INTERNATIONAL UNION OF
GEOLOGICAL SCIENCES
COMMISSION ON STRATIGRAPHY

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SUBCOMMISSION ON DEVONIAN STRATIGRAPHY

NEWSLETTER NO. 3

January 1987

I.U.G.S. Subcommission on Devonian Stratigraphy

Newsletter No. 3, 1987.

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Report on the 1986 SDS Meeting   Prague

The Devonian Subcommission met in Czechoslovakia August 3-11. Three field days in the Barrandian, SW of Prague, were designed to study Lower Devonian rocks, particularly possible stratotype sections for the Pragian and Emsian stages. This was followed by a 2-day business meeting in Prague and a 3-day excursion to Moravia to see and collect from rocks of Givetian to Early Carboniferous age. The business meeting included full and open discussions of remaining stage definitions and stratotypes. There is a convergence of opinion on several of these and members present agreed that completion of stage definitions prior to the next Geological Congress (Washington, 1989) is feasible. All aspects of the meeting were arranged by Dr. Ivo Chlupáč (UUG) and hosted by the Ústřední ústav geologický (Czechoslovak Geological Survey). The Subcommission's thanks go to Ivo and his colleagues for all the excellent arrangements made.

Four new Corresponding Members were elected to the Subcommission on Devonian Stratigraphy at the Prague meeting:

Dr. Cai Chong-yang (paleobotany and non-marine stratigraphy)

Dr. Ruan Yi-ping (ammonoids and tentaculitids)

Dr. Wang Chen-yuan (conodonts)

all of the Nanjing Institute of Geology and Palaeontology, Academia Sinica, P.R.C., and Dr. A.J. Wright (corals, brachiopods), Department of Geology, University of Wollongong, N.S.W., Australia.

You will see from the Membership list that we have a number of colleagues who are keenly interested in our work and who are active in stratigraphy. They are, however, accorded Honorary Membership status as they are primarily concerned with non-Devonian strata.

The list now includes:-

Prof. C.H. Holland, Trinity College, Dublin, Eire.
Prof. G. Sevastopoulo, Trinity College, Dublin, Eire.
Dr. R. Sinding-Larsen, Norwegian Geol. Survey, Trondheim, Norway.
Dr. M.G. Bassett, National Museum of Wales, Cardiff, U.K.
Dr. J.W. Cowie, University of Bristol, Bristol, U.K.
Dr. D. Kaljo, Institute of Geology, Tallinn, Estonian S.S.R., U.S.S.R.
Dr. E. Paproth, Geologisches Landsamt Nordrhein-Westfalen, Krefeld, B.R.D.
Prof. J. Remane, University of Neuchatel, Switzerland.

We have also heard from Mr. J.C. Loock of the Department of Geology, The University of the Orange Free State, Bloemfortein 9300, Republic of South Africa. He pointed out that we have no member from Africa south of the Sahara, but there is a strong presence of Devonian rocks in the Cape area.

Series Boundaries

John Cowie, Chairman of the International Commission on Stratigraphy, tells me that our SDS proposals have been presented to the Commission and received almost unanimous approval for recommendation to I.U.G.S. in Paris next month. An article in a forthcoming issue of Episodes states the case for our series boundaries proposals. In this matter the S.D.S. is well in the vanguard and before too long, we may hope, we may be completing our studies of stage boundaries.

CM Jim Sorauf, Binghamton, U.S.A. reports:-

The 1981 volumes, edited by W.A. Oliver, Jr. and Gilbert Klapper, the Devonian of New York State, parts I, Biostratigraphy and II, Field Trip Stops, has been reprinted by the S.U.N.Y. Binghamton library, and bound together as a single volume. It can be obtained by interested workers for $8.00 U.S., postpaid. Orders should be addressed to:

Library Accounting Office
Glenn G. Bartle Library
St. Univ. of New York at Binghamton
Binghamton, New York 13901
U.S.A.

The British Isles 'Friends of the Devonian' are arranging an informal meeting as shown below. They would be happy for members of the Subcommission, who so wish, to join them.

"Devonian clastic facies in the Ardennes"

Leader:- Jacques Thorez (University of Liége)

Depart Dover, Friday 1st May, 1987 a.m.
Return Dover, Sunday 3rd May, 1987 p.m.

