A micropalaeontological fraud that affected the JAES

Bruno Granier[a,], Monique Feist[b], Patrick G. Eriksson[c] and Sospeter M. Muhongo[d]

[a] Département des Sciences de la Terre et de l'Univers, UFR des Sciences et Techniques, Université de Bretagne Occidentale (UBO), 6 avenue Le Gorgeu, F-29238 Brest Cedex 3, France
[b] Laboratoire de Paléontologie (C.C.62), Université Montpellier 2, Place Eugène Bataillon, F-34095 Montpellier Cedex 05, France
[c] Department of Geology, **University of Pretoria**, Pretoria 0002, South Africa
[d] Regional Office for Africa International Council for Science (ICSU), PO Box 13252, Hatfield, Pretoria, South Africa

Article Outline

1. Introduction

Although one is loath to publish facts that tarnish the reputation of a colleague in science, and understanding that inexperienced researchers may inadvertently or through ignorance be guilty of a minor plagiarism, occasional cases of what might be termed "serial plagiarisers" become apparent. In such cases, there is little choice but to expose the person, not to do them a personal injury, but rather to ensure that the damage done to science becomes known and thus that potential citation of a false paper can be avoided, or at least minimised. It is a remarkable facet of African and Middle-Eastern geosciences, that despite widespread poverty and a common lack of resources to pursue research, that good scientific work is in fact done almost everywhere, in the face of such negative factors. The tarnishing of African–Middle Eastern geological endeavour by a very small number of individuals cannot be allowed to dilute the dedication and contribution made by the over-riding majority of geoscience workers in this vast region served by the *Journal of African Earth Sciences*. It is thus with profound regret and sadness that the following report must needs be given; there is no satisfaction to be had in such a necessity, nor is vindictiveness intended.

After the 8th International Symposium on Fossil Algae held in Granada, Spain (September 18–20, 2003), a set of conference papers as well as some additional manuscripts were considered for publication in a dedicated volume of the Spanish journal, *Revista Española de Micropaleontologia*. Aguirre (2004), one of the two special editors, was given one manuscript to peer-review. At first sight he found that the material illustrated by the author, Mostafa Mansour Imam, was very familiar to him. Then he realized that some photomicrographs, mostly those illustrating fossil coralline algae, were duplicates of figures from his own publications, from those of his colleagues, and from the classical series of papers published from the late 1950s to the early 1970s by J.H. Johnson. Finally, he found that the fraud also included illustrations from three earlier papers published in the *Revista Española de Micropaleontologia* and in the German journal, *Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen*. Once aware of the full extent of the fraud, Aguirre decided to warn the scientific community and published a short report (Aguirre, 2004) revealing the falsification; he also announced that a group (the authors of this report) were still investigating the case.

During the period 1996–2003, M.M. Imam published four papers in the *Journal of African Earth Sciences*: two as junior author ([Phillip et al., 1997] and [Refaat and Imam, 1999]), then two as the sole author ([Imam, 1999] and [Imam, 2001]). The details of plagiarised material in these papers are given below.

2. Phillip et al. (1997)

M.M. Imam was the second author of this multi-authored paper. Some photomicrographs from Youssef et al. (1988) were re-used, but are valid reproductions, for both papers investigate the same locality. However, Figs. 5–7 of his Pl. 1 (that is Figs. 4.5–4.7) of Phillip et al. (1997) are mirror-image views of the original photomicrographs in Youssef et al. (1988): a left-coiling specimen is converted into a right-coiling one, and vice-versa.

