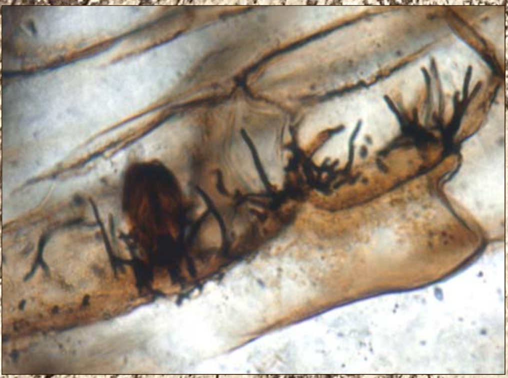
Agora Paleobotanica

Un hommage à / A tribute to
Bernard Renault (1836-1904)

6-9/07/2015, Autun (France)

Résumés - Abstracts



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Comité d'organisation / Organizing Committee

Anais BOURA – *Université Pierre et Marie Curie, Paris*
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Progamme mis à jour le 29/06
Program updated on 29/06

	8h-9h	9h-10h	10h-11h	11h-12h	12h-13h	13h-14h	14h-15h	15h-16h	16h-17h	17h-18h	18h-19h	19h-20h	20h-21h
Lundi Monday 06/07									Accueil Arrival *(Museum)*	Intro Talk	Allocution maire & apéritif Welcome address & drinks *(Museum)*		
Mardi Tuesday 07/07		Session Paléozoïque I Session Paleozoic I + posters *(Mairie/City Hall)*					Session Paléozoïque II Session Paleozoic II + posters *(Mairie/City Hall)*				Meeting Agora Paleobotanica *(Mairie)*		
Mercredi Wednesday 08/07		Session Mésozoïque et Tertiaire Session Mesozoic and Tertiary +posters *(Mairie/City Hall)*					Visite musée et exposition de fossiles Museum visit and fossil exhibition *(Museum)*					Diner Banquet *(Restaurant Les Ursulines)*	
Jeudi Thursday 09/07	Excursion à Muse Fieldtrip to Muse				Pique-nique et clôture du congrès Picnic and closing of the congress								

LUNDI/MONDAY

Museum d'Histoire Naturelle Jacques de La Comble

14 rue Saint-Antoine, Autun. There is another access (backyard & garden) from Impasse Rollet.

16h00-17h30 Accueil des participants
Participant arrival

17h30-18h Conférence introductive/ Opening talk
Georges GAND.
Le Bassin Permien d'Autun

18h-19h30 Allocution de bienvenue du maire - Apéritif de bienvenue
Welcome address by the mayor - Welcome drinks

MARDI /TUESDAY

Salon d'honneur de la mairie d'Autun/ City Hall

Place du Champ de Mars.

Session 1: PALEOZOÏQUE I
Modérateurs/Chairs: Philippe GERRIENNE & Evelyn KUSTATSCHER

9h00-9h30	Jean GALTIER. Keynote: Bernard Renault (1836-1904), his life, works and paleobotanical heritage.
9h30-9h50	Christine STRULLU-DERRIEN & P. KENRICK. *Palaeozoosporites renaultii,* a new fungus in the rooting system of the Rhynie Chert plant *Asteroxylon mackiei.*
9h50-10h10	* Gonzalo RIAL, B. CASCALES-MIÑANA, R. GOZALO & J.B. DIEZ. Discovery of a new spore assemblage in the Middle Devonian of Iberian Peninsula.
10h10-10h30	Brigitte MEYER-BERTHAUD, A.-L. DECOMBEIX, R. DUNSTONE, P. GERRIENNE, N. MOMONT & G. YOUNG. First record of aneurophytalean progymnosperms in Australia.
10h30-11h00	*Pause café/coffee break*
11h00-11h20	* Dorothée LETELLIER, A.-L. DECOMBEIX & B. MEYER-BERTHAUD. Whose are these roots? Early Carboniferous woody roots from Montagne Noire, France.
11h20-11h40	Cyrille PRESTIANNI, J.J. RUSTAN, D. BALSEIRO, E. VACCARI, A. STERREN & E. SFERCO. A new anatomically preserved flora from the Mississippian of Sierra de Las Minitas (La Rioja, Argentina).
11h40-12h00	* Borja CASCALES-MIÑANA. Apparent plant diversity dynamics during the Ordovician-Mississippian time interval.
12h00-**12h20**	* Manuel A. JUNCAL, J.A. KNIGHT & J.B. DIEZ. Preliminary palynological data of the Carboniferous stratigraphical sections from Sabero (NW Spain).

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* *Communications à considérer pour le prix de la meilleure communication par un étudiant ou postdoc membre d'Agora Paleobotanica / *Talks to be considered for the prize for the best communication by a student or postdoc member of Agora Paleobotanica.*

Session 2 : PALEOZOÏQUE II

Modérateurs/Chairs: Anaïs BOURA & Borja CASCALEZ-MIÑANA

14h-14h20	Christopher J. CLEAL, Y.G. TENCHOV, J. SREMAC, T. ĐEREK & S. JAPUNDŽIĆ. Age and floristic relationships of the Late Pennsylvanian vegetation of SW Croatia.
14h20-14h40	Jean BROUTIN. 1896, le mystère de la chambre pollinique est élucidé par Bernard Renault.
14h40-15h	Cynthia MEIJS, E. STOLLE , I. VAN WAVEREN, G. GAND, J-S. STEYER & M. SCHMITZ. A first glance at half a million years of Asselian vegetation history in the Autun Basin (France).
15h-15h20	J. VAN DER PAS, L. POPPE, Isabel VAN WAVEREN, D. CHABARD & R. THOMAS. *Dicranophyllum gallicum* var. *parchemineyii* Renault and Zeiler 1888. Stem-group to Ginkgo-, Cycado- and Coniferophytes?
15h20-15h40	Ronny RÖβLER & L. LUTHARDT. The Chemnitz Fossil Forest - three centuries of research deciphering a Permian T0 assemblage.
15h40-16h10	*Pause café/coffee break*
16h10-16h30	Ludwig LUTHARDT & R. RÖβLER. Tissue density variations in fossil wood from the Early Permian Petrified Forest of Chemnitz and their paleoecological significance.
16h30-16h50	*Xiao SHI, J. BROUTIN, S. CRASQUIN & J. YU. Did conifers cover the Late Permian uplands of South China?
16h50-17h10	Hans KERP & A. ABU HAMAD. New data on a mixed flora from the Um Irma Formation, Dead Sea region, Jordan.
17h10-**17h30**	Anne-Laure DECOMBEIX, E.L . TAYLOR & T.N. TAYLOR. Bark anatomy of glossopteridalean trees from the Late Permian of Antarctica.

18h-19h	**Agora Paleobotanica business meeting**

MERCREDI/WEDNESDAY

Salon d'honneur de la mairie d'Autun/ City Hall

Session 3: MESOZOÏQUE & TERTIAIRE

Modérateurs/Chairs: Cyrille PRESTIANNI & Uxue VILLANUEVA-AMADOZ.

9h-9h20 José Bienvenido DIEZ, J. BROUTIN, J. LOPEZ-GOMEZ, J.F. BARRANECHEA, H. DE LA HORRA, A. RONCHI, N. GRETTER & A. ARCHE.

Palynostratigraphical reinterpretation of the Permian/Triassic succession of Palanca del Noves (Catalan Pyrenees, NE Iberian Peninsula).

9h20-9h40 Marc PHILIPPE, K. BOKA, G. PACYNA, D. UHL, Z. WAWRZYNIAK, M. BARBACKA, P. FILIPIAK, L. MARYNOWSKY & F. THEVENARD.

A questioning endemism: *Agathoxylon keuperianum* in the German Keuper Basin.

9h40-10h * Artai Antón SANTOS, R. ROYO-TORRES, U. VILLANUEVA-AMADOZ, L.M. SENDER, A. COBOS, F.J. VERDU, G. MUIÑOS, L. ALCALÁ & J. B. DIEZ.

Paleobotanical study of the Tithonian-Berriasian "Las Zabacheras" site (Galve, Spain).

10h-10h20 Véronique DAVIERO, B. GOMEZ, C. COIFFARD & V. GIRARD.
Mauldinia : réinterprétation architecturale d'une inflorescence de Lauraceae du Cénomanien moyen du Gard.

10h20-10h50 * Mélanie TANRATTANA, A. BOURA, F. FOURNIER & L. VILLIER.

Evolution of the paleoclimate during late Eocene in western Europe: a study in the Alès Basin (Gard, France).

10h50-11h10 *Pause café/coffee break*

11h10-11h30	Alma Rosa HUERTA-VERGARA & S.R.S. CEVALLOS-FERRIZ. Cretaceous conifers and the history of Pinaceae in Mexico.
11h30-11h50	Sergio CEVALLOS-FERRIZ, A. L. HERNANDEZ-DAMIAN & A. R. HUERTA-VERGARA. Angiosperm reproductive organs from the Cretaceous (96 my) El Chango Quarry, Chiapas, Mexico.
11h50-12h10	Romain THOMAS. L'énigmatique *Rhizocaulon*: historique, description et identification.
12h10-12h30	Dario DE FRANCESCHI, R. THOMAS, S. DAILLIE & J. DEJAX. La collection de paléobotanique et les préparations pour les études anatomiques au Muséum National d'Histoire Naturelle, Paris.

Museum d'Histoire Naturelle Jacques de La Comble

14h-17h	Visite du musée d'histoire naturelle et de l'exposition de fossiles préparée par Jean Broutin et Jean Galtier. Visit of the natural history museum and of the fossil exhibition prepared by Jean Broutin and Jean Galtier.

Restaurant Les Ursulines

19h30-21h	Dîner de gala et remise du prix Boureau. Banquet and award announcement.

AFFICHES / POSTERS

Salon d'honneur de la mairie d'Autun/ City Hall

Les posters seront affichés à la mairie mardi toute la journée et mercredi matin.

Posters will be put up at the city hall Tuesday all day and Wednesday morning.