(Travel by car and ? minibus)

Further details contact:

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DLD

ON SELECTING CHRONOSTRATIGRAPHIC BOUNDARIES

An important guideline for choosing CS boundary levels is that each boundary be located in an unbroken stratal succession, of rocks deposited in a single lithotope, in order to insure that local environmental changes did not cause the evolutionary changes used to define and identify the boundary.

The logic of this guideline is so strong as to be unarguable. Further, the success of the first choice of a CS boundary level for a geologic system, at the base of the Devonian, has validated the application of this guideline in a compelling way.

However, there is evident concern among stratigraphers that the exclusive use of CS boundaries to delineate rock units fails to provide a language to describe the so-called natural units. Natural sedimentary rock units, or packages, are rock assemblages enclosed by widespread unconformities or by events that abruptly alter lithofacies and biofacies, over a broad area. Natural packages are powerful tools available to geologists and should not be obscured or downgraded because of nomenclatural constraints imposed in the absence of pragmatic considerations.

There is no widespread natural boundary at or stratigraphically near the base of the Devonian so no choice between CS and natural boundary levels was necessary when that boundary was defined. However, there is a natural boundary near or at the base of the Carboniferous, the base of the Famennian, and the base of the Pragian. When these boundaries are defined it should be possible to have the best of both approaches. Figure 1 illustrates the method of choice of a boundary level advocated here. In situations where an array of CS boundary choices is close to a widespread unconformity the boundary level should be chosen in a continuous sequence so as to project into the unconformity, preferably at the apex of the regression-transgression wedge.

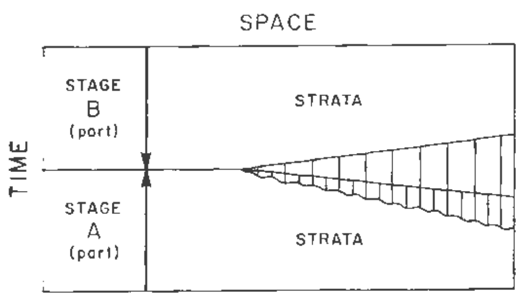

Fig. 1. Position of a CS boundary (at arrows) with relation to an unconformity, as advocated here.

In the example of the base of the Pragian, now under consideration by the Devonian Subcommittee of the IUGS, the rock boundary in the type area is the result of a regression (Chlupáč and Kukal, 1986). Regression, indicated by non-marine sandstones, is general at this level in near-shore areas of Europe (Babin Sandstone, Bunte Ebbe beds), or is represented by an actual physical break, as in the Remscheid anticline (Schmidt, 1949, Pl. 1). In North America, the succession at this level is punctuated by the cratonic unconformity between the Tippecanoe and Kaskaskia sequences (Sloss, 1963; Johnson, Klapper, and Sandberg, 1985). In Nevada, where best dated by conodonts, this unconformity is known to narrow to an interval comptising the upper part of the <u>pesavis</u> Zone and lower part of the <u>sulcatus</u> Zone (Johnson and Murphy, 1984). In as much as a major faunal change and realm shift in Nevada coincides with the physical boundary and is known to postdate the first appearance of <u>Eognathodus</u> <u>sulcatus</u>, the CS boundary should be defined at some level within the <u>sulcatos</u> Zone.

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WORK IN PROGRESS: CANADA

RAASCH, G.O. (Geological Consultant, #203 - 1011 - 17th Avenue S.W., Calgary, Alberta T2T OAB) has submitted the following abstracts of works in progress:

MIDDLE-EARLY UPPER DEVONIAN STRATIGRAPHIC RELATIONS, NORTHEASTERN BRITISH COLUMBIA

Gilbert O. Raasch

ABSTRACT

Stratigraphic relations of Devonian rock units lying between early Frasnian Muskwa (Canol) Shale and the Precambrian basement are demonstrated by means of eight east-west cross-sections based on subsurface data over an area corresponding to N.T.S. map units 94O and P plus the northern parts of units I and J.