Phillip et al. (1997)		**Youssef et al. (1988)**	
Pl. 1, Fig. 7 (Fig. 4.7)	*Globigerina ciperoensis ciperoensis*	Fig. 5A	*Globigerina ciperoensis*
Pl. 2, Fig. 3 (Fig. 5.3)	*Globigerinoides primordius*	Fig. 5B	*Globigerinoides* cf. *primordius*
Pl. 1, Fig. 6 (Fig. 4.6)	*Globigerina ciperoensis angustiumbilicata*	Fig. 5C	*Globigerina angustiumbilicata*
Pl. 1, Fig. 5 (Fig. 4.5)	*Globigerina eamesi*	Fig. 5D	*Globigerina bulloides*

3. Refaat and Imam (1999)

This paper deals with charophyte remains supposedly collected in Upper Eocene strata in Sinai, Egypt. Figs. 9 and 10 comprise, respectively, 22 and 16 gyrogonites. All of these 38 images were “borrowed” from 4 publications ([Feist-Castel, 1977], [Feist and Ringeade, 1977], [Grambast and Grambast-Fessard, 1981] and [Grambast-Fessard, 1980]). The results of our investigation are summarized in the four following tables:

Refaat and Imam (1999)		**Grambast-Fessard (1980)**		
Fig. 9.1	*Harrisichara lineate*	Pl. IV, Fig. 7	*Harrisichara heteromorpha* n.sp.	Palaeocene
Fig. 9.2	*Harrisichara lineate*	Pl. IV, Fig. 9	*Harrisichara heteromorpha* n.sp. (Holotype)	Palaeocene
Fig. 9.3	*Harrisichara lineate*	Pl. IV, Fig. 8	*Harrisichara heteromorpha* n.sp.	Palaeocene
Fig. 9.4	*Harrisichara tuberculata*	Pl. IV, Fig. 2	*Harrisichara muricata* n.sp. (Holotype)	Palaeocene
Fig. 9.5	*Harrisichara tuberculata*	Pl. IV, Fig. 1	*Harrisichara muricata* n.sp.	Palaeocene
Fig. 9.6	*Harrisichara* cf. *tuberculata*	Pl. III, Fig. 2	*Harrisichara regularis* n.sp. (Holotype)	Palaeocene
Fig. 9.7	*Harrisichara* cf. *tuberculata*	Pl. III, Fig. 3	*Harrisichara regularis* n.sp.	Palaeocene
Fig. 9.8	*Harrisichara vasiformis-tuberculata*	Pl. III, Fig. 1	*Harrisichara regularis* n.sp.	Palaeocene
Fig. 9.9	*Harrisichara vasiformis-tuberculata*	Pl. IV, Fig. 3	*Harrisichara muricata* n.sp.	Palaeocene
Fig. 9.10	*Harrisichara vasiformis-tuberculata*	Pl. IV, Fig. 6	*Harrisichara muricata* n.sp. (Holotype)	Palaeocene
Fig. 9.11	*Nitellopsis meriani*	Pl. II, Fig. 1	*Nitellopsis helicteres minor* n.ssp. (Holotype)	Palaeocene
Fig. 9.12	*Nitellopsis meriani*	Pl. II, Fig. 4	*Nitellopsis helicteres minor* n.ssp. (Holotype)	Palaeocene
Fig. 9.13	*Nitellopsis meriani*	Pl. II, Fig. 2	*Nitellopsis helicteres minor* n.ssp.	Palaeocene
Fig. 9.14	*Nitellopsis meriani*	Pl. II, Fig. 3	*Nitellopsis helicteres minor* n.ssp. (Holotype)	Palaeocene
Fig. 10.16	*Rhabdochara stockmansis*	Pl. I, Fig. 6	*Dughiella ovoidea*	Palaeocene
Refaat and Imam (1999)		**Grambast and Grambast-Fessard (1981)**		
Fig. 9.15	*Rhabdochara* cf. *altilis*	Pl. III, Fig. 1	*Gyrogona morelleti* n.sp. (Holotype)	Middle–Upper Eocene

