EDITORIAL

Literature compilations in palynology are not simply tedious lists

During the 1950s, 1960s and 1970s, pre-Quaternary palynology expanded at a phenomenal rate due largely to the exponential increase of the use of palynomorphs as marker fossils by the oil and gas industry worldwide (Woods 1955, Wilson 1961). Research activity in Quaternary palynology also increased substantially at the same time (Erdtman 1958). Because of the remarkably high numbers of papers on palynomorphs being published then, compared with earlier decades, several palynologists produced catalogues, compilations, indices, stratigraphical syntheses and the like in order to document the increasing numbers of taxa, and aspects such as their geographical and temporal extents.

An example of these type of publications is the *Catalog of Fossil Spores and Pollen*, a major series which was issued between 1957 and 1985 (Traverse et al. 1970). In the marine realm, Alfred Eisenack of Tübingen, Germany and several of his colleagues oversaw a comprehensive catalogue on acritarch and dinoflagellate cyst genera and species, providing line drawings/photographs, location/stratigraphical details and the original diagnoses. The first volumes in this series included Eisenack and Klement (1964) and Eisenack (1967), and the final ones were Eisenack and Kjellström (1981a, 1981b). Following the death of Alfred Eisenack in 1982, this well-circulated catalogue (*Katalog der fossilen Dinoflagellaten, Hystrichosphären und verwandten Mikrofossilien*) was revived (e.g. Fensome et al. 1991). One of the most enduring and useful series of these compilation style publications is the 'Lentin and Williams' index of dinoflagellate cysts. This lists alphabetically all dinoflagellate cyst genera, and their respective species, subspecies and varieties. Pertinent comments regarding the taxonomic history (combinations, emendations, synonyms etc.) and the age of the holotype are included. The inaugural dinoflagellate cyst index was Lentin & Williams (1977), and the latest iteration (Williams et al. 2017) is the ninth update.

One of my long-standing interests is the provincialism and stratigraphical ranges of Triassic to earliest Cretaceous dinoflagellate cysts. Clearly this type of work has a global dimension and requires that all publically available relevant data are synthesised. Hence it is important that I know of, and have access to, all the literature on this subject. Thus, during 2008, I decided to compile a list of all the papers ever published on Triassic, Jurassic and earliest Cretaceous dinoflagellate cysts, and to keep it up to date. In order to do this, I listed

all the items of pertinent literature I had at that time. To complete this task, I perused the John Williams Index of Palaeopalynology (JWIP) to ensure that I captured all the necessary contributions. The JWIP is a comprehensive, cross-referenced pre-Quaternary literature collection (Riding et al. 2012). I spent several weeks in the Natural History Museum in London ploughing through the many Mesozoic items in John William's unique literature collection and updating my list of papers. At that time the JWIP was being kept up to date on a daily basis, so I was confident that I had as complete a list of literature as was humanly possible. Consequently, I decided that it would be a good idea to publish my alphabetical-by-author listing of these items, together with geographical and stratigraphical details and other keywords. This was issued as Riding (2012), which included 1347 contributions. Naturally, I had inadvertently overlooked some papers, and new contributions are continually being published. Therefore in the intervening years I have published four supplements (Riding 2013, 2014, 2019a, 2019b) which, between them, gave the details of 531 more papers. The concept remains broadly similar but has evolved in that doi numbers are now included, the keywords are more comprehensive and the major papers included are briefly summarised. Specifically, Riding (2019a, 2019b) included regional summaries. All these five papers obviously are available as pdfs and are hence searchable. It is hoped that interested users will use these files to locate literature on specific stratigraphical intervals and/or geographical regions. For example if an oil company was interested in prospects in say the Middle Jurassic of eastern Siberia, it would be a simple matter to search these pdfs for contributions on biostratigraphy and other relevant disciplines such as palaeogeography or thermal maturity. To increase the usability of these five publications I have amalgamated all the 1878 papers into a single alphabetical listing that is hosted online on the AASP – The Palynological Society website (Riding 2019c). It is intended that this list will be updated as and when future supplements are published.

However, the purpose of this Editorial is not to promote these compilations of the literature on Triassic to earliest Cretaceous dinoflagellate cysts, rather it is to encourage others to undertake similar endeavours. There are many practitioners worldwide with the experience and means to do this. Typical candidates would be mid- to late-career researchers who have all the information and knowledge immediately to hand. Alternatively there may be early-career researchers, or research students, who have a pressing need to know the state of the art on, for example, Devonian spores or Paleogene/Neogene dinoflagellate cysts. Within our subject all palynomorph groups are important, but there are certain topics that are of

