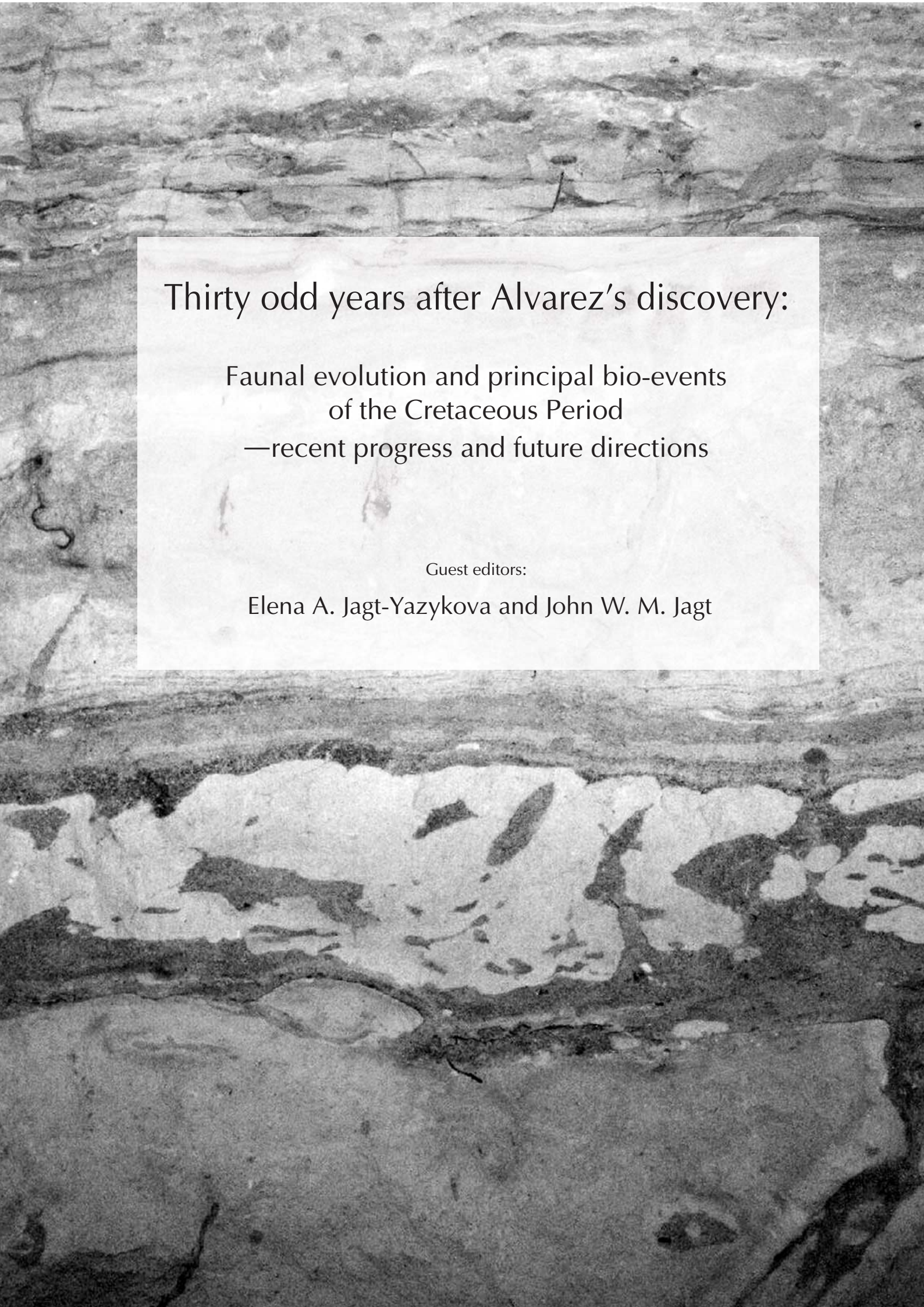

Thirty odd years after Alvarez's discovery:

Faunal evolution and principal bio-events of the Cretaceous Period —recent progress and future directions

Guest editors:

Elena A. Jagt-Yazykova and John W. M. Jagt

Preface

Acta Palaeontologica Polonica 57 (4): 675–676, 2012

Thirty odd years after Alvarez's discovery: Faunal evolution and principal bio-events of the Cretaceous Period —recent progress and future directions

ELENA A. JAGT-YAZYKOVA and JOHN W. M. JAGT

Ever since the discovery in 1980 of an iridium spike at the boundary between the Cretaceous and Paleogene periods in north-central Italy, the first piece of evidence to link this level definitively to a bolide impact (Alvarez et al. 1980), this and other (stage) boundaries have been under unabated scrutiny. As a "by-product", this has also sparked interest in other biotic and abiotic events, some of which have been suggested to be connected to meteorite impacts, albeit often on meagre evidence.

In celebration of the 30th anniversary of the 1980 *Science* paper by Luis W. Alvarez and co-workers, we were invited to guest edit an issue devoted to a discussion of what has been achieved during the past three decades and what directions future research was going to take. The response to the initial mailing was promising, but in the following months it rapidly became clear that, with the exception of three contributions, all manuscripts submitted would be dealing with Late Cretaceous ammonites. Admittedly, material from widely separated areas (i.e., Far East Russia and Japan, South America, New Jersey and Turkmenistan) was involved, but still. It amply demonstrates that interest in ammonites, and earliest Paleogene ones in particular, has not waned—far from it! But, to be honest, we had been wishing for a wider range of bio-events, also from other periods, and more variation in themes. For instance, the recent paper by O'Dea et al. (2011), which documents environmental change prior to the Cretaceous–Paleogene (K–Pg) boundary as inferred from temporal variation in cheilostome bryozoan morphology, is tantalising. More work along similar lines, and in other biotic groups, should be carried out.

For the present thematic issue, we thought it no more than fitting to invite Jan Smit (Vrije Universiteit, Amsterdam) for the kick-off, by submitting his views on those "early years". Continuing this theme, but adding numerous other examples from the stratigraphic column, Grzegorz Racki (University of Silesia, Katowice-Sosnowiec) discusses the limits to the applicability of Alvarez's impact theory of mass extinction. An overview of all mass extinction events, previously coupled with bolide impacts, is presented, with an in-depth discussion of impact craters (or, rather, the lack thereof), and of "factual misidentification", "correlative misinterpretation" or "causal overestimation". In summary, only the K–Pg event appears to be backed up by conclusive evidence.

Valentina Vishnevskaya (Geological Institute, Moscow) and Genrietta Kozlova (VNIGRI, St Petersburg) record in detail radiolarian bio-events across the Tithonian–Berriasian (Volgian) and Santonian–Campanian boundaries in the Russian Arctic and Pacific Rim. On the basis of parvicingulids, of which two new genera are erected, the Arctic and northern Pacific rim prove to be correlatable, while their absence in Sakhalin means that correlation with the Tethyan Ocean must rely on UA zones. From the same provenance area, i.e., the Russian Pacific coast, Elena Jagt-Yazykova (University of Opole) typifies ammonite faunal dynamics during the mid- and Late Cretaceous, documenting changes in ammonite diversity (extinction/origination, emigration/immigration) and total number of taxa present for the identification of the main bio-events. The marked endemism and "provincial" character of ammonite faunas from this area precludes direct correlation with Europe, Africa and North America. To counter these drawbacks, bio-events, rather than first and last occurrences of index species, should be used. A certain overlap is to be found in the paper by Ken'ichi Kurihara (Mikasa City Museum), Seiichi Toshimitsu (Geological Survey of Japan, Tsukuba) and Hiromichi Hirano (Waseda University, Tokyo). These authors home in on the Cenomanian–Turonian boundary and its impact on ammonite biodiversity, allowing them to state that the "mass extinction" across that boundary was not a global event, but a restricted one, confined to mid-palaeolatitudinal regions such as Europe and Japan. Changes in sea level and climate are suggested to have triggered this, but a "singly-cause" scenario is not envisaged.