- Antoine CHAMPREUX, B. MEYER-BERTHAUD, J. BROUTIN, A.-L. DECOMBEIX, J.-L. DESAGE, J. GALTIER & G. GAND.
  Permineralized coniferophytes from the Autun Basin: specimens from two new localities of Renault zone 3.

- Giuseppa FORTE, E. KUSTATSCHER, J. H. A. VAN KONIJNENBURG-VAN CITTERT & H. KERP.
  The Kungurian flora of Tregiovo (Trento, N-Italy).

- Giovanni G. SCANU, E. KUSTATSCHER, P. PITTAU & D. ZOBOLI.
  Permian floras of Sardinia: an attempt to reconstruct ancient environments.

- Uxue VILLANUEVA-AMADOZ , M. GERWERT, M. MARTINI, M. RAMÍREZ-CALDERÓN.
  Jurassic palynology of Oaxaca (Mexico).

- Janxing YU, J. BROUTIN, Z-Q. CHEN, X. SHI, H. LI, D. CHU & Q. HUANG.
  Vegetation changeover across the Permian-Triassic Boundary in Southwest China. Extinction, survival, recovery and paleoclimate: a critical review.

JEUDI/THURSDAY

8h00-12h30	Excursion à Muse. Fieldtrip to Muse.
12h30-14h	Pique-nique et clôture du congrès. Picnic and closing of the congress.

1896: le mystère de la chambre pollinique est élucidé par Bernard Renault, Sakugoro Hirase et Seiichiro Ikeno

Jean Broutin*

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Début 1896, toutes les gymnospermes étaient unanimement considérées comme siphonogames par les botanistes. Rien d'étonnant à cela on avait observé que les grains de pollen, une fois entrés dans l'ovule, édifient un tube pollinique. Les paléobotanistes avaient également découvert le même phénomène dans des ovules fossiles. Mais la fonction biologique de la *chambre pollinique* restait, elle, « mystérieuse ».

25 avril 1896 : "coup de tonnerre" dans la communauté des botanistes, Sakugoro Hirase fait une communication au congrès de la Tokyo Botanical Society intitulée : "Spermatozoids of Ginkgo biloba" ! (Hirase 1896a). Son attention avait été attirée par une étrange masse ellipsoïde, édifiée par le grain de pollen, entourée par une spirale portant de nombreux cils qu'il considéra comme… vibratiles. Pour vérifier cette hypothèse, il pratiqua de nombreuses coupes dans des ovules et observa, le 9 septembre, des spermatozoïdes mobiles dans un liquide emplissant la chambre pollinique ! (Hirase 1896b). La zoïdogamie pouvait donc être… interne à l'ovule ! Et non plus seulement l'apanage des plantes à « spores libres » à spermatozoïdes nageurs dans le milieu extérieur. En novembre, Seiichiro Ikeno confirme la réalité de cette « zoïdogamie interne » en l'observant chez le Cycas. Le retentissement de cette surprenante découverte fut immédiatement considérable chez les botanistes.

Dès 1887, Bernard Renault avait pourtant déjà évoqué la possibilité de l'existence d'une telle zoïdogamie chez les gymnospermes… fossiles ! Sans retenir la moindre attention ! En 1896, l'année même de l'annonce d'Hirase, Bernard Renault publie le résultat de ses études des grains de pollen contenus dans les chambres polliniques d'ovules de ptéridospermales et de cordaites. Il interprète une structure cellulaire interne au grain de pollen comme un microgamétophyte pluricellulaire. Il émet alors l'hypothèse que ces cellules pouvaient avoir produit des spermatozoïdes nageurs plutôt que d'édifier des tubes polliniques. Bernard Renault ignorait tout des travaux des botanistes japonais et… réciproquement. *(En ont-ils jamais eu connaissance ??).* Toujours est-il qu'il a eu cette intuition stupéfiante sur la seule observation d'un matériel fossile !

Mais ses travaux sur le contenu fossilisé des chambres polliniques ont enfin convaincu d'autres paléobotanistes. De nombreux petits corps pluricellulaires internes aux grains de pollen, observés dans les chambres polliniques d'ovules fossiles, furent interprétés comme une preuve *indirecte* de la production de spermatozoïdes. Le rôle crucial de la chambre pollinique devenant « micro-piscine nuptiale » permettant à des gamètes mâles nageurs d'atteindre et de féconder les oosphères, était enfin élucidé.

References

Hirase S.1896a. Spermatozoid of *Ginkgo biloba.* (en Japonais) Bot. Mag., Tokyo 10: 171.

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Poort RJ, Visscher H, Dilcher DL. 1996. Zoidogamy in fossil gymnoperms : the centenary of a concept, with special reference to prepollen of late Paleozoic conifers. Proc. Natl. Acad. Sci USA: 11713-1171.

Apparent plant diversity dynamics during the Ordovician-Mississippian time interval

Borja Cascales-Miñana*

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The aim of this contribution is to highlight the temporal pattern of land plant diversity during the terrestrialization process (i.e. the invasion of the land by plants, Vecoli et al. 2010). This issue has been traditionally addressed by studying the Silurian-Devonian megafossil-based diversity patterns of land plants (embryophytes). However, the inclusion of the dispersed spore fossil records is essential for characterizing the first steps of this process (i.e. Eoembryophytic flora *sensu* Gray 1993), a fact that has been, overall, largely neglected until a short time ago. So, this new study includes both spore taxa and plant megafossils to discern the diversity trajectories from the first phases of early land plant diversification until the stabilization of early Carboniferous forests (i.e. Palaeophytic flora *sensu* Cleal and Cascales-Miñana 2014). The diversity patterns of the main recognized plant lineages (i.e. Lycophyta and Euphyllophyta) have been also traced to discern the origin of the major fluctuations of plant megafossil-based diversity. Results reveal that while the dispersed spore diversity curve shows a sustained increase towards the end-Devonian into a model of two-phase diversification, with a first maximum in the late Silurian, the megafossil embryophyte diversity curve is characterized by a set of sequential ascending peaks at the Pragian (Early Devonian), Givetian (Middle Devonian) and Visean (Mississippian) with a single significant depletion in the Eifelian (Middle Devonian). The comparative analysis of the lycophyte and euphyllophyte diversity patterns suggests that the great embryophytic diversity changes are driven by diversification within lineages rather than by the rhythm of appearance of key morphological traits. This evidence (1) advocates for an intrinsic ecological control on the apparent changes of taxic richness, and (2) implies that the observed plant diversity dynamics respond to the overlapping of different exponential growth phases of the involved plant lineages.

Acknowledgements: This research was funded by project ANR-2010-BLAN-607-02 'TERRES' and by a Marie Curie Postdoctoral COFUND fellowship (University of Liege – grant number 600405).

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Angiosperms reproductive organs from the Cretaceous (96 my) El Chango Quarry, Chiapas, Mexico

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During the last decade a new quarry with abundant fish and invertebrates yielded a diverse assemblage of conifers, and some angiosperm vegetative and reproductive organs. The locality represents the oldest Cretaceous fossiliferous outcrop from Mexico, being 96 my old based on fish, ammonite and foraminifera dates. The first report of flowering plants from this marine sequence documented the presence of sea grasses, which are a common element of this taphocenosis. Other plant organs are represented by one or two samples, and are impression/compression fossils. Here we report 5 morphotypes suggesting a probable taxonomic affinity, but more observations and if possible further collection will add characters challenging these first suggestions. Morphotype 1 is an epiphyllius, a small flower with a biseriate not differentiated perianth, composed of six structures slightly fused in their proximal zone that may be compared with leaf-like structures, which develops from the adaxial surface of a symmetrical leaf-like organ with acute apex and a prominent mid-vein that is flanked by two weaker basal veins that do not reach the entire margin. From the same strata a fruit with almost spherical form and a strong pedicel resembles a berry. The similarities of these two organs with the reproductive structures of Ruscaceae, and especially with *Ruscus* suggest that a member of the group was present at that time. Morphotype 2 corresponds to a reproductive organ that seems to be also composed of a leaf like structure, perhaps an involucre, and a nut-like fruit with a single style. The organization of this structure resembles some reproductive units of Betulaceae, especially *Corylus*. Morphotype 3 is an infructesence composed of apocarpic fruits with persistent styles that resemble the fruits of some members of Proteaceae. Morphotype 4 is interpreted as a spiny schizocarp with a persistent style (?) that resembles fruits of some members in ca. 40 families, but seems morphologically close to some Apiaceae. Morphotype 5, interpreted as a flower maturing to a fruit, has 5-parted calix and corolla, and resembles in this maturation stage some members of Rosaceae, especially Maleae. This flower assemblage suggests the presence of an important herbaceous component in the coniferous forest that grew along the coast in southern Mexico at that time; however, the need of more collections is highlighted to complete the morphological descriptions and increase support to the taxonomic determinations of these plants.

Permineralized coniferophytes from the Autun Basin: specimens from two new localities of Renault zone 3

Antoine Champreux[1], Brigitte Meyer-Berthaud[1,*], Anne-Laure Decombeix[1], Jean-Luc Desage[2], Jean Galtier[1], Georges Gand[3]

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Four zones yielding silicified plant remains have been recognized in the Autun Basin by Renault (1893-1896). Zones 2, 3 and 4, characterized by Autunian plants, correspond to the successive formations of Igornay and Muse (lower Autunian), and Surmoulin-Millery (upper Autunian). Their paleobotanical content, together with that preserved as adpressions in the same formations, document paleofloral changes on the western side of the Tethys within a time interval extending from the latest Ghzelian (uppermost Pennsylvanian) to the early Sakmarian (lower Permian) (Broutin et al. 1999). The analyses realized so far indicate a progressive replacement of wetland plants by taxa better adapted to drier environments. The number of taxa referable to the Coniferophytes (i.e. belonging to the Cordaitales and Coniferales) increased during this time interval.
In order to enlarge the record of permineralized plants from the Autun Basin and improve our understanding of their diversity patterns, prospections directed in 2011 by Jean-Luc Desage, and 2015 by Georges Gand, were conducted on the northwestern side of the village of Muse. Isolated fragments representing coniferophytic woods were collected in two new localities, one along the banks of the Arroux River, the second at Les Echars. Both localities fall in Renault's zone 3. We present here the main characters of these specimens and compare them to *Cordaixylon sp*., *Dadoxylon rollei* and *Scleromedulloxylon varollense*, the three taxa of coniferophytic affinities found to date in zone 3 (Broutin et al. 1999). Many specimens show large spherical structures scattered in either rays or tracheids. They measure about 100 µm wide and show heavily silicified walls. The cells surrounding them are compressed, indicating that these structures developed inside living trees. Based on wood characters alone, the new discoveries confirm that the community of coniferophytic trees was well established in the Muse formation but suggest that it may not have been highly diversified.
(Poster)

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Age and floristic relationships of the Late Pennsylvanian vegetation of SW Croatia

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Upper Pennsylvanian deposits in the Velebit Mts and Lika region of Croatia are mainly marine, but also include relative thin terrestrial intercalations. The latter yield diverse fossil floras dominated by medullosaleans (especially *Alethopteris*) and sphenophytes, and represent the remains of the lowland vegetation that grew on the southern side of the Variscan Mountains. Biostratigraphically they belong to the *S. angustifolium* Zone of the Stephanian B Substage (late Kasimovian or earliest Gzhelian) age. They compare most closely with similar aged floras found in northern Spain and the Carnic Alps. In contrast, similar aged floras from intra-montane sequences further north and west in Europe often tend to be dominated by marattialean ferns and cordaitaleans. These differences are probably the result of the higher elevation and better drainage of the intra-montane basins.

