A tribute to Pál Müller; his life, career and scientific output

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An overview of Pál Müller's 40-year palaeontological career is presented, inclusive of all decapod crustacean genera and species he erected, as well as those named after him, plus a complete listing of all papers devoted to axiideans, gebiideans, anomurans and brachyurans (co-)authored by Pál between 1974 and 2012.

Contents

Life and career

Not many scholars have increased our knowledge of extinct south and central European anomurans and brachyurans so profoundly as Pál Müller has. His immense interest in the evolution of reef-dwelling decapod crustacean assemblages has resulted in several milestone works that stimulated other workers to follow in his footsteps.

Pál Mihály Müller (Fig. 1) was born in Budapest on 14 July 1935. In 1958 he received a master's (MSc) degree in geology at the Eötvös Loránd University (ELTE, Budapest). As a young graduate he worked as a geologist for the Bauxite Exploration Company (1958-1959), and later (1959-1967) for an agricultural planning company, Agroterv. His free time, however, was already devoted to decapod crustaceans and he visited different localities to collect their fossil remains. In 1975 he became a candidate of the

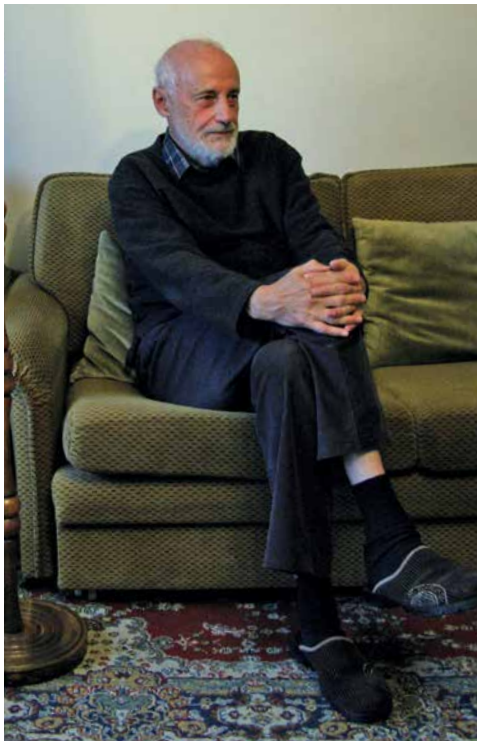

Fig. 1. Pál Mihály Müller, at home in Budapest (2008; photograph M. Hyžný).

Hungarian Academy of Sciences. Almost twenty-five years later, in 1999, this degree was accepted as a PhD, and he was appointed as Doctor of the Hungarian Academy of Sciences in 2003 based on a thesis on Mesozoic decapod crustaceans.

Pál's first papers on extinct decapods appeared in print when he was employed as a research scientist by the Research Institute for Water Resources VITUKI (1967-1975). In those days, he contributed a chapter (pp. 155-165) on hydrothermal palaeokarsts in Hungary for a book, edited by Pavel Bosák, entitled, 'Palaeokarst, a systematic and regional review' (Academia, Praha, 1989). Ever since 1976, and for the remainder of his professional career, Pál was affiliated to the Geological Institute of Hungary (Magyar Állami Földtani Intézet, MÁFI); renamed in 2012 Geological and Geophysical Institute of Hungary (Magyar Földtani és Geofizikai Intézet, MFGI). Although officially retired in 1995, he participated in various projects at MÁFI until 2010. He was also a member of the Committee of Palaeontology of the Hungarian Scientific Academy, and chairman of the Palaeontology and Stratigraphy Division of the Hungarian Geological Society (1994-1997).

Pál married Éva in 1960; together they have two sons. When Éva was offered a good job opportunity in Warsaw, Poland, they both moved there for three and a half years (1988-1991). After moving, Pál immediately started co-operation with Polish geologists and palaeontologists and attended numerous fieldtrips in Poland.

Fig. 2. Pál in the field, possibly at Kecskehegy (Budapest area, Hungary) (not dated, but pre-1984; photograph courtesy of Éva Müller).

Fig. 3. Pál (left) doing fieldwork at Tasádfő, Transylvania, Romania (not dated, but pre-1984).