Using examples from the Cenomanian (Upper Cretaceous) in Europe, Markus Wilmsen (Senckenberg Naturhistorische Sammlungen, Dresden) distinguishes three types of bio-events, ETBs (early transgressive), MFBs (maximum flooding) and LHBs (late highstand). He notes that shell beds that have a similar position within cycles and comparable sedimentological and taphonomical features, have been recorded from numerous Mesozoic and Cenozoic sections, and that the formation of such beds can be linked to sedimentary cycles of different hierarchy (3rd to 7th order), thus providing also a strong correlation tool.

http://dx.doi.org/10.4202/app.2012.1000

Taking the theme into the uppermost Cretaceous is the paper by Wolfgang Stinnesbeck, Christina Ifrim, and Christian Salazar (all Ruprecht-Karls-Universität, Heidelberg), who review the youngest ammonite records from Chile, Argentina, Brazil, Colombia and Mexico. Contrary to other studies (inclusive of papers in the present issue), ammonites are shown to have become extinct prior to the K–Pg boundary in Latin America. In New Jersey, there now is evidence to suggest that heteromorph ammonites (scaphitids and baculitids) did survive environmental perturbations across the boundary, if only for a brief period of time (several days to hundreds of years), as Neil Landman, Remy Rovelli, Denton Ebel (all American Museum of Natural History, New York), Matt Garb (City University of New York) and Lucy Edwards (United States Geological Survey, Reston) show. Naturally, with the provision that the iridium anomaly is in place and that dinocysts and ammonites are not reworked from underlying units. The same heteromorph ammonite families are represented in the uppermost Maastrichtian of the western Kopet Dagh (Turkmenistan), where typically Boreal elements from northern and central Europe have been recognised. These sections, along the Sumbar River, look very promising, also in documenting an iridium-rich, impact-related clay layer at the K–Pg boundary. Additional fieldwork is called for by Marcin Machalski (Institute of Paleobiology, Warsaw), John W.M. Jagt (Natuurhistorisch Museum Maastricht), Alexander Alekseev (Moscow State University), and Elena Jagt-Yazykova (University of Opole) in order to analyse ammonite distribution prior to (and ?across) that boundary in more detail.

Acknowledgements

Manuscripts submitted were peer reviewed; for their time and effort we wish to thank the following colleagues: Gerta Keller (Princeton University, Princeton, USA), Claude Monnet (University of Zürich, Zürich, Switzerland), Marta Bąk (Jagellonian University, Kraków, Poland), Nevenka Djeric (University of Belgrade, Belgrade, Serbia), Stijn Goolaerts (Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussels, Belgium), Christina Ifrim (Ruprecht-Karls-Universität, Heidelberg, Germany), Christian Koeberl (Naturhistorisches Museum Wien, Vienna, Austria), Wolfgang Stinnesbeck (Ruprecht-Karls-Universität, Heidelberg, Germany), Paul Wignall (University of Leeds, Leeds, UK), Jim W. Haggart (Geological Survey of Canada, Vancouver, Canada), Marcin Machalski (Institute of Palaeobiology, Warsaw, Poland), Franz Fürsich and Peter Schulte (both Friedrich-Alexander Universität, Erlangen-Nürnberg), Christopher Wood (Minehead, Somerset, UK), Seiichi Toshimitsu (Geological Survey of Japan, Tsukuba, Ibaraki, Japan), and Peter J. Harries (University of South Florida, Tampa, USA).

References

Alvarez, L.W., Alvarez, W., Asaro, F., and Michel, H.V. 1980. Extraterrestrial cause for the Cretaceous/Tertiary extinction. *Science* 208: 1095–1108.

O'Dea, A., Håkansson, E., Taylor, P.D., and Okamura, B. 2011. Environmental change prior to the K/T boundary inferred from temporal variation in the morphology of cheilostome bryozoans. *Palaeogeography, Palaeoclimatology, Palaeoecology* 308: 502–512.

Elena A. Jagt-Yazykova [eyazykova@uni.opole.pl], Uniwersytet Opolski, Zakład Paleobiologii, Katedra Biosystematyki, ul. Oleska 22, PL-45-052 Opole, Poland;
John W. M. Jagt [john.jagt@maastricht.nl], Natuurhistorisch Museum Maastricht, de Bosquetplein 6-7, NL-6211 KJ Maastricht, the Netherlands.