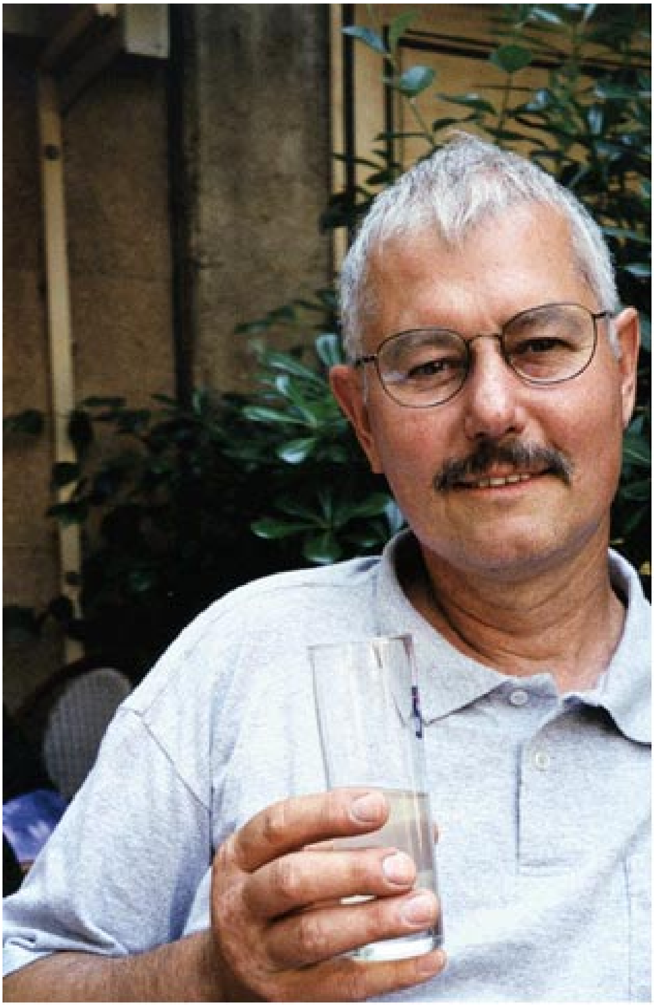
Although the contributions of the Spanish geologist were modest, their work shows a clear understanding of some principles of lacustrine geology, including facies analyses, depositional interpretations based on modern analogs, and paleoenvironmental reconstructions. For example, the definition of the Tajo Basin by Ezquerra del Bayo (1845) was not very precise, but it implied the concept of "Sedimentary Basin" and an attribution of a Tertiary age to these formations. He described the lithologic- sequence as composed of coarse detrital material at the base, gypsum and saline deposits in the middle and freshwater limestones at the top. In the geologic description of the Madrid province, Casiano del Prado (1864) already stressed the rapid lateral facies changes in lacustrine deposits. Martín Donayre (1873, 1886) and Palacios (1893) described the different rocks occurring within the Lacustrine Group of the Tertiary Terrain in the Ebro Basin: from the common limestones and dolostones to the oncolitic limestones in Borja "with certain similarities with the recent tuffas" as well as from the thick gypsum deposits of the central Ebro Basin and the halite layers west of Zaragoza to the lignites in Mequinenza. Modern facies analogs were already used to understand the genesis of some of these lacustrine formations. Mallada (1878) described a N-S cross-section of the lacustrine rocks in the Huesca province and interpreted them as deposited in a single large Miocene lake. He envisioned a connection among the Miocene lakes of the Ebro, Tajo and Duero Basins until the Alpine orogeny uplift.

Palacios (1893) noted that the sedimentary infilling of the three main Tertiary lacustrine basins in Spain (the Ebro, Tajo and Duero river basins) was similar: a basal conglomerate unit, an intermediate marl, and an upper unit composed of limestones with clays and silica. He also noted the spatial variability of the lacustrine deposits over short distances and explained it by changes in sedimentation: "*la sedimentación de sus distintos materiales no se verificó de una manera regular y uniforme, aún en extensiones relativamente poco considerables, sino que mientras en unos parajes se depositaban todavía rocas detríticas de elementos voluminosos, en otras se constituían ya las margas y arcillas y hasta las rocas de sedimentación química*". These ideas contain the principles of sedimentary sequence analyses and of the presence of depositional sub-environments in the alluvial-lacustrine systems.