Mauldinia : réinterprétation architecturale d'une inflorescence de Lauraceae du Cénomanien moyen du Gard

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Au début de la radiation des Angiospermes, les Lauraceae comptaient parmi les premières formes ligneuses de l'Albien et du Cénomanien, au milieu du Crétacé. *Mauldinia* Drinnan A.N., Crane P.R., Friis E.M., Pedersen K.R. est l'une de ces Lauraceae qui a été trouvée aux Etats-Unis, en Asie Centrale (Kazakhstan) et en Europe (République Tchèque, Allemagne).
Plus récemment, des spécimens ont été découverts à Saint-Laurent-la-Vernède et Saint-André-d'Olérargues, non loin de Bagnols-sur-Cèze, dans le département du Gard, sud-est de la France. Plusieurs dizaines de spécimens avec les cuticules préservées ont été isolés après désagrégation des sédiments argilo-ligniteux dans de l'eau oxygénée très diluée. Ils font l'objet de la présente étude.
Les travaux précédents sur *Mauldinia* ont concerné la structure des fleurs bisexuées, trimères au niveau des tépales et étamines, unicarpellées et uniovulées. Cette plante a donc été rapprochée des Magnoliides et plus particulièrement de la famille des Lauraceae. Cependant, l'allure générale de son inflorescence n'est pas connue.
L'inflorescence complète s'organise autour d'un axe de 0,5-1 mm de diamètre qui porte des unités latérales mesurant un peu plus de 2 mm de long. Chaque unité latérale est portée de façon alterne spiralée et se situe à l'aisselle d'une bractée. Les entre-nœuds mesurent de 1,5-2 mm de longueur. L'unité latérale est caduque, et donc les axes d'inflorescences nus présentent le plus souvent seulement les cicatrices et les bractées, ces dernières étant quant à elles persistantes. L'unité latérale présente une symétrie bilatérale, une dorsiventralité marquée, une légère concavité, une orientation préférentielle et un positionnement ventral des fleurs. Malgré sa petite taille, l'unité latérale peut porter jusqu'à 9 fleurs / fruits sessiles qui laissent en tombant des cicatrices circulaires. Nos échantillons ne montrent qu'une conservation partielle de fleurs et aucun fruit n'a été trouvé en connexion pour l'instant. Cette unité latérale est une inflorescence contractée avec soudure de pièces qui laissent difficilement apparaître une structure clairement reconnaissable. Certains auteurs la considèrent comme étant une soudure de bractées, cladodes, ou préfeuilles qui porteraient alors les fleurs. Sa forme grossièrement bilobée (en allure de « papillon ») est le résultat d'une organisation contractée en inflorescence définie de type cyme bipare puis unipare avec la production tout d'abord d'une seule fleur (fleur primaire) puis de fleurs latérales successivement émises de façon symétrique (fleurs secondaires qui porteraient les tertiaires, qui porteraient les quaternaires). La face dorsale de cette inflorescence laisse apparaître des structures qui pourraient correspondre à des bractées.
Cette organisation en cymes de l'unité latérale de l'inflorescence complète est classiquement observée à l'heure actuelle chez les Lauraceae. Cependant aucune inflorescence aussi contractée et de cette forme n'y est connue même chez d'autres familles actuelles. L'inflorescence complète correspond ainsi à un épi de cymes qui par la petite taille des fleurs pourrait la rapprocher d'une structure de type « chaton » et qui pourrait être possiblement pendant comme ce qui est observé chez les Betulaceae avec les fleurs protégées dans les premiers stades par ces unités latérales réduites à allure d'écailles « bilobées » très resserrées. Comparativement aux autres inflorescences de l'époque, ce modèle est original et illustre la diversité des inflorescences qui existait déjà au Cénomanien.

Bark anatomy of glossopteridalean trees from the Late Permian of Antarctica

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The Glossopteridales are a group of seed plants that dominated Gondwanan floras during the Permian. Their remains are found across a wide range of paleo-latitudes, and it is particularly interesting to understand the anatomical characteristics that might have enabled such an extensive distribution. In this study, we use silicified specimens from Antarctica to document for the first time the bark anatomy of high-latitude glossopteridalean trees.

Fragments of bark are moderately common within Late Permian silicified peat blocks from the locality of Skaar Ridge, in the Central Transantarctic Mountains. All have the same anatomy and the dominance of the Glossopteridales in the assemblage strongly suggests that they represent the bark of these trees. However, to take into account the fact that other gymnosperms might have been present at the locality, we looked for bark that would be more closely associated with glossopterids remains. One such specimen is a large *Vertebraria*, the distinctive root structure of the Glossopteridales, with remains of a thick layer of bark tissue on its periphery. Another unique specimen selected for this study is a trunk with the *Australoxylon*-type of wood typically found in glossopteridalean roots and stems from Skaar Ridge. The cambium zone is partly preserved in this trunk, which provides undisputable evidence that similar bark fragments found isolated in the silicified peat, do indeed belong to the Glossopteridales.

The bark still attached to the trunk reaches 3 cm in thickness. The secondary phloem is composed of sieve cells, axial and ray parenchyma, and fibers that tend to be arranged in discontinuous unicellular tangential layers in the inner part of the tissue. The outer bark is of the rhytidome type, with alternating layers of periderm and old secondary phloem. Numerous successive periderms are preserved in the trunk. They are located 0.2 mm to 1.2 mm apart and each one is represented by a layer of 3-5 radially flattened cells with slightly thickened walls. They mostly run parallel to the cambium and very rarely curve inwards and connect to the previous periderm layer. This suggests that the oldest bark was shed as large scales. In between the periderms, the old secondary phloem shows a significant proliferation of the axial parenchyma that tends to disorganize the layers of fibers. In addition, most parenchyma cells in the old secondary phloem show some degree of wall disintegration which gives the tissue a spongy aspect. While this might be an artifact of preservation, it has been observed in all studied bark fragments from Skaar Ridge and the occurrence of such a spongy bark is well-documented in some extant trees such as *Eucalyptus*.

The anatomy of the Skaar Ridge specimens shows that Antarctic Glossopteridales retained a significant amount of insulating dead bark tissue on their trunk, which provided a good protection of the cambium against biotic and abiotic environmental hazards (fire, frost, high temperatures, insects, etc.) and might have contributed to the large paleolatitudinal distribution of the group in the Permian.

La collection de paléobotanique et les préparations pour les études anatomiques au Muséum national d'Histoire naturelle, Paris

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La collection de végétaux fossiles du Muséum national d'Histoire naturelle (MNHN) est l'une des plus importantes au monde, par le nombre de spécimens (> 80 000) et la diversité des taxons représentés (>2640). Elle couvre en effet toutes les époques et l'ensemble des grands clades : principalement les Magnoliophyta (plus de 70 % des taxons présents) mais également les Lycophyta, Filicophyta, Coniferophyta, Sphenophyta (entre 5 et 10 % des taxons représentés pour chaque groupe), ainsi que quelques espèces groupées dans l'ensemble des Pteridospermatophyta, des Cycadophyta et diverses algues.

Une des richesses de cet ensemble est le nombre important de types et figurés, du fait de la présence des collections historiques constituées à partir du début du 19ème siècle. Celles de Brongniart, Saporta, Renault, Grand'Eury et bien d'autres sont encore largement consultées et utilisées par la communauté internationale des paléobotanistes.

Parmi les éléments conservés figurent de nombreuses lames minces, ou semi-minces, réalisées au 19ème siècle pour l'observation anatomique de certains spécimens des collections de Brongniart, Renault, Roche, Unger, Landriot… Ces lames comptent parmi les plus anciennes préparations microscopiques de matériel fossile. Durant le 20ème siècle sont venues s'ajouter d'autres collections de lames minces et de préparations microscopiques, notamment de paléo-palynologie : par exemple, la collection Boltenhagen du Crétacé et du Tertiaire du Golfe de Guinée (Gabon, Congo et Cameroun), qui compte près de 5000 préparations et plus de 4000 spécimens enregistrés dont de nombreux types et figurés.

Les préparations sont enregistrées avec les spécimens et lots de spécimens de la collection dans la base de données « PALAEO » accessible via le réseau internet sur le site « science » du MNHN (https://science.mnhn.fr/institution/mnhn/search). Environ 60 % de la collection est déjà informatisée et une partie des collections historiques est numérisée. Le programme E-ReColNat, en cours de réalisation, permettra également un accès en ligne de tous les spécimens types et figurés, avec au moins une photo de chacun. Dans le cas des lames minces, la lame dans son ensemble doit figurer sur le site du MNHN ; selon les travaux effectués, des images des éléments publiés (figurés) seront également mises en ligne.