particularly high impact whether this be academically, economically or both. Early Palaeozoic spores, Mississippian and Pennsylvanian pollen/spores, Paleogene dinoflagellate cysts and Neogene pollen are examples of these. If you have the requisite experience and interest, may I encourage you to consider compiling an alphabetical listing of all the papers on, for example, chitinozoa, Ordovician acritarchs or Triassic pollen and spores? It does not take such a long time and emphatically should not be seen as a 'stamp-collecting' exercise, rather the necessary first step to gaining a comprehensive overview of a specific topic. All compilers would derive major benefits from accruing the full set of relevant papers. I can unequivocally guarantee that you will find obscure gems that you were hitherto unaware of, and that you will come out of the exercise a much better informed palynologist. It is eminently possible that you will discover authors you did not even know existed. It is equally inevitable that your future studies will be more comprehensive than they otherwise would have been. Furthermore, the endeavour may well immediately stimulate collaborations, or help instigate other lines of enquiry. Added to all this, you will have performed a very valuable service to other palynologists working in whatever field, both now and in the future.

Remember that we live in an era of 'big data', machine learning and mathematical modelling. Hence a comprehensive knowledge of the literature can be critical in studies with a global perspective (e.g. Mullins et al. 2006, Pound et al. 2011; 2012, Woods et al. 2014, Boyd et al. 2018). More generally, if scholars of the fossil record and the diversity of life such as John Alroy, Mike Foote, Robert Rohde and Jack Sepkoski had been able to access compilations such as the ones I have described, their groundbreaking databases and research would have been far easier to compile (e.g. Sepkoski 1981; 1984, Sepkoski et al. 1981, Raup and Sepkoski 1982, Foote and Raup 1996, Foote and Sepkoski 1999, Foote 2000, Rohde and Muller 2005, Alroy et al. 2008). On a spectacularly more prosaic note, a digital list of references is always useful when compiling bibliographies.

I truly hope that this opinion piece will inspire more compilations to be collated. I have to concede that this is not particularly 'sexy work', which inevitably leads to several high impact publications. However, these compilations are often consulted on a daily basis by their core-users but, sadly, they typically are not particularly highly cited. Please do not immediately think that literature compilation is a relatively menial task that will take you away from more 'important' work. These collections of references do not have to include regional syntheses like in Riding (2019a, 2019b), or be in any way interpretive. Compilations can be simple bibliographical lists (e.g. Warrington 1980, 1981). They do not have to be

peer-reviewed or published, and can simply be hosted online, as in Riding (2019c). Of course, placing compilations online has the distinct advantage that the list can be updated at any time.

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ORCID

James B. Riding http://orcid.org/0000-0002-5529-8989

References

Alroy J., Aberhan M, Bottjer DJ, Foote M, Fürsich FT, Harries PJ, Hendy AJW, Holland SM, Ivany LC, Kiessling W, Kosnik MA, Marshall CR, McGowan AJ, Miller AI, Olszewski TD, Patzkowsky ME, Peters SE, Villier L, Wagner PJ, Bonuso N, Borkow PS, Brenneis B, Clapham ME, Fall LM, Ferguson CA, Hanson VL, Krug AZ, Layou KM, Erin H. Leckey EH, Nürnberg S, Powers CM, Sessa JA, Simpson C, Tomašových A, Visaggi CC. 2008. Phanerozoic trends in the global diversity of marine invertebrates. Science. 321:97–100.

Boyd JL, Riding JB, Pound MJ, De Schepper S, Ivanovic RF, Haywood AM, Wood SEL. 2018. The relationship between Neogene dinoflagellate cysts and global climate dynamics. Earth-Science Reviews. 177:366–385.

Eisenack A. 1967. Katalog der Fossilen Dinoflagellaten, Hystrichosphären und Verwandten Mikrofossilen. Band I. Dinoflagellaten 1. Ergänzungslieferung. 241 p. E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart, Germany.

Eisenack A, Kjellström G. 1981a. Katalog der Fossilen Dinoflagellaten, Hystrichosphären und Verwandten Mikrofossilien. Band I. Dinoflagellaten 4. Ergänzungslieferung. 124 p. E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart, Germany.

Eisenack A, Kjellström G. 1981b. Katalog der Fossilen Dinoflagellaten, Hystrichosphären und Verwandten Mikrofossilien. Band II. Dinoflagellaten 2. Ergänzungslieferung. 462 p. E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart, Germany.

Eisenack A, Klement, KW. 1964. Katalog der Fossilen Dinoflagellaten, Hystrichosphären und Verwandten Mikrofossilien. Band I. Dinoflagellaten. Ergänzungslieferung. 888 p. E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart, Germany.

Erdtman G. 1958. Palynology – development and growth. Fourth Sir Albert Charles Seward Memorial Lecture 14 November 1956. Birbal Sahni Institute of Palaeobotany, Lucknow, India, 8 p.

Fensome RA, Gocht H, Stover LE, Williams GL. 1991. The Eisenack Catalog of Fossil Dinoflagellates. New Series. Volume 1. 828 p. E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart, Germany.

