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A land plant saga: tribute to Jean Galtier – Introduction

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This special issue dedicated to Jean Galtier celebrates the more than 60 years he devoted to palaeobotany. Jean Galtier is recognized as an international authority on Paleozoic floras and paleoenvironments. His expertise in early ferns and early seed plants is acknowledged worldwide.

Jean Galtier was born on 17 March 1940 near Montpellier and has spent his entire life in this region of southern France to which he is greatly attached. Hired by the French National Center for Scientific Research (CNRS) in 1963, he joined the laboratory of "Palaeobotany and Plant Evolution" at the University of Montpellier. Its director at the time, Prof. Louis Gambast, offered him a thesis on the anatomically preserved plants of the Lower Carboniferous deposits of France, thus continuing the work initiated by a famous predecessor, Bernard Renault, for whom Jean Galtier has a deep admiration (Galtier, 2016). Jean Galtier's (1970) thesis was followed by numerous other publications, by him alone or with his students and post-docs, on the plants of the Tournaisian of Montagne Noire and the Viséen of Roannais and Esnost, near Autun. It was during his thesis project that Jean Galtier began to work on the early ferns, which are widely represented at Esnost, and on the early Pteridospermales, which are dominant in Montagne Noire.

His interest in ferns increased when, after Louis Grambast's death in 1976, he supervised the PhD and subsequent researches of John Holmes for over 10 years. This work focused on reconstructing Late Carboniferous ferns from the coal balls they collected in Lancashire, England (Holmes & Galtier, 1976). Another milestone in Jean Galtier's work on ferns is his collaboration with Tom Phillips, which began in the mid-1980s, and led to three important reviews on the evolution and ecology of the Late Paleozoic Zygopteridales, Tedeleaceae, and Anachoropterids (Phillips & Galtier, 2005, 2011 ; Galtier & Phillips, 2014).

Another decisive collaboration regarding his favourite plant groups is the one he built in the early 1990's with Charles Beck on the diversification of the calamopityacean pteridosperms. A series of papers was produced describing new genera and clarifying the systematics of the family (Beck et al., 1992 ; Galtier & Beck, 1995). Regarding seed plants, Jean Galtier also published several papers detailing the structure and morphology of Paleozoic ovules, emphasizing their diversity (Combourieu & Galtier, 1985 ; Galtier et al., 2007). He showed with *Coumiasperma*, the only permineralized ovule discovered from Montagne Noire, that some early ones may have departed from the classical hydrasperman type (Galtier & Rowe, 1989).

Jean Galtier was much interested in comparing the morphological and architectural evolution of the early ferns and early pteridosperms, both groups being characterized by the

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possession of large and complex fronds. One of the most important papers he devoted to this question is certainly his review on the evolution of the megaphyll (Galtier, 2010).

Jean Galtier's long friendly and fruitful collaboration with Andrew Scott on Early Carboniferous plant assemblages from Scotland started in the early 1980's (Galtier & Scott, 1985 ; Scott et al., 1986). It involved numerous field trips, revisiting AIbert Long's localities in Berwickshire and discovering many new localities yielding anatomically preserved plants. Numerous papers were published on the new plant assemblages, their environment and composition, with many new taxa described. The Scott et al. (1984) paper is one of the most widely cited among those devoted to Early Carboniferous floras.

In 1993, Jean Galtier was awarded a "Distinguished Visiting Professor" fellowship for a three-month visit at Tom Taylor's laboratory at Ohio State University. This was the beginning of a new friendly collaboration, which gave him the opportunity to describe a new filicalean fern from the Permian deposits of Antarctica, and to enter the hidden world of fungi with the Taylor's team (Taylor et al., 1994 ; Krings et al., 2007 ; Harper et al., 2016).

Early in his career when he collected fossils in the Autun surroundings, Jean Galtier became interested in Permian fossils. However, it is around the late 1990's that he started to spend more time in studying Permian plants and assemblages through collaborations with Jean Broutin, Ronny Rößler, Shi-Jun Wang and Jason Hilton. With the former, he revised the succession of floras preserved in the Lodève basin (southern France) (Galtier & Broutin, 2008). He contributed with Shi-Jun Wang and Jason Hilton to the description of new taxa of diverse affinities from China (Wang et al., 2006 ; Hilton et al., 2009). Ronny Rößler involved him in the description of new ferns and fern-allies from Brazil (Rößler & Galtier, 2002, 2003). There are few continents that Jean Galtier did not investigate. Apart from Europe, America, China, and Antarctica, his work on plant assemblages from North Africa and Australia are also noteworthy (Galtier et al., 2007 ; Decombeix & Galtier, 2017).