Ces outils assurent une meilleure accessibilité à distance de ces importantes collections et les visiteurs peuvent désormais préparer leur séjour dans des conditions optimales. Les données sont consultables en ligne et permettront à terme la réalisation des cartes de répartition par taxon et par niveau stratigraphique. Ces collections et en particulier les préparations en lames minces, comme celles de la collection Renault, recèlent encore une source d'information inexplorée ; la consultation du matériel sur place demeure irremplaçable pour leur valorisation scientifique.

Palynostratigraphical reinterpretation of the Permian/Triassic succession of Palanca del Noves (Catalan Pyrenees, NE Iberian Peninsula)

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The Permian-Triassic outcrops of the Palanca de Noves succession have been previously dated as Thuringian in age (Late Permian) based on palynological data (Broutin et al. 1988, Diez 2000). This temporal attribution was based on the dominance of classical Permian miospores but in these works the authors suggested also the possibility of a more modern age due to the presence of *Endosporites papillatus* and *Densoisporites nejburgii*.
These lycopod spores, as well as the occurrence of bisaccate pollen grains of *Voltziaceaesporites heteromorpha,* allow us to put now the Palenca de Noves palynological assemblage within the the *Densoisporites nejburgii* zone of Orłowska-Zwoliska (1977, 1984) and the nejburgii–heteromorphus phase (Brugman 1986), that correspond to an Early Triassic Spathian age (Lucas 2010, Kürschner & Herngreen 2010).

Acknowledgements: This communication is a contribution to project CGL2011-24408.

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The Kungurian flora of Tregiovo (Trento, N-Italy)

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The Permian was a period during which several groups of gymnosperms evolved that spread during the Mesozoic (Kerp 1996, DiMichele et al. 2008) and then became dominant. The transition from an icehouse to a greenhouse world during the latest Carboniferous and Permian was one of the major climatic changes of the Palaeozoic. During the Permian typical latest Carboniferous – earliest Permian hygrophilous floras, dominated by tree ferns and sphenophytes, were replaced by floras with taxa that were much better adapted to drier conditions and seasonal drought, such as various groups of gymnosperms, notably conifers (e.g., Looy et al. 2015). With the changing climatic conditions, these latter groups that originally evolved in extrabasinal environments eventually spread to the lowland areas where they became dominant (e.g., DiMichele et al. 2008). The recent discovery of a Kungurian flora (340 slabs) from the new "Le Fraine" section (Tregiovo basin, Trento, N-Italy) contributes to a better understanding of the floral transition during the Permian, especially because in Euramerica hardly any floras from this time interval are known. Plant fossils from the Tregiovo Basin have been described by Remy & Remy (1978) and Visscher et al. (2001). The study of the new material, together with material from museum collections in Brescia and Vienna, reveals a very diverse flora, with several genera of sphenophytes (e.g., *Annularia, Calamites*), ferns and/or seed ferns (e.g., *Sphenopteris*, *Peltaspermum*, *Lodevia*), ginkgophytes (e.g., *Sphenobaiera*), taeniopterids, but especially abundant conifers (e.g., *Walchia*, *Ernestiodendron*, *Otovicia*, *Dolomitia*, *Feysia*, *Quadrocladus*) and a putative alga. The new knowledge of the Tregiovo flora will implement the picture of the Permian transitional floras.
(Poster)

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Bernard Renault (1836-1904), his life, works and paleobotanical heritage

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Bernard Renault was born in Autun and he first became a professor in Physics and Chemistry. However, in parallel, he was studying the silicified plants which he collected since his youth near Autun. With the support of Brongniart, he published his first palaeobotanical paper in 1868 and obtained a position at the Muséum National (1872) to prepare the sections of the famous Brongniart's monograph on silicified seeds. After Brongniart's death, Renault obtained the grade of Doctor ès Sciences Naturelles and he delivered a remarquable "Cours de Botanique fossile" but he never obtained the promised chair of Professor. Renault finished his career as Assistant, continuing to prepare and examine sections in an exiguous laboratory jocosely called "Renault's cage".

Emphasis is made on the very fructuous collaborations developped by Renault with C. Grand'Eury, C.E. Bertrand and R. Zeiller. He published more than 150 papers including several large volumes which are among the landmarks of paleobotany, like his Flore fossile du Bassin Houiller et Permien Autun et d'Epinac, "one of the great works on petrified plants of the Paleozoic, written by one of the most illustrious and least appreciated botanists of this time "(Andrews 1980). Renault introduced a considerable number of new taxa belonging to all taxonomical groups known at this time. He laid much of the foundation of our knowledge of the sigillarians, sphenopsids, ferns, medullosans, cordaiteans and their reproductive biology. Thematically and chronologically, his researches may be divided into two parts; the first concerns plant permineralizations and compressions of Early Carboniferous to Permian, mainly from central France. Later, Renault developed a considerable interest in fossil microorgisms found in peats, coals and plant fossils. His pioneering studies, brought together in a large volume published in 1900, concerned bacteria, algae and several types of fungi, for example the first report of Carboniferous chytrids. This reveals Renault's breadth of knowledge, in view of the primitive state of microscopy and microbiology at the time…

Finally, Renault left to the Muséum National an exceptional heritage of collections of plant compressions and permineralizations specimens and the Renault collection of more than 4000 slides. Since Renault's death, the reinvestigation of his slide collection has been the source of inspiration, and of a considerable amount of studies and of new discoveries which are summarized. They concern most groups of vascular plants as well as fungi and microorganisms.

The Autunian stratotype: main historical researches and lithostratigraphic organization

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The Autun-Epinac basin is located in the northwest part of the Massif Central, in the Hercynian Morvan region. Some of its geological aspects were first known by engineers-geologists and miners working in the coal measures which were discovered in 1774 in the eastern part, around Epinac-les-Mines. All these productive layers were included in the Stephanian. Moving west, this Carboniferous part is overlaid by a 1200 m thick detrital series in which appear many oil-shale beds ("Couches de schistes bitumineux" in French) alternating vertically with sandstones and conglomerates. These beds are more abundant on the northern and southern borders, and result from the erosion of the basement (Visean volcanic rocks; granites). One of these oil-shale beds, seen in the Muse village, has been famous since 1811 when Lainé and Brard found here a fish layer containing several thousands of complete specimens, now known as *Aeduella blainvillei*. By its richness, and the subsequent collections that enriched several European museums and favored paleontological studies, this latter site has contributed a lot to the fame of the oil-shale beds of the Autun basin. Their age, either Permian or Carboniferous, was already discussed in the 1820s by several European geologists. The numerous fossils found in the Muse site are probably also the reason why the priest Landriot, teacher at the small seminary of Autun, searched for fossils in others places and gathered a large collection from 1830. They were mostly plants (impressions, silicified woods) that he gave to Brongniart, Professor of Paleobotany at the national Museum of natural History in Paris (NMNM). These fossiliferous findings in the fields were also expanded by excavations of oil shale beds that began in 1828 in the Igornay bed. In 1865, there were 21 concessions in which several pyrolysis factories provided 6700 tons of oil per year. In the second half of 19th century, between 1866 and 1888, a few new vertebrates, Reptiles and Amphibians, were collected and studied by Gaudry. From the 1870s, Bernard Renault, a native of Autun, intensively searched for fossil plants in the Autun basin but also in the Visean cherts of the Esnot area. His studies, based on the macroscopic and microscopic observations of the thin sections produced in its manufactory, were published in a lot of papers when he became Professor Brongniart's assistant. At this time, the available stratigraphic and paleontological data allowed Mayer Aymar (1881) and Munier-Chalmas & de Lapparent (1893) to propose all the oil-shale beds and associated sandstones of the Autun series as a continental chronological stage. It was named 'Autunian' with the marine equivalent being the Artinskian, a Russian stage of Lower Permian age. The two world wars of the 20th century slowed down researches in the Autun basin. But after 1945, the studies began again with new paleontological discoveries in the fields and in oil-shale debris of the former factories. The development of palynological studies by J. Doubinger and her disciples was also decisive. Shortly after 1950, Pruvost presented a new stratigraphy of the Autunian series consisting of four 'assises' (Formations), the lowest one, Igornay, lying unconformably on the Epinac Stephanian series. A campaign of boreholes carried out by the National Geological Survey (BRGM) and new mapping observations reinforced the Pruvost's Autunian lithostratigraphic organization. Using the global scale ages, it appeared to Doubinger et al. (1977) and Broutin et al. (1999) that the Igornay Formation could be Upper Gzhelian in age. It is confirmed by recent and unpublished isotopic datations (Pellenard et al. in press).

Cretaceous conifers and the history of Pinaceae in Mexico

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In Northern Mexico, in the state of Coahuila, Weber and Serlin et al. identified from the Olmos Formation some members of conifers. Recently, in the states of Sonora and Chiapas new vegetative and reproductive structures are being collected and studied based on numerous impression/compression fossils, and some permineralizations.
In the town of Esqueda, Sonora, Northwestern Mexico, a calcareous, limonite and shale sequence 72 my old is characterized by the presence of dinosaur tracks, diverse stromatolite forms, and a large and diverse coniferous assemblage containing mainly Pinaceae. In South-eastern Mexico, in the El Chango Quarry, of Chiapas, a thick marine sequence, 96 my old, contains fish, bivalves, gastropods, arthropods and an important diverse assemblage of conifers including vegetative and reproductive organs resembling members of Pinaceae, Podocarpaceae, Araucariaceae and Cupressaceae. This last family is dominant among the plants. Impressions of twigs and cones demonstrating organic connection of a Cheirolepidiaceae plant, as well as dispersed bracts related to this family are of special interest. These Cretaceous Mexican assemblages support the establishment of a diverse conifer flora in Mexico at that time, that seems to be interrupted in the Paleogene where the fossil record lacks macrofossil of conifers. However, during the Neogene conifer diversity is re-established, and macrofossils of Podocarpaceae and Taxaceae from the Miocene and Cupressaceae from the Pliocene from Tlaxcala and Hidalgo in Central Mexico have been reported, but the record of Pinaceae is restricted to pollen grains during this time. The history of Pinaceae in Mexico based on the fossil record leads to the question, how and when did Mexico became the country with the largest number of species of *Pinus* in the world? And it highlights the need to further document the importance and significance of the discontinuities in the fossil record of the family.