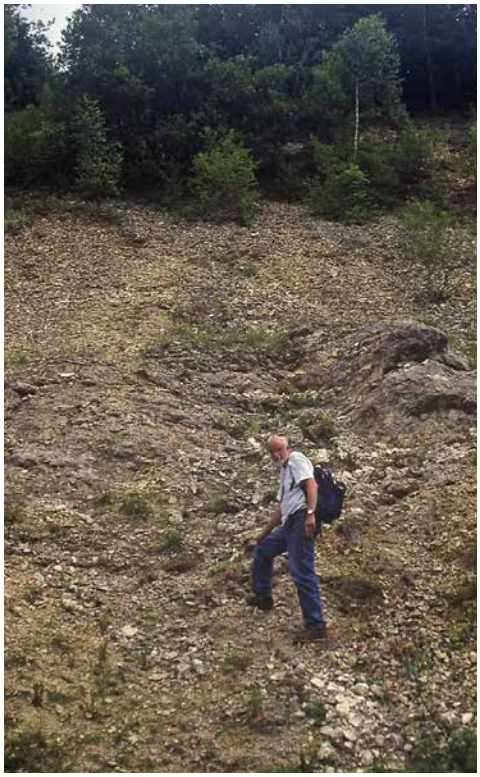

Fig. 4. Fieldwork at Szklarka Valley, Kraków area, southern Poland (2002; photograph M. Krobicki).

Fig. 6. Fieldwork in Hungary (2002): from left to right, Barbara Studencka (Muzeum Ziemi, Warszawa), the late Iwona Czepiec (formerly AGH University, Kraków) and Pál (photograph M. Krobicki).

Fig. 5. Fieldwork at Młynka quarry, Kraków area, southern Poland (2002; photograph M. Krobicki).

Fig. 7. Pál in the field at the famous locality of Rákos in the Budapest area, Hungary (2008; photograph M. Hyžný).

Fig. 8. Fieldwork in Hungary (summer 1996); from left to right Hilary Sanders, Pál, Imre Magyar and his wife.

Although Pál graduated as a geologist, his interests were much wider, including hydrogeology. As a true naturalist, he enjoyed both mountainous peaks and the depths of caves. Indeed, speleology and cave exploration have been his great passions. As a geologist at the Geological Institute of Hungary he was highly interested in Neogene carbonate sedimentology, mainly in the Budapest area. It was these rocks that yielded rich decapod faunas. Numerous of Pál's field trips were dedicated to the collection of fossil decapod crustaceans (Figs. 2-8). He was very persistant and occasionally visited a single locality over a hundred times so as to be certain that all, or nearly all, decapod crustacean taxa were represented in his collections. In addition to callianassoids, anomurans and crabs, he was also passionate about molluscs from the Pannonian Basin. About twelve million years ago, this was cut off from the eastern Paratethys and Mediterranean to become a vast brackish lake with numerous molluscan taxa. It is Pál's view that the mostly endemic bivalve and gastropod faunas of the Late Miocene-Pliocene 'Lake Pannon' probably are the most diverse lacustrine molluscan fauna in Earth history. Two of his achievements in this field are of special note. The first is his recognition of a shallow-water bivalve phylogenetic lineage, starting with '*Lymnocardium*' *ponticum* and ending with *Prosodacnomya vutskitsi*, which provided the basis for a high-resolution biozonation of the littoral facies in the Pannonian Basin (9-6 Ma). The second is the ingenious idea of connecting the 'Lake Pannon' palaeontological data base with seismic data obtained through hydrocarbon exploration in the deep subbasins of the Pannonian Basin. This idea led to large-scale palaeontological collecting and processing, with a new dimension being added to 'Lake Pannon' biostratigraphy and palaeoecology.

Pál has been studying fossils with great enthusiasm, both in the field, in the laboratory or at home. His brilliant and sparkling mind was never short of new hypotheses regarding the taxonomy, palaeoenvironmental context, stratigraphic range and evolutionary patterns of the macrofaunal groups he studied, but never mixed facts with fiction, so to speak. When it comes to testing his ideas, he has always been thorough and highly critical.

During his scientific career, Pál received ample recognition for his work both on fossil decapod crustaceans and 'Lake Pannon' molluscs. In 1986 he received the Miksa Hantken Commemorative Medal of the Hungarian Geological Society for his monograph on Badenian decapod crustaceans (Müller, 1984a). Later, in 2002, the Hungarian Speleological Society awarded him the Kadic Ottokár Award for his marked contributions, over several decades, to karst science and in 2003 he received the Ring of Appreciation of the Hungarian Geological Society for his activities 'in the life, operation and directing organs of the society'.