Use of the top of the Dunedin-Hume-Nahanni succession of Eifelian age as the primary datum reveals a marked westward (basinward) thickening of these beds as well as of the underlying Stone Dolomite. The latter appears to contain several depositional cycles.

Bank carbonates constituting the Givetian Stringocephalus zonal succession, in places rest directly on the Eifelian limestones or are separated from them by a substantial thickness of Evie-Klua (Hare Indian) Shale. This shale is a facies equivalent of the lower and middle parts of the bank carbonate, into which it grades both upward and laterally. The highest part of the bank carbonate, however, corresponding to the Stringocephalus aleskanus Zone and Sulphur Point ("Presqu'ile") Formation, appears to lack any shale equivalent.

Where the Givetian Upper Elk Point carbonate bank is fully developed, it is overlain by up to several hundred feet of reefoid limestone equivalent to the lower member of the Slave Point Formation of the Great Slave Lake region.

Although paleontological evidence over western Canada indicates that an important hiatus involving most or all of the conodont hermanni-cristatus Zone exists between the Slave Point and the Elk Point carbonates, their relation is concordant; Slave Point carbonates occur only where the Upper Elk Point carbonate banks are developed.

The carbonate bank edges are in the nature of steep submarine escarpments, which range in height from 800 to 1200 feet (244 to 366 m). Therefore, marine withdrawal following Slave Point deposition at or near the end of lower disparilis Zone time exposed a surface of rugged topographic relief.

The subsequent marine transgression entered the low-lying parts of this landscape, perhaps as early as late disparilis (Tecnocyrtina missouriensis) time, to deposit the grey shales of the Otter Park Formation in channels between the carbonate banks. By earliest Frasnian time, the profile of equilibrium had risen high enough to permit deposition of Beaverhill Lake argillaceous limestone of earliest Frasnian age (Lower asymmetricus Zone) above the Slave Point carbonate, at least in the more southerly part of the area.

The succession under consideration terminates with the Muskwa (Canol) euxinic black shale of early Frasnian age, which rests unconformably on rock units ranging in age from earliest Frasnian to earliest Givetian.

LATEST MIDDLE AND EARLY UPPER DEVONIAN MEGAFAUNAL SUCCESSION, WESTERN CANADA

Gilbert O. Raasch

ABSTRACT

In western Canada, Devonian strata lying between Givetian beds with Stringocephalus and the base of the Famennian Stage involve eleven megafaunal and conodont zones. Taking the region as a whole, these zones are in sequence, and are separated from the Stringocephalus beds below by an hiatus corresponding to the conodont hermanni-cristatus Zone, and from the beds above by the Frasnian-Famennian unconformity.

The sequence divides naturally into four successions herein termed informally in ascending order, the Normandian, Wallbridgean, Lower Jasperan and Upper Jasperan successions. The Normanian succession involves the Beavertail Formation and the lower member of the Slave Point Formation. It is divisible into two biozones.

The Wallbridgean succession corresponds to Raasch's (1973) "Lower Well-aerated Unit" and comprises the Flume and most of the Waterways and Beavertail formations and their equivalents. It is divisible into four biozones.

The Lower Jasperan succession corresponds to the writer's "Medial Poorly-aerated Unit" and embraces the Perdrix, Cairn, Duvernay, Cooking Lake, Majeau Lake, and Mildred units. It divides into two biozones.

For beds immediately underlying the sequence under consideration and comprising units of Eifelian age, and of Givetian age corresponding to the range of Stringocephalus, the name Mackenzian succession is employed. It divides into eight zonal units, previously designated DM1 through DM8 by the writer (1982).

Although in terms of the region as a whole, the succession is in sequence, over much of it, a nonsequence occurs which is post-Normanian in age, and which corresponds to the herein designated Wallbridgean Onlap.

The relationship of the megafaunal zones to established conodont zones, as well as to equivalent rock units is considered. Some changes in stratigraphic nomenclature are recommended as a consequence of application of biostratigraphic controls in conjunction with the physical evidence.

Correlation of the zonal units with zones and rock units elsewhere in North America is indicated.