Throughout his career, Jean Galtier enjoyed prospecting, collecting and preparing his fossils himself. He considerably expanded the palaeobotany collections of the University of Montpellier. In the 1980-90's, it was not uncommon to find him breaking rocks in the garrigue of Montagne Noire or around the Stephanian coal deposits of Graissessac, when he was not in the laboratory preparing peels with hydrofluoric acid. In his articles, he has always been careful to provide numerous illustrations to support crucial points of structure and development. For his drawings, he relied heavily on the use of the camera-lucida, of which he is an avid user. In order to compare his specimens with already known taxa, Jean Galtier has never been satisfied with a purely literary knowledge of the fossil record. He visited museums and laboratories around the world to examine the types himself. His unparalleled expertise of all major Paleozoic plant groups is based on his extensive knowledge of most major collections in Europe and North America.

Jean Galtier won prestigious awards. Just after his thesis he received the bronze medal of the CNRS then, in 1989, the Paul Bertrand prize of the Academy of Sciences in Paris, and, in

2010, the W.J. Jongmans medal for excellence in palaeobotany and palynology. Jean Galtier actively promoted and served palaeobotany. After having been vice-president of the International Organization of Paleobotany (IOP) for four years, he was elected president for the period 1996-2000. He has also long served on the editorial board of two journals, Review of Palaeobotany and Palynology, and Palaeontographica B. He has been a corresponding member of the Botanical Society of America since 2006.

Jean Galtier retired in 2005 and obtained the status of emeritus. For his retirement, a well-attended meeting, which included a field trip to his favorite locality of Graissessac, was held in April 2006 in Montpellier. Since his retirement he has remained very active, assisting and collaborating with numerous younger colleagues.

The present issue, which honors Jean Galtier's career and dedication to palaeobotany, contains 24 research papers dealing with taxonomy, ecology and evolution, and written by his colleagues, close collaborators and friends. It covers 400 million years of plant evolution, from the Lochkovian to the Neogene, the largest section being devoted to the Paleozoic. All major groups of land plants are considered, i. e., the eophytes, early tracheophytes, lycopsids, ferns and allies, pteridospermales, putative cycads and ginkgos, conifers, and angiosperms. Charophytes, fungi and micro-organisms are also represented, with three papers. The 24 articles in this issue open as many windows on major steps in the evolutionary saga of land plants and their increasingly better understood environmental contexts.

Acknowledgements

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Supplementary Data

S1: List of Jean Galtier's publications.

References

Beck, C.B., Galtier, J., Stein Jr., W.E. 1992. A reinvestigation of *Diichnia* Read from the New Albany Shale of Kentucky. Rev. Palaeobot. Palynol., 75 (1-2), 1-32.

Combourieu, N., Galtier, J. 1985. Nouvelles observations sur *Polypterospermum*, *Polylophospermum*, *Colpospermum* et *Codonospermum*, ovules de ptéridospermales du Carbonifère supérieur français. Palaeontographica B, 196 (1-3), 1-29.

Decombeix, A.-L., Galtier, J. 2017. *Ahnetia*, a new lignophyte stem from the Lower Carboniferous of southern Algeria. Rev. Palaeobot. Palynol., 237, 62-74.

Galtier, J. 1970. Recherches sur les végétaux à structure conservée du Carbonifère Inférieur français. Paléobiol. Continent., 1(4), 1-221.

Galtier, J. 2010. The origins and early evolution of the megaphyllous leaf. Int. J. Plant Sci., 171 (6), 641-661.

Galtier, J. 2016. Bernard Renault (1836-1904) Illustre paléobotaniste bourguignon et son héritage scientifique. Rev. Scient. Bourgogne-Nature, 23-2016, 63-76.