Preliminary palynological data of the Carboniferous stratigraphical sections from Sabero (NW Spain)

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This communication provides the first palynological results obtained from the proposed stratotype and adjacent reference sections designated in the proposal by Knight and Wagner (2014) to define a Saberian Substage in the West European regional chronostratigraphic system, to replace the lower part of Stephanian-B (Pennsylvanian, Carboniferous).
The palynomorph assemblages were obtained from the samples SAB-25 and SAB-27 located close to the lithostratigraphic contact between the Sucesiva and Quemadas formations which has been proposed as the Barruelian-Saberian boundary. The type section is situated north of the village of Saelices in the municipality of Sabero (León, Spain).
The fossil microflora found shows an abundant presence of miospores of the genus *Florinites (Florinites florini, Florinites pumicosus, Florinites visendus, Florinites millotti, Florinites similis)* and other spores such as *Granulatisporites granulatus, Crassispora kosankei, Lycospora pusilla, Apiculatisporis spinosaetosus, Endosporites globiformis, Lophotriletes* cf. *Microsaetosus, Cadiospora magna, Thymosphora thiessenii, Cycadopites* sp.*, Leiotriletes* sp.*, Lophotriletes* sp.*, Potonieisporites* sp.

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New data on a mixed flora from the Um Irna Formation, Dead Sea region, Jordan

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The Permian Um Irna Formation comprises an up to c. 65 m thick formation of alluvial fan, fluviatile and lacustrine sediments overlying the Cambrian Um Ishrin Formation at the eastern side of the Dead Sea (Bandel & Khoury 1981, Makhlouf et al. 1991, Dill et al. 2010, Stephenson & Powell 2013). Plants were first described by Mustafa (2003) including one species with preserved cuticles. Although most of the illustrated specimens are rather fragmentary, a Cathaysian affinity was clear. The age of the flora was inferred as late Permian. From another, nearby outcrop Kerp et al. (2006) and Abu Hamad et al. (2008) described three new species of *Dicroidium* with excellent cuticle preservation, a genus that is traditionally regarded as a marker for the Triassic of Gondwana. Charcoalified material was described by Uhl et al. (2007). Stephenson & Powell (2013) conducted a palynological study and suggested that the Um Irna Fm. might be slightly older than previously thought. Additional fieldwork in 2011 and 2015 yielded a wealth of new material including many large to very large specimens. Apart from an abundance of *Dicroidium*, several new taxa, including at least two species of the putative ginkgophyte *Rhibidopsis*, a genus known from Angaraland, Cathaysia and northern Gondwana, the latest representatives of the typical Cathaysian genus *Tingia*, cycads and various conifers, were found. The new material not only further demonstrates the mixed nature of this flora, but it also shows the transitional character. Laser-ablation-ICP-MS analysis of zircons from a tuff in the basal part of the Um Irna Formation revealed a precise age.

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Whose are these roots? Early Carboniferous woody roots from the Montagne Noire, France

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Although fossil roots are important to understand the evolution of plants and their interactions with the environment, they have received little scientific attention. During the Early Carboniferous, we observe an important diversification of the aerial parts of lignophytes, the group that contains progymnosperms and seed plants. Many species have been described from anatomically preserved fossil stems. These fossils contain information related to the aerial architecture of the plants. They can also give information about paleoclimates. However, there is not much knowledge about the corresponding rooting systems. By studying in detail the wood anatomy of fossil roots, we were able to assess their relationship with some well-known genera of fossil stems.

The five specimens of fossil roots studied in the present work were collected in the Montagne Noire, and originate from the Lydiennes Formation. This formation corresponds to marine sediments containing plants of Tournaisian age. The roots have a significant amount of wood, with a diameter around 2.5 to 7 cm. The biggest root contains secondary phloem, a tissue rarely preserved in fossils and that can provide taxonomic and functional information. By anatomical study of thin-sections in transverse, tangential, and radial planes, it was possible to obtain information on the secondary xylem and secondary phloem. Ray size, tracheid shape, diameter, and radial pitting, but also the number of tracheids separating two parenchymatous rays and the presence of sclereids in the phloem provided valuable taxonomic information. The stele is another significant parameter used for the description, but it is often damaged in the studied specimens. Following these different observations and measures, we compared the roots to nine genera of stems from the same deposit.

The roots of several types of plants are present. The first specimen is related to the arborescent seed plant *Eristophyton.* The second and third specimens have a wood similar to *Calamopitys*, a seed plant with a non self-supporting habit. The fourth one appears affiliated to the progymnosperm *Protopitys*. Concerning the fifth specimen, the study shows a combination of two different genera and its affinities remain uncertain. The lack of growth rings in all the specimens suggests a lack of marked seasonality.

This study shows that it is often possible to link anatomically preserved roots to the corresponding aerial structures in a same deposit by using the wood anatomy. However, this does not always work because (1) the roots can represent taxa for which the stems are unknown yet, and (2) there can be qualitative and quantitative differences between the wood of the stem and the wood of the roots in a same plant. Although there are few detailed studies providing data on the anatomy of both the aerial and underground parts of a same genus, this kind of work offers new elements that will contribute to the reconstitution of ancient plants and landscapes.

Tissue density variations in fossil wood from the early Permian Petrified Forest of Chemnitz and their palaeoecological significance

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Palaeoenvironmental studies on Palaeozoic terrestrial ecosystems have contributed to the understanding of long-term climatic dynamics and the resulting environmental changes on land surface. Due to preservational lack of data, short-term environmental fluctuations in a scale of years usually remain concealed.
The fossil forest of Chemnitz represents a unique T^0 assemblage of an early Permian (Sakmarian) plant community, grown on a mineral substrate of alluvial red beds. The ecosystem was buried by ash fall, flow and surge deposits of a phreatomagmatic volcanic eruption, revealing a radiometric age of 290.6 ± 1.8 Ma. Silicification led to a three-dimensional preservation of still upright-standing and horizontally transported stems, which were uncovered in a first scientific excavation between 2008 and 2011, and are now being studied at a second excavation site. Palaeoclimatic investigations on the palaeosol yielded new indications that point to a seasonal, semi-humid climate under which the hygrophilous plant community developed, most probably supported by a stable, near-surface groundwater table. Nevertheless, seasonal fluctuations affected growth of long-lived woody plants, visible in rhythmic tissue density variations (TDV's). These TDV's can be studied on different organs (trunks, branches, roots) of several arboreal plants, such as calamitaleans, cordaitaleans and medullosan seed ferns. In calamitaleans, TDV's predominantly occur as so called "false rings" showing a gradual decrease of cell size and an increase of cell wall thickness. Additionally, some specimens possess single distinct event zones accompanied to severe damage at the trees. The pycnoxylic gymnosperm wood shows TDV's of typical growth rings similar to modern tree rings but with a very small portion of late wood. These more or less rhythmic TDV's are interpreted as phases of inhibited growth during annual dry seasons. Specimens exhibiting a high preservation quality can be used for statistical analysis of growth ring patterns.
Moreover, the specific types of TDV's occurring in each plant group exhibit the potential for plant ecological inferences regarding their adaptation strategies to seasonal droughts. An exceptional example is provided by some medullosan seed ferns showing no regular pattern of TDV's, but individual growth interruptions, which cannot be compared to those of the other plant groups.
Altogether, the significance of growth ring patterns in an early Permian tropical to sub-tropical environment is so far unexplored and raises a number of open questions, which need to be adressed during our current research, particularly with respect to the site-specific conditions of the Chemnitz Fossil Forest ecosystem.

A first glance at half a million years of Asselian vegetation history in the Autun Basin (France)

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The Muse locality from the Autun basin has been the object of renewed study. It consists mostly of bituminous shales alternating with 8 thin vitreous tuff beds. Recently absolute dating has placed the bituminous shales from the Muse Formation in the Asselian. The zircons for absolute dating are from two vitreous tuffs 2 meters apart and represent a period of circa half a million years.
Two hundred samples were taken each cm from the entire range of the 2,5 meter thick condensed Muse section. The results of the analysis of first 50 slides are presented here, 120 counts per sample. Identified genera are *Laevigatosporites*, *Punctatosporites*, *Spinosporites*, *Deltoidospora*, *Florinites*, *Wilsonites*, *Vesicaspora*, *Potonieisporites*, and *Cheiledonites*, trilete spores, and monosaccate, bisaccate and plicate pollen are recorded. Most abundant are *Florinites, Laevigatosporites* and *Punctatosporites*. The spectrum is briefly compared to the plant fossils recorded in the Muse shales from the upper layers of the excavation as the deeper levels have not been systematically sampled yet.
The pollen and spore spectrum displays highest diversity in the "Couche à Poissons" at the section base, decreases in upwards direction where the fern spores dominate. The gradual drop in diversity along the whole section is repeatedly punctuated by severe positive excursions of the fern ratio which coincides with the vitreous tuffs.
While charcoals indicative of high heat related to fire appear regularly along the 2,5 meter section and various levels prove to be fully opaque, the overall palynofacies of the section is brown and indicates transport at moderate temperature. Absolute dating allows for the comparison to global climatic signals and indicates the period represented by the section corresponds to a transition from a low to a high eustatic sea level representing a tectonically driven periodicity of the third order. Such rise in eustatic sea level is generally interpreted as the transition to an interglacial, and rising temperatures are expected to be reflected by a drop of the treeline, instead the ratio of monosaccates and bisaccates pollen decreases.
The interference between such gradual changes in the ratio of monosaccate and bisaccate pollen and abrupt fern spike excursions is discussed in terms of climate, ecology, volcanism and tectonics.

First record of aneurophytalean progymnosperms in Australia

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The Middle to early Late Devonian is a time of major morphological and systematic diversification for the early land plants. These evolutionary changes resulted in the formation of complex ecosystems like the mid Givetian to early Frasnian forest recently documented at Riverside Quarry in New York State (Stein et al., 2012). In this multilayered forest, canopy trees were affiliated to the Pseudosporochnales (Cladoxylopsida) and the understorey consisted of aneurophytalean progymnosperms. The major source of Middle to early Late Devonian plants historically came from Western Europe and the eastern part of the USA, but an increasing number of fossils are reported from China. The paleogeographical relationships between south China and Gondwana remain uncertain. In Gondwana, the record of Middle to early Late Devonian plants outside South America is poor. Plants of this age have been described in Morocco and the occurrence of the cosmopolitan lycopsid genus *Leclercqia* has been established in Qeensland (Prestianni et al. 2012, Meyer-Berthaud et al. 2003).