It is highly regrettable that in 2012 Pál was diagnosed with Alzheimer's disease, and this progressed rather rapidly making Pál unable to participate any longer in the scientific projects he so loved.

Studies of fossil decapod crustaceans

As far as extinct decapod crustaceans are concerned, two main topics in Pál's work are apparent. The first concerns Neogene assemblages in Europe, the other focuses on reef-dwelling species in time and space. Pál started his studies at the classic localities of Imre Lőrenthey (1867-1917), the great palaeocarcinologist of the late nineteenth and

early twentieth centuries. Pál's first papers focused on taxa from the Miocene of the Budapest area (Müller, 1974a, b, 1975a, b, 1976, 1978), in particular from the 'Badenian' Stage in the central Paratethys. In 1984 his *magnum opus*, a monograph on all taxa then known from 'Badenian' strata, was published. Although much new material has been discovered since, this work still remains a major reference. It was published as volume 42 of *Geologica Hungarica*, *Series Palaeontologica*, which is very fitting because in the same series, 55 years earlier, the grand monograph by Imre Lőrenthey came out (Lőrenthey & Beurlen, 1929). These two tomes constitute the basic literature source for any scholar who works on fossil decapod crustaceans from central Europe.

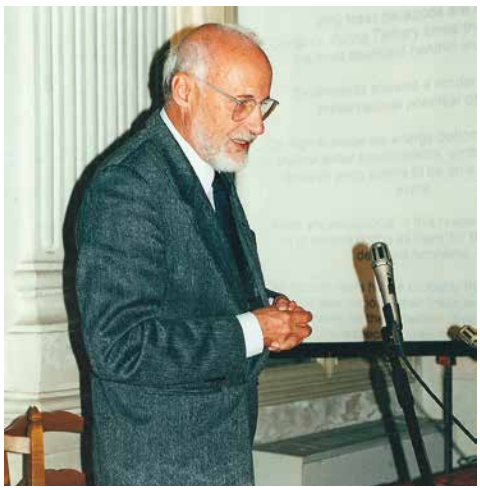

Fig. 9. Pál delivering his talk at Montecchio Maggiore (2000).

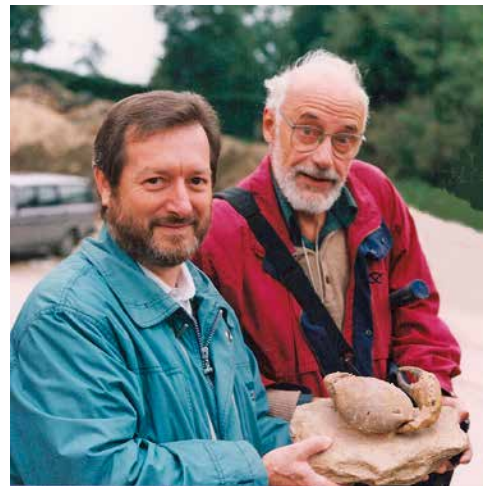

Fig. 10. Pál and Claudio Beschin during fieldwork in the Montecchio Maggiore area (2000).

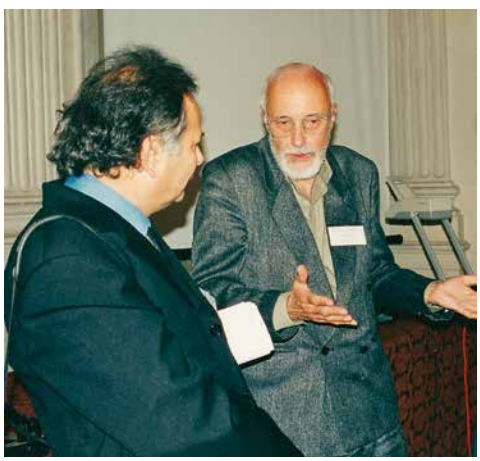

Fig. 11. Pál discussing crabs with Antonio De Angeli at Montecchio Maggiore (2000).

Fig. 12. Participants of the Montecchio Maggiore workshop (2000); Pál standing in the second row, extreme left.