The number of modern lakes in Spain is relativelly small, compared with other countries, but they occur in a variety of geographic, climatic and ecologic settings (Alonso, 1998). At the time of the multidisciplinary investigations of Forel (1892-1902) in modern Lake Geneva that established limnology as an independent scientific discipline, early studies and surveys were done in the two largest modern lakes in Spain: Sanabria in Zamora province, (Ciria y Vinent, 1908; Taboada, 1913) and Banyoles in Girona province, (see Julià, 1977), as well as some in small lakes (Calderón, 1888; Hernández Pacheco, 1900) The study of modern playa lakes in the Iberian Peninsula started at about the same time. From the first research work of Calderón (1888), numerous authors have been carrying out research efforts on the Spanish saline lakes from varied points of view, and with different objectives (see and Montes and Martino, 1987, for extensive reviews). Donayre (1873) had already described the extensive mudflats of the Gallocanta Lake ("el terreno que le rodea es en extremo fangoso") and the direct correlation between the amount of salts extracted from La Salineta Lake (Zaragoza province) and the annual rainfall. In spite of all these works, a limnologic tradition was never established, and the studies of Ramón Margalef (see his classic book "Limnología" published in 1983) in the mid and late 20th century represent the pioneer work in limnology in Spain.

A list of the contributions on Spanish lacustrine formations during the 20th century would be too long. The well-established tradition of detailed stratigraphic work and mapping of lacustrine formations started during the 19th century was, undoubtedly, one of the foundations for the strength of the Spanish scientific community in the late 20th century in these fields. The readiness of the Spanish researchers to create and participate in a "lacustrine" network during the 1980s and 1990s was the combination of young spirits, old traditions, and the right amount of foreign enthusiasm. The IGCP-219 and 324 projects, lead in Spain by Drs. Ll. Cabrera and P. Anadón, greatly improved the knowledge of both recent and fossil lake systems on the Iberian Peninsula. Calvo (2001) defined the last 15 years in Spanish Limnogeology as the "Keltsian age". In the Preface of this book, Lluis Cabrera and Pere Anadón summarize the history of those years, the strong connection between Kerry and the Spanish community and the main accomplishments of both projects.

LIMNOGEOLOGY IN SPAIN: A TRIBUTE TO KERRY KELTS



"Lakes are dynamic response systems collecting complex signatures of the landscape (vegetation, carbon, pollen, dust, ash, soil erosion, floods, seasons) and aquatic systems (water source, composition, balance, temperature, chemistry, isotopes, carbon, precipitates, biotic and abiotic processes). These signatures integrate climate parameters of temperature, precipitation, wind, seasonality, climate extremes, and variability." Kerry Kelts

The Book “Limnogeology in Spain: a tribute to Kerry Kelts” is a scientific homage of the Spanish Limnogeologic Community to one of its members. Most of the contributors knew Kerry in person and shared with him worshops, fieldtrips, meetings and geologic discussions in outcrops all over the world. They are colleagues and friends who participated in the IGCP-219 and 324 projects. Conflicting schedules and the many deadlines to meet at universities and research institutions in Spain have impeded others to write a chapter for this book, but they shared the goal of this community effort. Lluis Cabrera and Pere Anadón give a detailed account of the history of the two IGCP projects in Spain and how Kerry was a dynamic catalyst during those years.

I am happy to have been able to include a piece of Kerry´s writings as the opening chapter. Kerry was a great advocate of the use of smear slides and microscopic analyses to describe and classify lacustrine sediments. The same tool (microscope) and the same concept (start with the mud…) bring together the study of modern sediments and old rocks. As he said, “the microscope is the most powerful sediment tool, although much more difficult to use than a microprobe, X-Ray diffraction, or isotope instrument”.