In this communication, we document the first occurrence of aneurophytalean progymnosperms in Australia. The fossils were found in the Bunga beds outcropping in the locality of Bunga Pinch Quarry, on the south coast of New South Wales. They consist of one fertile and several vegetative specimens which all show the decussate pattern of branching characterizing the genus *Tetraxylopteris*. The association of *Tetraxylopteris* with large lycopsids at Bunga Pinch Quarry constrains the age of the Bunga beds to the Givetian – Frasnian interval. Based on the shape and arrangement of the ultimate appendages, the vegetative specimens may belong to a new species. The diversification of a dissected type of ultimate appendages in the genus *Tetraxylopteris*, and possibly in most aneurophytalean progymnosperms, is noteworthy when considering that some supposedly more basal euphyllophytes from South China had evolved laminate ultimate appendages as early as the Early Devonian.

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A questioning endemism: *Agathoxylon keuperianum* in the German Keuper Basin

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One of the first described fossil woods, *Agathoxylon keuperianum* (Unger) Philippe et al. in press, was recorded up to now only in Germany, except for a poorly substantiated data from Lorraine, the material of which is lost. New data are presented, based on German, Polish and French material. Although this new material significantly enlarges *A. keuperianum* geographical distribution, the species remains an endemic of what is known by geologists as the German Keuper Basin. Late Triassic sedimentology characterizes this basin as a shallow marine area, where salt and clay deposition dominated, under warm and dry subtropical climate. Of note, despite belonging to a species-plethoric genus with usually little stratigraphical value, *A. keuperianum* is well characterized, and restricted to the Keuper. This geographical and stratigraphical endemism is probably related to a peculiar palaeoecology. Oldest data for *A. keuperianum* and wood genus *Xenoxylon* are both from the Schilfsandstein, a sediment set that is interpreted as marking a continent-wide event known as the Carnian Pluvial Event. It suggests that the *A. keuperianum* occurrences within the German Keuper might indicate wetter snaps within an otherwise hot and dry period.

A new anatomically preserved flora from the Mississippian of Sierra de Las Minitas (La Rioja, Argentina)

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A new anatomically preserved flora has been discovered in the Sierra de Las Minitas, a set of low mountains located approximately 30 km to the southwest of the small town of Jagüé, northernmost Precordillera, La Rioja Province, western Argentina.
Fossils were collected from a virtually unexplored section, in a very complex stratigraphic and structural setting. Preserved inside nodules, plant remains come from an interval in a thick siliciclastic succession, mainly composed by yellowish to greenish shales and siltites, subordinated sandstone and conglomerate layers and diamictitic deposits. Brachiopods and corals in a number of levels indicate that marine deposits are at least partially represented. In addition, an exquisitely preserved fish assemblage has been identified associated with the fossil flora in similar nodules.
Since the palaeontological survey of the area is still preliminar, fossils could not be referred to a formal stratigraphic unit. In turn, due to the absence of reliable biostratigraphic indicators and radiometric data, just a broad Mississippian age is interpreted for the fossil-bearing strata.
Under progress, the study of the flora has revealed a diverse assemblage comprised of Lycopsids, Ferns (cladoxyls and zygopterids), seed plant rachises and stems.
The Sierra de las Minitas deposits are complex and very likely record most of the Mississippian. They are particularly fossiliferous throughout the whole succession. Plant, fishes and invertebrates have been collected and record a strong climatic and ecological transition from cold to warm environments. Given the depauperate nature of previously known floras from the Mississippian of southern South America, these diverse anatomically preserved records may shed light on the ecological, biogeographical and evolutionary history of high latitude Gondwanan continental environments.

Discovery of a new spore assemblage in the Middle Devonian of Iberian Peninsula

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In the Iberian Peninsula, the known assemblages of Middle Devonian plants are scarce and poor in remains. Indeed, together with a punctual occurrence documented from Guadalmez (Ciudad Real, central Spain), only two fossil sites (i.e. Quinto Real and Olaberri, Navarra, northern Spain) have been previously described. See Montero and Dieguez (2010) and Wagner (2012) for further details. In addition, no palynological study has been performed for precising the age and/or describing any microfossil-based plant diversity for this time interval. However, advancing in the knowledge of Middle Devonian flora of this region is crucial for an accurate assessment of diversity trends of the Laurasia-Gondwana transition. Here, we present the first palaeobotanical data based on microfossil evidence of the Middle Devonian of Iberian Peninsula. Samples were collected from the Santuario de la Virgen de Rodanas sited in the Zaragoza Province (northeastern Spain). First results showed a highly diverse palynoflora. The presence of *Acinosporites lindlarensis*, *Apicusliretusispora densiconata*, *Biornatispora dubia*, *Cymbosporites cyathus*, *Dibolisporites eifeliensis*, *Geminospora lemurata*, *Perotriletes caperatus* and *Pterostermella reticulate*, among others, is documented. A great variety of acritarchs was also observed. If confirmed, the temporal distribution of spore diversity suggests an Eifelian age for the outcrop. However, the prospected sites belong presumably to the lower section of the Rodanas Formation (eastern Iberian Chain), which is currently catalogued as Frasnian (Late Devonian) based on data of ostracods, ammonoids and conodonts (see e.g., Dojen et al. 2004). Thus, in this contribution we (1) discuss the age and interpretation of this outcrop, and (2) analyze the palaeogeographic significance of these new dispersed spore data.

Acknowledgements: B.C.-M. is supported by a Marie Curie Postdoctoral COFUND fellowship (University of Liege – grant number: 600405).

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The Chemnitz Fossil Forest – three centuries of research deciphering a Permian T^0 assemblage

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Since collecting at this site started as long ago as the early 18th century, specimens from Chemnitz provided the basis for the introduction of fossil plant names such as *Psaronius, Tubicaulis, Calamitea* and *Medullosa*, reaching back to the early days of palaeobotany. J.T. Sterzel (1841-1914), a school teacher for more than 40 years, became museum director only after retirement from his school in 1909. Without university study and without academic teachers, he entered the science of palaeobotany in a self-taught way. In the scientific society of Chemnitz he acted as curator, and he developed outstanding collections forming the basis of the later museum. As an honorary member of different geological surveys in Germany he investigated several late Palaeozoic floras published as monographs. His most important contribution was the collection, acquisition, care and presentation of new fossil trunk finds for the first municipal museum at Chemnitz. Collaboration and literature exchange with many researchers worldwide – among them B. Renault, R. Zeiller, C. Grand'Eury and P. Bertrand – became the basis for the current palaeobotanical library.

Since the 1990s new specimens have been recovered during construction work. However, all of them were unintentional since most of the fossil forest has been developed into an urban area. Research on specific taxa, particularly on ferns and calamitaleans, has resulted in new observations and taxonomic revisions.

A major step was the first systematic and well-documented excavation in the township of Hilbersdorf from 2008–11. The fossil forest site, late Sakmarian in age (290.6±1.8 Ma) and occurring within the Leukersdorf Fm. (Chemnitz Basin, Germany), provided evidence for an outstanding fossil assemblage buried instantaneously by pyroclastics. Fifty-three trunk bases, still standing upright in their place of growth and rooting in the underlying palaeosol, characterise this fossil Lagerstätte as a unique window into the past that gives insights into a lowland environment sheltering a rich vegetation as well as a diverse fauna of vertebrates, arthropods and gastropods; several of them recognised for the first time from this age. Therefore, after a few years of research this autochthonous fossil forest became the most complete Permian forest ecosystem known to date. The comprehensive data-set of 3D coordinates gathered for every fossil find resulted in a special database and a 3D model which can be applied as research tool to attain more information on the specific volcanic taphonomy, but also permits the reconstruction of the whole ecosystem. As significant indicators of deep-time palaeoclimate, recently a number of new palaeontological, pedological and geochemical characteristics have been investigated. For the first time, several lines of evidence indicate that this fossil forest once faced an annual precipitation of around 800 to 1,100 mm and otherwise grew on a nearly unweathered palaeosol. Although this diverse T^0assemblage argues for a hygrophilous, dense, multi-aged vegetation of dominating conservative lineages, the habitat on a non-peat-forming mineral stand was affected by environmental disturbances and pronounced seasonality. Terrestrial animals complete the reconstruction of this outstanding ecosystem and its climatic and preservational controls. Albeit spatially confined, this diverse *in-situ* record may contribute to understand wetland-dryland dynamics of sub-tropical northern Hemisphere Pangaea.

Paleobotanical study of the Tithonian-Berriasian “Las Zabacheras” site (Galve, Spain)

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Las Zabacheras fossil site represents a deltaic sediment complex in the Villar del Arzobispo Formation in Galve (Teruel, Spain), and it has been assigned to the Tithonian-Berriasian (Late Jurassic-Early Cretaceous) (Royo-Torres et al., 2014a).
The remains of the first dinosaur defined in Spain, *Aragosaurus ischiaticus* Sanz, Buscalioni, Casanovas and Santafé 1987 were found seventy years ago. Recently, new fossils have been found in the same outcrop (Royo-Torres et al., 2014b), associated with the palynological record presented in this paper, and new macroflora remains some meters overlying the vertebrate-containing strata (CGL2013-41295-P project DINOTUR, Exp. 20/2014 Aragón Government).
The macrofloristic assemblage is composed at the moment of 14 morphotypes related to different fossil fern genera (*Cladophlebis*, cf. *Todites*, cf. *Eboracia*), as well as the presence of some tiny conifer pollen cones. Also a rich and well-preserved palynological assemblage has been studied, which is mainly constituted by *Exesipollenites* and *Spheripollenites*, and to a lesser extent, by the genera *Concavissimisporites*, *Impardecispora*, *Trilobosporites* and other spores.
This work aims to provide an important contribution to the knowledge of both paleoflora and, also the paleoecosystems developed in the Iberian Peninsula during the Tithonian-Berriasian times.