Pál collected extensively in Eocene coral limestones around Budapest, resulting in numerous new genera and species which he wrote up with his London-based colleague and good friend, Joe S.H. Collins (Müller & Collins, 1991a). In the late 1990s, Pál worked on the *Fossilium Catalogus Austriae* and this led to two papers (Müller, 1998a, b).

In more than one respect, the year 2000 was a great one. In October the 1st Workshop on Mesozoic and Cenozoic decapod crustaceans was organised at Montecchio Maggiore (Vicenza, Italy), which Pál attended (Figs. 9-12). His contribution on Jurassic reefal brachyurans presented there (and later published in *Annales Societatis Geologorum Poloniae*; Müller *et al*., 2000) sparked a new wave of interest in the roots of brachyurans. In recent years, this has led to a plethora of papers in which Middle and Late Jurassic brachyurans were reassessed. Unfortunately, Pál could no longer contribute; the last paper with him as senior author appeared in print in 2006. Since then, a number of contributions have come out, co-authored by Pál.

During his entire scientific career, Pál has worked both systematically and tirelessly. His collection of fossil decapod crustaceans has always been kept in great order, every single piece of cheliped or tiny carapace being in its own small box and a reference number matching the data base in his computer. Moreover, all boxes were hand made by Pál himself and arranged in larger boxes holding colour codes for specific stratigraphic levels which yielded the material. Thus, from a scientific point of view, his personal collection, now transferred to the Hungarian Natural History Museum at Budapest, is as valuable now as it was during his days of active research.

By himself, or in co-operation with colleagues abroad, Pál described over 100 species of extinct decapod crustaceans, mostly from Eocene and Miocene strata in Europe.

Taxa erected by Pál Müller

A total of 32 genera, 117 species and a single subspecies of gebiidean, axiidean, anomuran and brachyuran decapods have been described by Pál over the years. They are here listed alphabetically.

Genera

Acanthogalathea Müller & Collins, 1991a [originally as subgenus]
Actaeites Müller & Collins, 1991a
Budapanopeus Müller & Collins, 1991a
Caprocancer Müller & Collins, 1991a
Corallicarcinus Müller & Collins, 1991a
Daragrapsus Müller & Collins, 1991a
Ebalites Müller, 1978 (= *Palaeomyra* A. Milne-Edwards, 1861)
Eomaldivia Müller & Collins, 1991a
Eoplax Müller & Collins, 1991a (*non Eoplax* Ashby & Cotton, 1936 = *Muelleroplax* Schweitzer, Feldmann, Garassino, Karasawa & Schweigert, 2010)
Gemmacarcinus Müller & Collins, 1991a
Haydnella Müller, 1984a
Kerepesia Müller, 1976
Kromtitis Müller, 1984a
Lobogalenopsis Müller & Collins, 1991a
Longoporcellana Müller & Collins, 1991a
Mesolambrus Müller & Collins, 1991a
Miocyclus Müller, 1979b
Miopipus Müller, 1984a
Mioranina Müller, 1978 (= *Albunea* Weber, 1795)
Mioxaiva Müller, 1978
Nanomaja Müller & Collins, 1991a
Ovamene Müller & Collins, 1991a
Ovocarcinus Müller & Collins, 1991a

Paraxanthosia Müller & Collins, 1991a
Pilumnomimus Müller & Collins, 1991a
Priabonocarcinus Müller & Collins, 1991a
Prochlorodius Müller & Collins, 1991a
Rakosia Müller, 1984a
Sculptoplax Müller & Collins, 1991a
Szaboa Müller & Galil, 1998
Tasadia Müller *in* Janssen & Müller, 1984
Trachypirimela Müller, 1974b