Refaat and Imam (1999)		**Grambast-Fessard (1980)**		
Fig. 9.16	*Rhabdochara* cf. *altilis*	Pl. I, Fig. 3	*Gyrogona lamarcki* n.sp.	Middle–Upper Eocene
Fig. 9.17	*Gyrogona caelata*	Pl. I, Fig. 13	*Gyrogona lemani capitata* n.ssp. (Holotype)	Middle–Upper Eocene
Fig. 10.13	*Gyrogona subglobosa*	Pl. II, Fig. 2	*Gyrogona lamarcki* n.sp.	Middle–Upper Eocene
Fig. 10.14	*Gyrogona subglobosa*	Pl. I, Fig. 1	*Gyrogona lamarcki* n.sp. (Holotype)	Middle–Upper Eocene
Fig. 10.15	*Gyrogona subglobosa*	Pl. I, Fig. 7	*Gyrogona lamarcki* n.sp.	Middle–Upper Eocene
Refaat and Imam (1999)		**Feist and Ringeade (1977)**		
Fig. 9.18	*Sphaerochara subglobosa*	Pl. XII, Fig. 9	*Sphaerochara*aff. *davidi*	Lower Miocene
Fig. 9.19	*Sphaerochara ulmensis*	Pl. XIII, Fig. 7	*Sphaerochara*aff. *davidi*	Lower Miocene
Fig. 9.20	*Stephanochara ungeri*	Pl. XIII, Fig. 2	*Stephanochara berdotensis* n.sp.	Lower Miocene
Fig. 9.21	*Stephanochara ungeri*	Pl. XIII, Fig. 3	*Stephanochara berdotensis* n.sp.	Lower Miocene
Fig. 9.22	*Stephanochara ungeri*	Pl. XIII, Fig. 6	*Stephanochara berdotensis* n.sp.	Lower Miocene
Fig. 10.7	*Rhabdochara major*	Pl. XIII, Fig. 9	*Rhabdochara langeri*	Oligocene–Lower Miocene
Fig. 10.8	*Chara notata*	Pl. XII, Fig. 7	*Chara notata*	Oligocene–Lower Miocene
Fig. 10.9	*Harrisichara vasiformis-tuberculata*	Pl. XI, Fig. 3	*Sphaerochara labellala* n.sp.	Upper Eocene
Fig. 10.10	*Harrisichara vasiformis-tuberculata*	Pl. XI, Fig. 2	*Sphaerochara labellala* n.sp.	Upper Eocene
Fig. 10.11	*Harrisichara* sp.	Pl. X, Fig. 10	*Harrisichara subteres* n.sp.	Upper Eocene
Fig. 10.12	*Harrisichara* sp.	Pl. X, Fig. 12	*Harrisichara subteres* n.sp.	Upper Eocene
Refaat and Imam (1999)		**Feist-Castel (1977)**		
Fig. 10.1	*Nitellopsis meriani*	Pl. I, Fig. 3	*Nitellopsis (Microstomella) aptensis* n.sp. (Holotype)	Upper Eocene–Lower Oligocene
Fig. 10.2	*Harrisichara tuberculata*	Pl. IV, Fig. 1	*Sphaerochara davidi* n.sp. (Holotype)	Upper Oligocene
Fig. 10.3	*Harrisichara tuberculata*	Pl. IV, Fig. 4	*Sphaerochara davidi* n.sp.	Upper

Refaat and Imam (1999)		Grambast-Fessard (1980)		
				Oligocene
Fig. 10.4	*Stephanochara berdotensis*	Pl. IV, Fig. 7	*Stephanochara oodea* n.sp. (Holotype)	Upper Oligocene
Fig. 10.5	*Stephanochara berdotensis*	Pl. IV, Fig. 10	*Stephanochara oodea* n.sp.	Upper Oligocene
Fig. 10.6	*Stephanochara vectensis*	Pl. IV, Fig. 9	*Stephanochara oodea* n.sp.	Upper Oligocene

With the exception of Fig. 10.8, all denominations of already published figures have been changed. Most images illustrated types (paratypes and even holotypes) and in a few cases (Figs. 9.15 and 10.6–7) gyrogonites were rotated 180° and consequently appear with their bases upward, thus demonstrating that the author is not aware of the standards or conventions used by specialists of this particular microfossil group.