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Permian Floras of Sardinia: an attempt to reconstruct ancient environments

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Permian successions bearing plant macrofossils are located in different areas of Sardinia. The Cisuralian plant assemblages of the region show different composition and state of preservation. Guardia Pisano in southern Sardinia yielded only two taxa to date: *Pecopteris polymorpha* and *Lebachia* sp. Despite this, palynomorphs are diversified and dominated by *Potonieisporites* pollen grains (35-37%) with subordinate taeniate and ataeniate disaccates (20-25%) and rare monolete microspores (Pittau et al. 2002). Three basins can be distinstinguished in central-southern Sardinia. Conifers and cordaitales are the most common in the Escalaplano-Mulargia basin. Perdasdefogu yielded abundant and well preserved plant remains, including sphenophytes (*Asterophyllites*, *Annularia*), ferns (*Pecopteris*, *Odontopteris*, *Neuropteris*), seed ferns (*Rhachiphyllum*, *Dichophyllum*, *Lodevia*), taeniopterids, *Cordaitales*, and conifers (e.g., *Walchia*, *Culmitzschia*, *Otovicia*; Cassinis et al. 1999). Of special interest is a silicified horizon with an exceptionally preserved permineralised macroflora (Galtier et al. 2011). Abundant plant remains were collected in the Seui-Seulo basin during mining activities, including leaves, trunks and root systems (e.g., *Annularia*, *Pecopteris*, *Cordaites*, *Sigillaria*, *Artisia*; Broutin et al. in Cassinis et al. 1999). An unpublished plant fossil assemblage (about 300 slabs) from Genn'e Acca shows abundant ferns, seed ferns, cordaitales and conifers. The Lu Caparoni basin is located in northwestern Sardinia. The macroflora includes sphenophytes (*Annularia sphenophylloides*), ferns (e.g., *Pecopteris*, *Odontopteris*), seed ferns (*Autunia*, *Callipteridium*, *Dichophyllum*, *Rhachiphyllum*), conifers (e.g., *Culmitzschia*, *Walchia*) and taeniopterids (Cassinis et al. 1999).

Pittau et al. (2008) divided the Cisuralian (lower Permian) in three ecological palynological phases, each representing an evolutionary stage of the Sardinian post–collisional Hercynian tectonic phase. The Escalaplano-Mulargia basin belongs to the *Florinites* phase (Stephanian-Autunian). The Guardia Pisano and Seui-Seulo assemblages fall into the *Potonieisporites* phase (lower Asselian) and the Perdasdefogu and Lu Caparoni basins belong to the Vittatina-Striatiti phase (Asselian-Sakmarian).

The PhD-project includes the restudy of the Permian macroremains. The combined stratigraphical, sedimentological, paleobotanical and palynological study of the original outcrops will permit to reconstruct the Sardinian palaeoenvironments and their changes through time during the early Cisuralian. (Poster)

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Did conifers cover the Late Permian uplands of South China?

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In South China, the *Gigantopteris* flora occupied the palaeotropical lowlands in the Late Permian. However, the contemporary upland vegetation remains still undefined. The discovery of a new Late Permian conifer dominated plant assemblage in marine deposits of Guizhou, Southwest China, indicates that coeval conifers existed. This fact supports that the conifers covered coal swamps surrounding areas corresponding, may be, to upland terrains. The assemblage includes several hundred of nicely preserved conifer leafy shoots, many of them displaying very informative preserved epidermis cuticles. The conifer remains include the formerly described *Pseudoullmannia frumentarioides* He et al. (1996) and *Szecladia mutinervia* Yao et al. (2000), and two new taxa that have not been documented before, *Brachyphyllum* spp. and *Cupressinocladus* spp. These conifers, associated with typical cathaysian plants, are only discovered in the Late Permian marine deposits together with typical Changhsingian marine fauna. Paradoxically, not a single conifer remain has been found in the coeval terrestrial coal bearing deposits. The reason for this phenomenon could be that the dense swampy vegetation acted as a biological barrier, preventing the conifer debris to reach the terrestrial vegetal burial environments, while wind or rivers may have transported them directly into the ocean.

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Palaeozoosporites renaultii, a new fungus in the rooting system of the Rhynie Chert plant *Asteroxylon mackiei*

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Associations between plants and fungi were an important and varied feature of early terrestrial ecosystems, yet in most instances their affinity and biological functions remain poorly understood. We document a new species of fungus colonizing the rooting system of the early lycopod *Asteroxylon mackiei*, based on exceptionally well-preserved fossils from the Rhynie Chert. We investigated historical petrographic thin sections using standard optical microscopy and Confocal Laser Scanning Microscopy (CLSM). *Palaeozoosporites renaultii* (gen. nov, sp. nov.) colonized the inner cortex of the plant rooting system. The fungus had an aseptate thallus with isotomous or sympodial branching. The mycelium bore distinctive porate, globose to elongated structures that we interpret as zoosporangia and resting sporangia. Whereas most of the Rhynie Chert plants developed symbiotic associations of the mycorrhizal type, it seems that this was not the case for *Asteroxylon mackiei* which possessed the most evolved rooting system among the Rhynie Chert plants. We argue that the new root-borne fungus was most likely parasitic.
Doubts remain over the precise systematic affinity of *P. renaultii*, which resembles chytrids but possesses a set of characters not observed in living taxa. This observation leads to the hypothesis that *P. renaultii* might belong to an extinct group. Extinction can generate a false signal regarding the origin of evolutionary novelties in a group when only living species are taken in account. If our hypothesis is correct, *P. renaultii* represents a candidate of fossil morphology that could be incorporated in a phylogeny-based analysis of extant species of basal Fungi.

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Evolution of the paleoclimate during Late Eocene in Western Europe: a study in the Alès Basin (Gard, France)

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The Priabonian (38-33.9 Ma) is a critical period for the evolution of terrestrial environments. A progressive deterioration of the climate leads to an increase of the seasonality in mid latitudes and a quick drop of the global temperature marks the end of the stage, which is renowned as the Terminal Eocene Event. Deep changes in the floras composition are associated to the climate changes in North America, northern China, Central and Northern Europe, but data remain limited for other parts of the globe.
Here, we present preliminary reappraisal of the Priabonian fossil plants found in the Alès Basin (southern France). The aims of this study are: (1) to characterize the fossil vegetation types in several localities of different ages and sedimentary facies; (2) to derive paleoclimatic interpretation from the fossil leaves associations and finally (3) to outline and reconstruct the paleoflora and climate evolution of the Alès Basin during late Eocene.
The Alès Basin has yielded numerous plant remains but only the paleoflora from Célas locality was published and studied in detail (Laurent 1899). We investigated the historical collections housed in the Museum of Natural History of Marseille, as well as newly collected material form the varied sections (Saint Jean de Ceyrargues, Saint-Jean de Maruéjols, Saint-Hippolyte-de-Caton, and Vieilles Fumades). The floristic composition of the Alès Basin flora looks close to that of other Late Eocene European localities, especially the ones in the Transeuropean Paratethys and Mediterranean Tethys bioprovinces (Kvacek 2010). The vegetation is characterized by a mixture of broad-leaved and sclerophyllous elements. Main components of the Célas locality are members of the Moraceae (*Ficus*), Lauraceae (*Cinnamomum*) families or genus *Doliostrobus*, *Zizyphus,* along with some sclerophyllous *Myricaceae, Proteaceae* and *Fabaceae.*
Fossil plants remains are commonly used by paleobotanists to reconstruct paleoclimate. In particular, Physiognomic analyses, especially Climate Leaf Analysis Multivariate Program (CLAMP), have proved to be worthwhile for reconstructing Paleogene paleo-temperatures and paleo-precipitations. First applications to the two early Priabonian localities of Célas and Saint-Hippolyte-de-Caton) are similar to previous studies conducted in Central and Northern Europe. They clearly indicate a subtropical environment, probably comparable to those of subtropical Queensland (Eastern Australia). The localities from middle and late Priabonian will be investigated later on. Available sedimentological, geochemical and paleontological data clearly show a climate cooling that should be recorded in the progressive renewal of floras.

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L'énigmatique *Rhizocaulon* : historique, description et identification

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Gaston de Saporta débute sa carrière de paléobotaniste dans les années 1850 puis commence son œuvre dans une publication en 1861 : Examen Analytique des flores tertiaires de Provence (Saporta *in* Herr 1861). C'est sa première contribution, et la première plante qu'il mentionne est une monocotylédone qu'il nomme *Rhizocaulon*.

L'identification de cette plante n'a jamais été poussée jusqu'au bout et elle a été successivement comparée aux Eriocaulaceae, Cyperaceae, Restionaceae, Pandanaceae, Bromeliaceae et Velloziaceae. La comparaison est toujours restée superficielle pour ne s'en tenir qu'à l'aspect extérieur de la plante. Aucune étude d'anatomie comparée n'a jamais été réellement entreprise. Saporta s'est plus concentré sur des considérations écologiques de ces plantes et de leur « rôle » dans l'écosystème lacustre du Sud-Est de la France à « l'époque tertiaire ».

L'étude de cette plante nous montre que, dès ses débuts, Saporta décrivait ses spécimens en ayant une notion de plante entière et non celle morphotaxon. En effet, pour décrire ce fossile, il fait tout de suite appel à une association d'organes retrouvés dans différents gisements de différentes époques, allant du Crétacé à l'Oligocène. Les premiers spécimens de *Rhizocaulon* appartiennent à des terrains crétacés des environs de Marseille (terrain à lignites du bassin de Fuveau, Campanien supérieur). Ce sont des empreintes de feuilles et de tiges possédant une nervation parallèle. Il rapproche ces fossiles à ceux de l'Oligocène du bassin d'Apt. Ces derniers sont des ensembles de tiges cespiteuses silicifiées formant des touradons dépassant un mètre de hauteur et 15 cm de diamètre. Par la suite il associe à ces deux formes, une troisième, correspondant à des inflorescences provenant de divers gisements (gypses d'Aix, Bois d'Asson…). Dans les descriptions qu'il a pu faire, il a toujours essayé de justifier ces rapprochements sans pour autant en fournir une réelle preuve.