Species (arranged according to infraorders, superfamilies and families)
Infraorder Gebiidea
Family Upogebiidae
Upogebia scabra Müller, 1974b
Infraorder Axiidea
Family Callianassidae
Callianassa almerai Müller, 1993
Callianassa kerepesiensis Müller, 1976
Callianassa roztoczensis Müller, 1996
Callianassa szobensis Müller, 1984a
Callichirus bertalani Hyžný & Müller, 2010a
Infraorder Anomura
Family Chirostylidae
Eumunida pentacantha (Müller & Collins, 1991a) [as *Protomunida*]
Family Galatheidae
Acanthogalathea parva (Müller & Collins, 1991a) [as *Galathea*]
Family Porcellanidae
Eopetrolisthes striatissimus (Müller & Collins, 1991a) [as ?*Petrolisthes*]
Longoporcellana denticulata Müller & Collins, 1991a
Petrolisthes haydni Müller, 1984a
Petrolisthes magnus Müller, 1984a
Pisidia kokayi (Müller, 1974a) [as *Porcellana*]
Pisidia viai Müller, 1984b
Polyonyx arcuatus Müller & Collins, 1991a
Family Albuneidae
Albunea assymetrica (Müller, 1978) [as *Mioranina*]
Family Diogenidae
Dardanus curtimanus Müller & Collins, 1991a
Diogenes longimanus Müller & Collins, 1991a
Diogenes matrensis Müller, 1984a
Paguristes cserhatensis Müller, 1984a
Paguristes oligotuberculatus Müller & Collins, 1991a
Family Paguridae
Anapagurus marginatus Müller, 1978 (= *A. carinatus* Harvey, 1998)
Anapagurus miocenicus Müller, 1978
Pagurus concavus Müller, 1978
Pagurus latidactylus Müller & Collins, 1991a
Pagurus rakosensis Müller, 1978
Pagurus albus Müller, 1978 (= *P. tuberculosus* Harvey, 1998)
Pagurus turcus Müller, 1984a
Pylopagurus corallinus Müller, 1996
Pylopagurus leganyi Müller, 1984a
Family uncertain
Ovocarcinus elongatus Müller & Collins, 1991a
Infraorder Brachyura
Family Dromiidae
Dromia neogenica Müller, 1978
Dromia fossata (Müller & Collins, 1991a) [as *Dromilites*]
Dromia subglobosa (Müller & Collins, 1991a) [as *Dromilites*]
Kerepesia viai Müller, 1976
Kromtitis pentagonalis Müller & Collins, 1991a
Lucanthonisia eotvoesi (Müller, 1975a) [as *Dromilites*]
Family Dynomenidae
Dynomene emiliae Müller, 1979b
Ovamene franciae Müller & Collins, 1991a
Family Cymonomidae
Cymonomus primitivus Müller & Collins, 1991
Family Dorippidae
Dorippe ornatissima Müller, 2006
Family Ethusidae
Ethusa evae Müller & Collins, 1991a
Ethusa octospinosa Müller, 2006
Family Calappidae

Parthenope loczyi Müller, 1974b [= *Mursia lienharti* (Bachmayer, 1962)]
Family Leucosiidae
Ebalia hungarica Müller, 1974a
Ebalia meulenkampi Georgiades-Dikeoulia & Müller, 1984
Ebalia multiangulata Müller, 1993
Ebalia oersi Müller, 1978
Gemmacarcinus fossatus Müller & Collins, 1991a
Gemmacarcinus planus Müller, 1993
Palaeomyra globulosa (Müller, 1975a) [as *Ebalia*]
Typilobus moralejai Müller, 1993
Family Epialtidae
Nanomaja simplex Müller & Collins, 1991a
Family Inachidae
Achaeus magnus Müller, 1978
Family Majidae
Schizophrys visegradensis Müller, 1984a
Family Parthenopidae
Parthenope szaboi Müller, 1974b
Parthenope tetenyensis Müller, 1984a
Mesolambrus declinatus Müller & Collins, 1991a
Family Cancridae
Miocyclus bulgaricus Müller, 1979b
Family Carcinidae
Xaiva bachmayeri Müller, 1984a
Liocarcinus praearcuatus Müller, 1996
Family Pirimelidae
Pirimela loerentheyi (Müller, 1974a) [as "*Carcinus*"]
Trachypirimela grippi (Müller, 1974b) [as *Micromithrax*]
Trachypirimela radula Müller, 1974b (= *T. grippi*)
Family Portunidae
Euronectes vocans (Müller, 1993) [as *Rakosia*]
Lissocarcinus szoeraenyiae (Müller, 1974b) [as *Thia*]
Mioxaiva psammophila Müller, 1978
Rakosia carupoides Müller, 1984a
Rakosia rectifrons Müller, 1996
Portunus miocaenicus Müller, 1984a
Portunus neogenicus Müller, 1978
Charybdis fragilis (Müller, 1978) [as *Thalamita*]
Charybdis mathiasi Müller, 1984a
Family Tumidocarcinidae
Titanocarcinus kambuehelensis Verhoff, Müller, Feldmann & Schweitzer, 2009
Family Pilumnidae
Actumnus telegdii (Müller, 1974b) [as *Pilumnus*]
Budapanopeus denticulatus Müller & Collins, 1991a
Glabropilumnus fossatus Müller, 1996
Pilumnopeus dilatatus Müller, 1993
Pilumnopeus paratethyensis Müller, 1984a
Pilumnopeus tetenyensis Müller, 1984a
Pilumnus olivellai Müller, 1993
Family Domeciidae
Jonesius planus (Müller, 1996) [as *Maldivia*]
Family Panopeidae
Panopeus granulineatus Müller & Collins, 1991a
Panopeus viai Müller, 1993
Panopeus wronai Müller, 1984a
Family Tetraliidae
Tetralia loerentheyi (Müller, 1975b) [as *Trapezia*]
Family Trapeziidae
Eomaldivia pannonica Müller & Collins, 1991a
Eomaldivia trispinosa Müller & Collins, 1991a
Trapezia glaessneri Müller, 1975b
Family Xanthidae
Actaea calzadai Müller, 1984b
Actaea turcocampestris Müller, 1984a
Chlorodiella juglans Müller, 1984a
Chlorodiella loczyi Müller, 1984a
Chlorodiella mediterranea tetenyensis Müller, 1984a
Glyptoxanthus primitivus Müller, 1993
Lachnopodus murdjadjensis Saint-Martin & Müller, 1988
Haydnella steiningeri Müller, 1984a
Sculptoplax rigida Müller & Collins, 1991a