Galtier, J., Beck, C.B. 1995. A reinvestigation of *Calamopitys americana* with a description of two species from the Lower Carboniferous of U.S.A. and France. Palaeontographica B, 237 (4-6), 75-111.

Galtier, J., Broutin, J. 2008. Floras from red beds of the Permian Basin of Lodève (Southern France). J. Iberian Geol., 34 (1), 57-72.

Galtier, J., Phillips, T.L. 2014. Evolutionary and ecological perspectives of Late Paleozoic ferns. Part III. Anachoropterid ferns (including *Anachoropteris*, *Tubicaulis*, the Sermayaceae, Kaplanopteridaceae and Psalixochlaenaceae). Rev. Palaeobot. Palynol., 205, 31-73.

Galtier, J., Rowe, N.P. 1989. A primitive seed-like structure and its implications for early gymnosperm evolution. Nature, 340 (6230), 225-227.

Galtier, J., Scott, A.C. 1985. Diversification of early ferns. Proc. Roy. Soc. Edinburgh, 86B, 289-301.

Galtier, J., Feist, R., Talent, J.A., Meyer-Berthaud, B. 2007. New permineralized flora and trilobites from the mid-Tournaisian (Early Carboniferous) Ruxton Formation, Clarke River Basin, north-east Australia. Palaeontology, 50 (1), 223-243.

Harper, C.J., Kings, M., Galtier, J., Taylor, T.N. 2016. A microfossil with suggested affinities to the peronosporomycetes (Oomycota) from the Carboniferous (c. 330 Ma) of France. Nova Hedwigia, 103 (3-4), 315-326.

Hilton, J., Wang, S.-J., Galtier, J., Bateman, R.M. 2009. Cordaitalean seed plants from the Early Permian of North China. III. Reconstruction of the *Shanxioxylon taiyuanense* plant. Int. J. Plant Sci., 170 (7), 951-967.

Holmes, J., Galtier, J. 1976. Twin shoots borne on a *Botryopteris* frond from the British Upper Carboniferous. Rev. Palaeobot. Palynol., 22 (3), 207-224.

Krings, M., Dotzler, N., Taylor, T.N., Galtier, J. 2007. A microfungal assemblage in *Lepidodendron* from the Upper Visean (Carboniferous) of central France. C. R. Palevol, 6 (6-7), 431-436.

Phillips, T.L., Galtier, J. 2005. Evolutionary and ecological perspectives of Late Paleozoic ferns: Part I. Zygopteridales. Rev. Palaeobot. Palynol., 135 (3-4), 165-203.

Phillips, T.L., Galtier, J. 2011. Evolutionary and ecological perspectives of late Paleozoic ferns. Part II. The genus *Ankyropteris* and the Tedeleaceae. Rev. Palaeobot. Palynol., 164 (1-2), 1-29.

Rößler, R., Galtier, J. 2002. First *Grammatopteris* tree ferns from the Southern Hemisphere - New insights in the evolution of the Osmundaceae from the Permian of Brazil. Rev. Palaeobot. Palynol., 121 (3-4), 205-230.

Rößler, R., Galtier, J. 2003. The first evidence of the fern *Botryopteris* from the Permian of the Southern Hemisphere reflecting growth form diversity. Rev. Palaeobot. Palynol., 127 (1-2), 99-124.

Scott, A.C., Galtier, J., Clayton, G. 1985. A new late Tournaisian (Lower Carboniferous) flora from the Kilpatrick Hills, Scotland. Rev. Palaeobot. Palynol., 44 (1-2), 81-99.

Scott, A.C., Meyer-Berthaud, B., Galtier, J., Rex, G.M., Brindley, S.A., Clayton, G. 1986. Studies on a new Lower Carboniferous flora from Kingswood near Pettycur, Scotland. I. Preliminary report. Rev. Palaeobot. Palynol., 48 (1-3), 161-180.

Taylor, T.N., Galtier, J., Axsmith, B.J. 1994. Fungi from the Lower Carboniferous of central France. Rev. Palaeobot. Palynol., 83 (1-3), 253-260.

Wang, S.J., Hilton, J., Galtier, J., Tian, B. 2006. A large anatomically preserved calamitean stem from the Upper Permian of southwest China and its implications for calamitean development and functional anatomy. Plant Syst. Evol., 261 (1-4), 229-244.