4. Imam (1999)

This paper deals with planktonic foraminifera supposedly collected in strata of Late Eocene to Middle Miocene age from northeastern Libya. We did not find the "source" of the 16 photomicrographs used in Fig. 7, but we identify all the images (32) used in Figs. 8 and 9 which were "borrowed" from one publication (Waters and Snyder, 1986). The results of our investigation are summarized in the following table:

Imam (1999)			Waters and Snyder (1986)		
Fig. 8.1	*Cassigerinella chiploensis*	Lower Miocene	Pl. 4, Fig. H	*Cassigerinella chipolensis*	Upper Oligocene–Middle Miocene
Fig. 8.2	*Catapsydrax dissimilis*	Upper Oligocene–Lower Miocene	Pl. 4, Fig. N	*Catapsydrax dissimilis*	Upper Oligocene–Lower Miocene
Fig. 8.3	*Globigerina ciperoensis ciperoensis*	Upper Oligocene–Lower Miocene	Pl. 3, Fig. E	*Globigerina ciperoensis*	Upper Oligocene
Fig. 8.4	*Globigerina ciperoensis ciperoensis*	Upper Oligocene–Lower Miocene	Pl. 3, Fig. G	*Globigerina ciperoensis*	Upper Oligocene
Fig. 8.5	*Globigerina ciperoensis angustiumbilicata*	Upper Oligocene	Pl. 3, Fig. R	*Globigerina angustiumbilicata*	Upper Oligocene–Middle Miocene

Imam (1999)			**Waters and Snyder (1986)**		
Fig. 8.6	*Globigerina angulisuturalis*	Upper Oligocene–Lower Miocene	Pl. 3, Fig. J	*Globigerina pseudociperoensis*	Lower–Middle Miocene
Fig. 8.7	*Globorotalia siakensis*	Lower Miocene	Pl. 2, Fig. T	*Globorotalia siakensis*	Upper Oligocene–Middle Miocene
Fig. 8.8	*Globorotalia siakensis*	Lower Miocene	Pl. 2, Fig. S	*Globorotalia siakensis*	Upper Oligocene–Middle Miocene
Fig. 8.9	*Globigerina praebulloides*	Upper Oligocene–Lower Miocene	Pl. 3, Fig. P	*Globorotalia scitula praescitula*	Lower–Middle Miocene
Fig. 8.10	*Globigerina praebulloides*	Upper Oligocene–Lower Miocene	Pl. 3, Fig. Q	*Globorotalia scitula praescitula*	Lower–Middle Miocene
Fig. 8.11	*Globorotalia kugleri*	Oligocene–Miocene transition	Pl. 2, Fig. K	*Globorotalia kugleri*	Oligocene–Miocene transition
Fig. 8.12	*Globorotalia kugleri*	Oligocene–Miocene transition	Pl. 2, Fig. J	*Globorotalia kugleri*	Oligocene–Miocene transition
Fig. 8.13	*Globorotalia obesa*	Lower Miocene	Pl. 2, Fig. L	*Globorotalia obesa*	Upper Oligocene–Middle Miocene
Fig. 8.14	*Globorotalia obesa*	Lower Miocene	Pl. 2, Fig. N	*Globorotalia obesa*	Upper Oligocene–Middle Miocene
Fig. 8.15	*Globigerina venezuelana*	Upper Oligocene–Lower Miocene	Pl. 3, Fig. M	*Globigerina venezuelana*	Upper Oligocene–Middle Miocene
Fig. 8.16	*Globigerina venezuelana*	Upper Oligocene–Lower Miocene	Pl. 3, Fig. N	*Globigerina venezuelana*	Upper Oligocene–Middle Miocene
Fig. 9.1	*Globigerinoides primordius*	Lower Miocene	Pl. 1, Fig. J	*Globigerinoides quadrilobatus primordius*	Lower Miocene
Fig. 9.2	*Globigerinoides primordius*	Lower Miocene	Pl. 1, Fig. K	*Globigerinoides quadrilobatus primordius*	Lower Miocene