Superfamily Xanthoidea *incertae sedis*
Actaeites lobatus Müller & Collins, 1991a
Caprocancer altus Müller & Collins, 1991a
Muelleroplax minima (Müller & Collins, 1991a) [as *Eoplax*]
Paraxanthosia budensis Müller & Collins, 1991a
Pilumnomimus planidentatus Müller & Collins, 1991a
Prochlorodius ellipticus Müller & Collins, 1991a
Priabonocarcinus gallicus Müller & Collins, 1991a
Family Euryplacidae
Corallicarcinus planus Müller & Collins, 1991a
Family Mathildellidae
Branchioplax sulcata Müller & Collins, 1991a
Family Crossotonotidae
Crossotonotus diosdensis Müller, 1984a
Family Palicidae
Palicus hungaricus Müller, 2006
Family Captandriidae
Paracleistostoma miocaenica Müller, 1998b
Family Macrophthalmidae
Tritodynamia miocaenica Müller, 2006
Family Grapsidae
Litograpsus parvus (Müller & Collins, 1991b) [as *Palaeograpsus*] = *Palaeograpsus bittneri* Müller & Collins, 1991a
Metopograpsus badenis Müller, 2006
Pachygrapsus hungaricus Müller, 1974a
Family Varunidae
Asthenognathus rakosensis Müller, 2006
Brachynotus februarius Müller, 1974a
Superfamily Grapsoidea *incertae sedis*
Daragrapsus trispinosus Müller & Collins, 1991a

Taxa named after Pál Müller

A total of four genera and ten species, here arranged alphabetically, have been named in Pál's honour.

Genera
Muelleristhes Garassino, De Angeli & Pasini, 2014
Muelleroplax Schweitzer, Feldmann, Garassino, Karasawa & Schweigert, 2010
Muellerpalia Bandel, 2010
Palmunidopsis Fraaije, 2014

Species
Bathynectes muelleri Ósso & Stalennuy, 2011
Beripetrolisthes mulleri De Angeli & Garassino, 2002
Dardanus muelleri Karasawa & Inoue, 1992
Hepatus pauli Collins, Garvie & Mellish, 2014
Munidopsis palmuelleri Hyžný, Gašparič, Robins & Schlögl, 2014
Palmunidopsis muelleri Fraaije, 2014
Panopeus muelleri Gatt & De Angeli, 2010
Planobranchia palmuelleri Artal, Van Bakel & Onetii, 2014
Portunus muelleri Collins, 2014
Zovocarcinus muelleri De Angeli & Garassino, 2014

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