The book contains thirteen more chapters dealing with different aspects of lacustrine research in Spain. Two papers describre the sedimentology of lacustrine formations from two classic basins (Duero and Guadix-Baza). Four papers deal with Late Quaternary and Holocene records from saline lakes, peatbogs, and karstic lakes in the Iberian Range, La Mancha and Andalucia. Three more papers focus on particular lacustrine facies (palustrine carbonates, microbialites and seismites) and their environmental and depositional interpretations. Another paper reviews the “dolomite problem”. Two papers provide new insights in the use of inorganic and organic proxies in lake research. One of them describes a statistical method to reconstruct past lake level changes from mineralogic data; the other reviews of the use of biomarkers in Spanish lacustrine formations. Human-made lakes (reservoirs) also deserved a space in this book as limnic systems and the last chapter summarizes some examples from Spanish reservoirs.

In Chapter 2, **Ana Alonso** reviews the state-of-the-art of palustrine carbonates with a thorough description of their sedimentary and petrographic facies and the implications for environmental reconstructions and sequence stratigraphy in terrestrial basins.

In Chapter 3, **Rosa Mediavilla, J.J. Santisteban and C. Dabrio** present an example of mixed terrigenous and carbonate sedimentation in Miocene shallow lakes from the Duero Basin. They propose a depositional model with coeval sedimentation of siliciclastics and carbonates in the same lake, instead of a temporal succession of clastic and carbonate-dominated lakes controlled by external factors.

Concha Arenas, Ll. Cabrera and E. Ramos describe Oligocene fluvial-lacustrine microbialites from the Cala Blanca Formation in the Balearic Island of Mallorca (Chapter 4). They show how morphology and lamination type are the results of the interplay of sedimentary environment conditions and the type of microorganisms.

In chapter 5 **Trinidad Torres, José Eugenio Ortiz, Vicente Soler, Emilio Reyes, Antonio Delgado, Maruja Valle, Juan Francisco Llamas, Rafael Cobo, Ramón Julià, Ernestina Badal, Miguel Angel García de la Morena, María Jesús García-Martínez, Jorge Fernández-Gianotti, José Pedro Calvo, and Antonio Cortés** describe the detailed stratigraphy and sedimentology of a Pleistocene lacustrine succession in the east domain of the Guadix-Baza Basin (Granada). Paleomagnetism determinations and amino acid racemisation provide a chronologic framework for this succession and allow the correlation of palaeobiologic (palaeontologic sites), palaeoanthropologic (Lower and Middle Palaeolithic sites) and neotectonic (seismites) events. They provide an example of salinity reconstructions based on sedimentary facies analyses and ostracode assemblages.

Chapter 6 (**F.X.C. de las Heras, P. Anadón and L. Cabrera**) review the use of biomarkers in lacustrine coals and oil shales from several Tertiary basins in Spain. The authors show how even in these relatively small lacustrine systems, oil source rocks are diverse because of varying proportions of organic matter inputs and/or changing depositional and early diagenetic conditions.

J.P.Calvo, J.A. Mckenzie, and C. Vasconcelos (Chapter 7) review the recent advances in our understanding of the "dolomite problem" and the contributions from modern and ancient lacustrine systems. The role of microbial communities, in particular sulfate-reducing bacteria, is considered a decisive factor to overcome kinetic barriers and allow dolomite precipitation to occur at surface conditions. Current research trends are summarized, including bacterial culture experiments, the study of fossilization patterns of bacteria, and the recognition of (bio)markers to prove the bacterial origin of dolomite formed in lakes and/or marine settings

The modern meets the old again in Chapter 8 by **Miguel A. Rodríguez Pascua, Arnfried Becker, José Pedro Calvo, Colin A Davenport and David Gómez-Gras**. They present examples of a variety of Neogene and Holocene seismites that can be used as a proxy for detailed paleoseismologic analyses. Based on modern analogs, they propose a classification of seismites according to a hierarchical ordering of earthquake magnitudes.