Imam (1999)			**Waters and Snyder (1986)**		
Fig. 9.3	*Globigerinoides trilobus*	Lower Miocene	Pl. 1, Fig. F	*Globigerinoides quadrilobatus triloba*	Lower–Middle Miocene
Fig. 9.4	*Globigerinoides trilobus*	Lower Miocene	Pl. 1, Fig. G	*Globigerinoides quadrilobatus triloba*	Lower–Middle Miocene
Fig. 9.5	*Globigerinoides immaturus*	Lower Miocene	Pl. 1, Fig. H	*Globigerinoides quadrilobatus praeimmaturus*	Lower–Middle Miocene
Fig. 9.6	*Globigerinoides immaturus*	Lower Miocene	Pl. 1, Fig. I	*Globigerinoides quadrilobatus praeimmaturus*	Lower–Middle Miocene
Fig. 9.7	*Globigerinoides sacculifer*	Lower Miocene	Pl. 1, Fig. D	*Globigerinoides quadrilobatus sacculifer*	Lower–Middle Miocene
Fig. 9.8	*Globigerinoides sacculifer*	Lower Miocene	Pl. 1, Fig. E	*Globigerinoides quadrilobatus sacculifer*	Lower–Middle Miocene
Fig. 9.9	*Globigerinoides subquadratus*	Lower Miocene	Pl. 1, Fig. N	*Globigerinoides subquadratus*	Lower–Middle Miocene
Fig. 9.10	*Globigerinoides altiaperturus*	Lower Miocene	Pl. 1, Fig. A	*Globigerinoides quadrilobatus altiapertura*	Lower Miocene
Fig. 9.11	*Globigerinoides altiaperturus*	Lower Miocene	Pl. 1, Fig. B	*Globigerinoides quadrilobatus altiapertura*	Lower Miocene
Fig. 9.12	*Globigerinoides sicanus*	Lower Miocene	Pl. 1, Fig. L	*Globigerinoides sicanus praesicanus*	Lower–Middle Miocene
Fig. 9.13	*Globigerinoides woodi*		Pl. 3, Fig. H	*Globigerinoides woodi*	Upper Oligocene
Fig. 9.14	*Globoquadrina dehiscens dehiscens*	Lower Miocene	Pl. 4, Fig. A	*Globoquadrina dehiscens*	Lower–Middle Miocene
Fig. 9.15	*Globigerinoides altispira globosa*	Lower Miocene	Pl. 3, Fig. O	*Globigerina venezuelana*	Upper Oligocene–Middle Miocene
Fig. 9.16	*Globigerinoides altispira altispira*	Lower Miocene	Pl. 4, Fig. G	*Globoquadrina altispira globosa*	Upper Oligocene–Middle Miocene

5. Imam (2001)

This paper deals with planktonic foraminifera supposedly collected in Upper Cretaceous to Lower Eocene strata from northeastern Libya. Except for Fig. 6.6 ("*Abathomphalus mayaroensis*"), we identify all remaining images (25) used in Fig. 6 which were "borrowed" from one publication (Petters, 1983).