Foote M. 2000. Origination and extinction components of taxonomic diversity: General problems. Paleobiology. 26:74–102.

Foote M, Raup DM. 1996. Fossil preservation and the stratigraphic ranges of taxa. Paleobiology. 22:121–140.

Foote M, Sepkoski Jr JJ. 1999. Absolute measures of the completeness of the fossil record. Nature. 398:415–417.

Lentin JK, Williams GL. 1973. Fossil dinoflagellates: index to genera and species. Geological Survey of Canada Paper No. 73–42, 176 p.

Mullins GL, Aldridge RJ, Dorning KJ, Le Hérissé A, Moczydłowska-Vidal M, Molyneux S, Servais T, Wicander R. 2006. The diversity of the Lower Paleozoic phytoplankton: The PhytoPal Project. Palynology. 30:224.

Pound MJ, Haywood AM, Salzmann U, Riding JB, Lunt DJ, Hunter SJ. 2011. A Tortonian (Late Miocene, 11.61–7.25 Ma) global vegetation reconstruction. Palaeogeography, Palaeoclimatology, Palaeoecology. 300, 29–45.

Pound MJ, Haywood AM, Salzmann U, Riding JB. 2012. Global vegetation dynamics and latitudinal temperature gradients during the Mid to Late Miocene (15.97–5.33 Ma). Earth-Science Reviews. 112:1–22.

Raup DM, Sepkoski Jr JJ. 1982. Mass extinctions in the marine fossil record. Science. 215:1501–1503.

156 Riding JB. 2012. A compilation and review of the literature on Triassic, Jurassic, and earliest
157 Cretaceous dinoflagellate cysts. American Association of Stratigraphic Palynologists
158 Contributions Series No. 46, 119 p. plus CD ROM.

159 Riding JB. 2013. The literature on Triassic, Jurassic and earliest Cretaceous dinoflagellate
160 cysts: supplement 1. Palynology. 37:345–354.

161 Riding JB. 2014. The literature on Triassic, Jurassic and earliest Cretaceous dinoflagellate
162 cysts: supplement 2. Palynology. 38:334–347.

163 Riding JB. 2019a. The literature on Triassic, Jurassic and earliest Cretaceous dinoflagellate
164 cysts: Supplement 3. Palynology. 43:104–150.

165 Riding JB. 2019b. The literature on Triassic, Jurassic and earliest Cretaceous dinoflagellate
166 cysts: supplement 4. Palynology, doi: 10.1080/01916122.2019.1612795.

167 Riding JB. 2019c. The literature on Triassic, Jurassic and earliest Cretaceous dinoflagellate
168 cysts (version #1 - May 2019). https://palynology.org/the-literature-on-triassic-jurassic-and-
169 earliest-cretaceous-dinoflagellate-cysts-version-1-may-2019/#.

170 Riding JB, Pound MJ, Hill TCB, Stukins S, Feist-Burkhardt S. 2012. The John Williams
171 Index of Palaeopalynology. Palynology. 36:224–233.

172 Rohde RA, Muller RA. 2005. Cycles in fossil diversity. Nature. 434:208–210.

173 Sepkoski Jr JJ. 1981. A factor analytic description of the Phanerozoic marine fossil record.
174 Paleobiology. 7:36–53.

175 Seposki Jr JJ. 1984. A kinetic model of Phanerozoic taxonomic diversity. III. Post-Paleozoic
176 families and mass extinctions. Paleobiology. 10:246–267.

177 Sepkoski Jr JJ, Bambach RK, Raup DM, Valentine JW. 1981. Phanerozoic marine diversity
178 and the fossil record. Nature. 293:435–437.

179 Traverse A, Ames HT, Spackman W. 1970. The *Catalog of Fossil Spores and Pollen* -
180 history and status. Review of Palaeobotany and Palynology. 10:165–173.

181 Warrington G. 1980. British Triassic palaeontology; supplement 4. Proceedings of the Ussher
182 Society. 5:90.

183 Warrington G. 1981. British Triassic palaeontology; supplement 5. Proceedings of the Ussher
184 Society. 5:242.

Williams GL, Fensome RA, MacRae RA. 2017. The Lentin and Williams index of fossil dinoflagellates 2017 edition. American Association of Stratigraphic Palynologists Contributions Series No. 48, 1097 p.

Wilson LR. 1961. Palynology as a tool for economic geology. Micropaleontology. 7:372–374.

Woods MA, Vandenbroucke TRA, Williams M, Riding JB, De Schepper S, Saabe K. 2014. Complex response of dinoflagellate cyst distribution patterns to cooler early Oligocene oceans. Earth-Science Reviews. 138:215–230.

Woods RD. 1955. Spores and pollen - a new stratigraphic tool for the oil industry. Micropaleontology. 1:368–375.

James B. Riding

British Geological Survey

Keyworth

Nottingham NG12 5GG

UK

Email: jbri@bgs.ac.uk