Juana Vegas, Blanca Ruiz-Zapata, Mª José López-García, Mª José Gil-García, Miriam Dorado-Valiño, Ana Valdeolmillos-Rodríguez and Alfredo Pérez-González describe a high resolution lacustrine record of the Late Glacial - Holocene transition in Laguna Grande (Sierra de Neila, NW Iberian Range) (Chapter 9). A detailed sedimentologic, palynologic, and diatom study allows the identification of the GS-1/Younger Dryas event and its characterization in two phases, an initial phase colder and more arid than the second phase. The data also show that the early Holocene was the period with highest lake levels since deglaciation.

In Chapter 10, **Santi Giralt and Ramón Julia** apply statistical analyses to reconstruct lake level changes for the last 70,000 years in a hydrologically-closed basin. Their methodology is based on detailed analyses of the mineralogic composition of the primary, chemically-precipitated lake sediments, and a "transfer function" between mineralogy, water composition, and lake level. The reconstructed lake levels for Salines Lake in SE Spain fit well with the known paleohydrologic evolution of southestern Spain.

Sergio Sánchez-Moral, Salvador Ordóñez, Maria Angeles García del Cura and D. Benavente review the changes in brine concentration, mineralogy, and the genesis of evaporitic deposits in playa lakes from La Mancha Plain (Chapter 11). The sedimentation of Quero Playa Lake, an artificial pond, and a laboratory experiment were monitored daily in order to understand saline sedimentation and water balance. The results show that salt deposition is not a continuous process, in which salinity might increase slowly with ephemeral stages of dilution and that evaporation and the hydration degree of the salts are the main controls; brine depth is not a significant factor.

M.J.Mayayo, A. Luzón, A.R. Soria, A.C. Roc, J.A. Sánchez, and A. Pérez summarize in Chapter 12 the state of knowledge on the largest saline lake in Spain - Gallocanta Lake, Teruel-Zaragoza provinces, NE Spain – and describe its sedimentologic, hydrochemical and mineralogic evolution based on a multidisciplinary study of a large number of cores (37 between 1 and 2.33 m long). The vertical succession and lateral relationships of sedimentary facies and units integrated with the pollen assemblages define three evolutionary stages during the Holocene.

The last two chapters deal with shorter time scales in lacustrine archives, from centuries to decades. In Chapter 13, **Blas Valero Garcés, Ana Navas, Pilar Mata, Antonio Delgado-Huertas, Javier Machín, Penélope González-Sampériz, Antje Schwalb, Daniel Ariztegui, Michael Schnellmann, Roberto Bao and Antonio González-Barrios** integrate multidisciplinary proxies with detailed sedimentary facies analyses to reconstruct the environmental and hydrological history of Zoñar Lake (Córdoba province, southern Spain) during the last few centuries. This paper underlines the potential of sedimentary facies analyses as a tool to unravel paleoenvironmental and paleohydrologic information from lacustrine cores. Sedimentary facies may provide "qualitative" reconstructions as useful as the "numeric" reconstructions provided by other proxies.

In the last chapter, **M. Esther Sanz Montero** introduces us to the sedimentology of a different kind of limnic system: reservoirs and dams. Spain currently has about 1100 large dams, some of them built by the Romans 2000 years ago and still operative. Spain has the third highest number of dams in Europe and the fifth in the world. It has been estimated that about 360 x 10^6 m^3 of sediment are deposited in those reservoirs every year. Reservoirs typically have elongated geometries that produce strong longitudinal gradients. The geology of catchments is the main parameter controlling the composition and size of the sediment package. Siltation of a reservoir is not a problem to be solved by future generations, but an urgent need for sustainable development.

Finally, as the editor of the book I would like to thank all the contributors for their efforts to make this happen. I am also very grateful to the reviewers: **Nacho López, Beth Gierlowski-Kordesch, Bill Last, Michael Rosen, Tony Stevenson, Mike Talbot, Concha Arenas, Ana Alonso, Brian Jones and Doug Schurrenberger**. Thanks also to **Ana Moreno** for her excellent editing work. I gladly acknowledge the Publishing Department of the Spanish Scientific Research Council (CSIC) for including this book in the Science Series of the CSIC and **Wifredo Rincón**, the Director of the Publishing Department for his enthusiam and patience during the editing process.

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