Cette présentation aura pour but de présenter les touradons silicifiés et un bref aperçu de son anatomie ainsi que de quelques genres actuels qui peuvent s'en rapprocher du point de vue de la morphologie et de l'anatomie.

N'oublions pas que sa dernière contribution fut publiée en 1894 (Saporta 1894), année de sa disparition, dans la *Revue générale de botanique* et s'intitulait : Étude monographique sur les *Rhizocaulon*…

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First record of anatomically preserved wood in the Stephanian of the Pyrenees (Erillcastell, Catalonia)

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The Carboniferous record from the Pyrenees was deposited in intramontane late Hercynian basins, usually filled in with alluvial and fluvio-lacustrine deposits. The Stephanian flora of such basins is generally preserved as adpressions and has been described from a number of localities such as Surroca-Ogassa in the Cadí-Camprodon basin or Malpàs in the Pont de Suert basin (see respectively Martín-Closas and Martínez 2007 and Talens and Wagner,1995 with references therein). So far there was not a single report of anatomically preserved wood known from the Late Carboniferous Pyrenean basins. However in the locality of Erillcastell (Pont de Suert basin) a thick volcanic Westphalian unit (Grey Unit) underlies the Stephanian fluvio-lacustrine succession (Transition Unit) and probably supplied enough silica for the permineralization of plant tissues during early diagenesis. These remains are always found within sandstone and conglomerate of meandering river channels, located near the base of the fluvio-lacustrine unit, a few meters above the top of the volcanic unit.
The remains found so far belong to genera *Dadoxylon* and *Arthropitys*. A third type of axis is currently under study. Their preservation is good to excellent and allows for a good description of the internal anatomy. The cordaitalean wood corresponds probably to *Dadoxylon rollei* Unger as described by Marguerier (1973) from the Autunian of Autun. Especially interesting is the well-preserved examples of tyloses observed within the tracheids of the studied material. The sphenopsid wood is most affine to *Arthropitys medullata* Renault, as described by Marguerier (1967) also based on material from Autun. The material from Erillcastell shows in transverse section well developed secondary wood made of fascicular tracheids showing scalariform pits separated by interfascicular medullar rays, uniseriate and multiseriate, showing well-developed marginal pits. The growth rings are hardly distinguishable, as in *A. bistriata* (Cotta) Goeppert, described recently by Röβler and Noll (2010). In radial section the cross fields show large rounded pits covering the whole cell wall.

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Palaeonvironmental reconstruction of the Stephanian wetlands from Erillcastell (Eastern Pyrenees, Catalonia)

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The Stephanian flora from Erillcastell is a significant Carboniferous paleobotanical record in the southern Pyrenees. The studied deposits belong to Pont de Suert-Sort Basin, a narrow intramontane half-graben formed within the Hercynian Range after the compressive stages. A sedimentological and taphonomic analysis allowed us to hypothesize about the habitat of the species in this basin and to compare it with other Stephanian intramontane basins. Up to five environments were documented: peat-swamp, floodplain, meandering river system, braided river system and alluvial fan. Autochthonous assemblages were composed by sphenophytes in life position, found in floodplain facies, *Stigmaria* associated to *Sigillaria,* found in peat-swamp and in oxbow lakes from abandoned channels. Parautochthonous assemblages are formed by *Sigillaria* found in lag-deposits of meandering rivers, *Alloiopteris* found in the early infilling facies of peat-swamps, monospecific *Calamites* assemblage was found in the accretional facies of meandering rivers and also in the floodplain deposits, associated with *Pecopteris* foliage. Allochthonous assemblages are composed by portions of fern, pteridosperm and cordaitalean foliage found in the floodplain deposits with evidence of being transported there by tractive river flows. In braided rivers, *Cardiocarpus*, *Dadoxylon* and *Arthropitys* were transported by floatation while indeterminate woody axes and *Sigillaria* were transported by traction and are found in the lag-deposit of the river channel.
The results show that *Sigillaria* grew in the peat-swamp and was the source of organic matter precursory of the coal. *Alloiopteris* grew the initial stages of peat-swamp. *Sigillaria* and *Calamites* grew in the meandering river banks forming a riparian community. *Calamites* could form monospecific stands in the floodplain. Marattialean tree ferns grew near the floodplain margins while the pteridosperms grew in indeterminate areas beyond the floodplain. Finally, *Cordaites* lived near the alluvial fans. These results differ from other south-European intramontane basins i.e. Graissessac-Lodève (France) and Surroca-Ogassa (Catalonia) documented respectively by Martín-Closas and Galtier (2005), and Martín-Closas and Martínez-Roig (2007) by the occurrence of *Sigillaria* forming the riverine vegetation of meandering rivers and by the low abundance of plant remains in the floodplain deposits. The distribution of *Sigillaria* in the studied basin shows how well it could adapt to fluvial facies.

Acknowledgements. This is a contribution to project 2014SGR-251 of the AGAUR. Research Agency of the Catalan Autonomous Government.

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Dicranophyllum gallicum var. *parchemineyii* Renault & Zeiller 1888 Stem-group to Ginkgo-, Cycado- and Coniferophytes?

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Dicranophyllum gallicum was first described by Grand'Eury in 1877. Its variation *D. gallicum* var. *parchemineyii* was illustrated by Renault and Zeiller in their 1988 study of the fossil flora of the Commentry basin from the Massif Central but was assembled by the engineer D. Parcheminey in the mines of Ronchamp at the foot of the Vosges. This variation is typified by small seeds still being attached on either side of the leaf, as emphasized in Renault and Zeiller (1988): "…, on voit … encore *attachées* (in italics), un certain nombre de graines". This unique feature appearing on a single rock led numerous scientists to place this particular variation of *D. gallicum* at the base of the Coniferophytes. Because of the shape of its leaves *D. gallicum* was also considered basal to the Ginkgophytes, while seeds on either side of the leaf can also typify Cycadophytes. *Dicranophyllum gallicum* however, has numerous characteristics reminiscent of the lycophytes.

Results from the qualitative and quantitative analysis of *D. gallicum* from France, Germany, Czech Republic, Portugal, Spain are presented to establish coherence between the characteristic bifurcating leaf and the stem with equally characteristic leaf scars and formally assign the species to either of the higher taxa suggested above. Characteristics of stem, leaf scar, leaves, and putative fertile structures were recorded systematically to create a quantitative dataset suitable for analysis in PAST. Systematic relations between the various parameters were used to reconstruct the species habit.

Recent reexamination of the specimens of *D. gallicum* and *D. gallicum* var. *parchemineyii* curated at the Museum in Paris indicates attached fertile structures strongly reminiscent of the fertile structures of *Tobleria biscuspis* which are shown to have a size distribution suggesting fertilization.

D. gallicum cannot indisputably be assigned to either of the higher taxa suggested above, as the identity of possible fertile structures remains open for numerous interpretation, yet we attach most value to the characters that can be evaluated, such as the leaf cushion and leaf organization which would allow for placement in the Lycopodiales.

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Jurassic palynology of Oaxaca (Mexico)

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Although there are many works on Jurassic plant macroflora from Mexico, the palynological assemblages still remain unknown. The study area is located in Santo Domingo de Tianguistengo locality in the Otlaltepec Basin (Oaxaca State, Mexico). The studied samples from the Otlaltepec Formation yielded very rich and diverse floral assemblages. Previous works on Early and Middle Jurassic macroflora from Oaxaca indicates a humid and warm climate (Silva Pineda and Arambarri Reyna). Sedimentological data together with palynological content also seem to support this. Spores are predominant in the palynological assemblages (mainly constituted by the genera *Cyathidites* and *Deltoidospora*). Gymnosperm pollen grains are less abundant, *Araucariacites* and *Classopollis* being the dominant genera.
(Poster)

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Vegetation changeover across the Permian-Triassic boundary in Southwest China. Extinction, survival, recovery and palaeoclimate: a critical review

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This paper reviews critically the Permian-Triassic (P-Tr) fossil plants and microflora recorded in three well-studied terrestrial Permian-Triassic boundary (PTB) sections, namely Chahe, Zhejue, and Jiucaichong, and two marine-terrestrial transitional PTB sections, namely Mide and Tucheng, in western Guizhou Province and eastern Yunnan Province (WGEY), Southwest China. Distinct floral composition, abundance and diversity across the PTB allow the establishment of two terrestrial macrofloral assemblages. The *Lobatannularia multifolia-Gigantoclea guiyangensis* assemblage was recognized from the upper Xuanwei Formation, and the *Annalepis*-*Peltaspermum* assemblage from the lower Kayitou Formation. The former flora comprises 105 species in 39 genera and is late Changhsingian in age. The latter assemblage includes 18 species in 14 genera and is Induan in age. The Changhsingian assemblage is characterized by the loss of many Wuchiapingian elements of the *Gigantopteris* flora and an increase of the gymnosperms. Most of the Permian-type plant taxa were wiped out in the PTB crisis on land with only few relicts persisting into the Early Triassic, which saw the flourishing of *Annalepis* and common presence of *Peltaspermum* and Permian relicts of the gigantopterids. During the Permian-Triassic transition some rare gigantopterids elements as well as some *Peltaspermum* representatives survived the biocrisis. *Annalepis* a pioneering lycopsid genus in the recovery of the Triassic land plants, and its proliferation marks the recovery of land plants after the PTB crisis on land in WGEY. Accordingly, vegetation changeover across the PTB is marked by a dramatic turnover of plants on land from the Permian *Gigantopteris* flora to the Triassic *Annalepis*-dominated assemblage. Palynofloras are characterized by a dramatic drop of palynomorphs in both abundance and diversity and show a stepwise extinction pattern. Moreover, macro- and microfloras of the WGEY region indicate that humid and warm climate regime prevailed through the P-Tr transition in Southwest China. The coal forming-swamps gradually migrated westward due to marine trangressions throughout the Late Permian. The "*Gigantopteris* flora" also migrated from east to west and a few species could survive into the earliest Triassic in the WGEY region, but disappeared soon after.
(Poster)