Imam (2001)		**Petters (1983)**	
Fig. 6.1	*Heterohelix striata*	Pl. 1, Fig. 14	*Heterohelix striata*
Fig. 6.2	*Heterohelix striata*	Pl. 1, Fig. 15	*Heterohelix striata*
Fig. 6.3	*Pseudogumbelina excolata* [sic]	Pl. 1, Fig. 16	*Pseudoguembelina costulata*
Fig. 6.4	*Heterohelix navarroensis*	Pl. 1, Fig. 21	*Heterohelix navarroensis*
Fig. 6.5	*Pseudotextularia eleganus* [sic]	Pl. 1, Fig. 13	*Pseudotextularia elegans*
Fig. 6.7	*Globotruncana aegyptiaca*	Pl. 2, Fig. 3	*Globotruncana aegyptiaca*
Fig. 6.8	*Globotruncana aegyptiaca*	Pl. 2, Fig. 4	*Globotruncana aegyptiaca*
Fig. 6.9	*Gansserina gansseri*	Pl. 2, Fig. 1	*Globotruncana gansseri*
Fig. 6.10	*Gansserina gansseri*	Pl. 2, Fig. 2	*Globotruncana gansseri*
Fig. 6.11	*Rugoglobigerina rugosa*	Pl. 2, Fig. 5	*Rugoglobigerina macrocephala*
Fig. 6.12	*Rugoglobigerina rugosa*	Pl. 2, Fig. 9	*Rugoglobigerina macrocephala*
Fig. 6.13	*Globigerinelloides asperus*	Pl. 2, Fig. 19	*Globigerinelloides caseyi*
Fig. 6.14	*Morozovella angulata*	Pl. 5, Fig. 19	*Morozovella angulata*
Fig. 6.15	*Praemurica uncinata*	Pl. 5, Fig. 6	*Morozovella gracilis*
Fig. 6.16	*Globanomalina compressa*	Pl. 3, Fig. 12	*Planorotalites compressa*
Fig. 6.17	*Igorina pusilla*	Pl. 5, Fig. 18	*Globorotalia plesiotumida*
Fig. 6.18	*Globanomalina pseudomenardii*	Pl. 3, Fig. 2	*Planorotalites pseudomenardii*
Fig. 6.19	*Globanomalina pseudomenardii*	Pl. 3, Fig. 1	*Planorotalites pseudomenardii*
Fig. 6.20	*Morozovella velascoensis*	Pl. 5, Fig. 1	*Morozovella velascoensis*
Fig. 6.21	*Morozovella velascoensis*	Pl. 5, Fig. 2	*Morozovella velascoensis*
Fig. 6.22	*Morozovella formosa formosa*	Pl. 5, Fig. 9	*Morozovella subbotinae*
Fig. 6.23	*Morozovella formosa formosa*	Pl. 5, Fig. 8	*Morozovella subbotinae*
Fig. 6.24	*Subbotina pseudobulloides*	Pl. 4, Fig. 6	*Subbotina pseudobulloides*

Imam (2001)		Petters (1983)	
Fig. 6.25	*Subbotina triloculinoides*	Pl. 4, Fig. 4	*Subbotina triloculinoides*
Fig. 6.26	*Subbotina velascoensis*	Pl. 4, Fig. 1	*Subbotina velascoensis*

6. Conclusions

The author of this fraud pretended he was illustrating material he supposedly collected in remote areas of both Egypt and Libya (which makes quality control of the data difficult). However most photomicrographs were “borrowed” from the existing publications of other authors. The microfossils illustrated were all found to be characteristic of other stratigraphic intervals than those they were originally associated with in the plagiarised papers. In addition, M.M. Imam used classical (coralline red algae) or reference (charophytes) illustrations, but rotated (charophytes) or mirrored (planktonic foraminifers) some images, thus demonstrating that he has no real experience/competence in either of these fields of micropaleontology. Though the denunciation of the fraud was given some publicity ([Aguirre, 2004], [Bosch, 2004a], [Bosch, 2004b] and [Granier et al., 2007]), the falsified data have already begun to pollute science (for instance (Jackson et al., 2005) and (Jackson et al., 2006), who used the Imam publications to ascribe a time range to a tectonic event). Finally, as in the Gupta fraud ([Talent et al., 1988] and [Talent, 1989]), the most regrettable aspect is that it tarnishes the reputation of countless honest and professionally ethical colleagues from the same African–Middle-Eastern region.

References

Aguirre, 2004 J. Aguirre, Plagiarism in palaeontology. A new threat within the scientific community, *Revista Española de Micropaleontologı´a* **36** (2) (2004), pp. 349–352.

Bosch, 2004a Bosch, X., 2004a. Fallout from fraud. The Scientist 5 (1), 20040922-02 <http://www.the-scientist.com/news/20040922/02/>.

Bosch, 2004b Bosch, X., 2004b. Plagiarism in paleontology. The Scientist, Philadelphia 5 (1), 20041008-03 <http://www.the-scientist.com/news/20041008/03/>.

Feist and Ringeade, 1977 M. Feist and M. Ringeade, Étude biostratigraphique et paléobotanique (Charophytes) des formations continentales d’Aquitaine, de l’Éocène supérieur au Miocène inférieur, *Bulletin de la Société géologique de France* **XIX** (2) (1977), pp. 341–354.

Feist-Castel, 1977 M. Feist-Castel, Étude floristique et biostratigraphique des Charophytes dans les séries du Paléogène de Provence, *Géologie méditerranéenne* **IV** (2) (1977), pp. 109–138.

Grambast and Grambast-Fessard, 1981 L. Grambast and N. Grambast-Fessard, Étude sur les Charophytes tertiaires d'Europe Occidentale. III - Le genre *Gyrogona*, *Paléobiologie Continentale* **XII** (2) (1981), pp. 1–35.

Grambast-Fessard, 1980 N. Grambast-Fessard, Les Charophytes du Montien de Mons (Belgique), *Review of Palaeobotany and Palynology* **30** (1980), pp. 67–88.

Granier et al., 2007 Granier, B., Feist, M., Bucur, I.I., Senowbari-Daryan, B., 2007. Further investigation of the, Imam's micropaleontological fraud: The stolen algae. In: Grgasović, T., Vlahović, I. (Eds.), Field Trip Guidebook and Abstracts – 9th International Symposium on Fossil Algae, Croatia, pp. 223–224.

Imam, 1999 M.M. Imam, Lithostratigraphy and planktonic foraminiferal biostratigraphy of the Late Eocene-Middle Miocene sequence in the area between Wadi Al Zeitun and Wadi Al Rahib, Al Bardia area, northeast Libya, *Journal of African Earth Sciences* **28** (3) (1999), pp. 619–639.

Imam, 2001 M.M. Imam, Biostratigraphy of the Upper Cretaceous–Lower Eocene succession in the Bani Walid area, northwest Libya, *Journal of African Earth Sciences* **33** (1) (2001), pp. 69–89.

Jackson et al., 2005 C.A.L. Jackson, R.L. Gawthorpe, I.D. Carr and I.R. Sharp, Normal faulting as a control on the stratigraphic development of shallow marine syn-rift sequences, *Sedimentology* **52** (2) (2005), pp. 313–338.

Jackson et al., 2006 C.A.L. Jackson, R.L. Gawthorpe, C.W. Leppard and I.R. Sharp, Rift-initiation development of normal fault blocks: insights from the Hammam Faraun fault block, *Journal of the Geological Society* **163** (2006), pp. 165–183.

Petters, 1983 S.W. Petters, Gulf of Guinea planktonic foraminiferal biochronology and geological history of the South Atlantic, *Journal of foraminiferal Research* **13** (1) (1983), pp. 32–59.

Phillip et al., 1997 G. Phillip, M.M. Imam and G.I. Abdel Gawad, Planktonic foraminiferal biostratigraphy of the Miocene sequence in the area between Wadi El-Tayiba and Wadi Sidri, west central Sinai, Egypt, *Journal of African Earth Sciences* **25** (3) (1997), pp. 435–451.

Refaat and Imam, 1999 A.A. Refaat and M.M. Imam, The Tayiba Red Beds: transitional marine-continental deposits in the precursor Suez Rift, Sinai, Egypt, *Journal of African Earth Sciences* **28** (3) (1999), pp. 487–506.

Talent, 1989 J.A. Talent, The case of the peripatetic fossils, *Nature* **338** (1989), pp. 613–615.

Talent et al., 1988 J.A. Talent, R.K. Goel, A.K. Jain and J.W. Pickett, Silurian and Devonian of India, Nepal and Bhutan: biostratigraphic and palaeobiogeographic anomalies, *Courier Forschungsinstitut Senckenberg* **106** (1988), pp. 1–57.

Waters and Snyder, 1986 V.J. Waters and S.W. Snyder, Planktonic foraminiferal biostratigraphy of the Pungo River Formation, southern Onslow Bay, North Carolina continental shelf, *Journal of foraminiferal Research* **16** (1) (1986), pp. 9–23.

Youssef et al., 1988 E.A.A. Youssef, S.E. Fahmy and M. Imam, Stratigraphy and microfacies of the Miocene sequence at Gebel Sarbut El Gamal, west-central Sinai, Egypt, *Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen* **177** (1988), pp. 225–242.