DEVONIAN FAMENNIAN FAUNAL ZONES IN WESTERN CANADA AND THEIR CHRONOSTRATIGRAPHIC SIGNIFICANCE

Gilbert O. Raasch

ABSTRACT

Nine discrete faunal zones comprise the Late Upper Devonian, Famennian succession in Western Canada. These in descending order are:

DFM 9 Zone of Tylothyris clarksvillensis

DFM 8 Zone of Palmatolepis expansa

DFM 7 Zone of Sinotectinostrum banffensis

DFM 6 Zone of Evanescirostrum seversoni (South)/
Sinotectinostrum avellana (North)

DFM 5 Zone of Ptychomaletoechia sulculifera (South)/
Gastrodetoechia rugosa (North)

DFM 4 Zone of Basilicorhynchus

DFM 3 Zone of Cyrtiopsis prepta

DFM 2 Zone of Eoparaphorhynchus lentiformis

DFM 1 Zone of Eoparaphorhynchus walcotti

The sedimentary succession divides naturally into three gross-lithogic units, informally termed lower, middle and upper Famennian. The "lower" Famennian corresponds to the Sassenach and Alexo formations, the "middle" to the Palliser and Wabamun formation, and the "upper" to the Exshaw Formation.

None-sequence separate: (1) most or all of the Sassenach from the overlying Morrow Member of the Palliser Formation; (2) the Morrow Member from the Costigan Member of the Palliser Formation; (3) the Costigan Member from the lower Exshaw; and (4) the lower from the upper Exshaw. The relation of the upper Exshaw to the overlying Mississippian, Banff Formation, is sequential.

Relation of the proposed brachiopod zones to the formal conodont succession is indicated.

GUANGXI DEVONIAN, CHINA

The 562 Comprehensive Geological Brigade in Sanhe, Hebei Province, reports that it has since 1982 been making systematic studies of the Middle and Upper Devonian section of Ma-anshan, Xiangzhou district, Guangxi.

1. The sequence and lithological character of the Middle and Upper Devonian is as follows (in ascending order):

Guba Fm.	- grey mudstone intercalated with bioclastic limestone at its base.
Guche Fm.	- its lower part consists of dark grey mid-thick bedded limestone; its upper part consists of greyish yellow marls intercalated with thin limestone.
Changchun Fm.	- yellowish grey mudstone intercalates with thin marls.
Jide Fm.	- dark grey thin-mid bedded bioclastic limestone, with nodular structure at its top.
Baqi Fm.	- dark grey thin-mid bedded microsparitic-micritic limestone, intercalated with muddy-siliceous bands at its middle part.
Juntian Fm.	- dark grey lumpy and thin-mid bedded bioclastic micritic limestone.
"Rongxian Fm."	- light grey thick bedded bioclastic limestone.

The "Guilin limestone" (*sensu* Hou *et al*., 1985, p. 41) at Ma-anshan primarily yields deep-water type Palmatolepids, while the typical Guilin limestone of the Guilin area contains back-reef (lagoonal) branching stromatoporoids. As these sections belong to different facies, we erect new formation, namely Juntian Fm. for this area instead of Guilin Fm.

2. At the base of Jide Fm. (bed no. 247, 2.56 m thick) *Icriodus obliqumarginatus* was found for the first time, it belongs to the upper part of *ensensis* zone. Above a continuous sequence of 21 conodont zones is the Upper *ensensis* Zone, Lower *varcus* Zone, Middle *varcus* Zone, Upper *varcus* Zone, Lower *hermanni-cristatus* Zone, Upper *hermanni-cristatus* Zone, *disparilis* Zone, Lowermost *asymmetricus* Zone, Lower *asymmetricus* Zone, Middle *asymmetricus* Zone, Upper *asymmetricus* Zone, *An. triangularis* Zone, Lower *gigas* Zone, Upper *gigas* Zone, Uppermost *gigas* Zone, Lower *Pa. triangularis* Zone, Middle *Pa. triangularis* Zone, Upper *Pa. traingularis* Zone, Lower *crepida* Zone, Middle *crepida* Zone, Upper *crepida* Zone. All of these zones can be well defined, except for the boundary between *ensensis* Zone and Lower *varcus* Zone. The conodonts of the Middle/Upper Devonian boundary beds had already been reported by Hou *et al*. 1985.

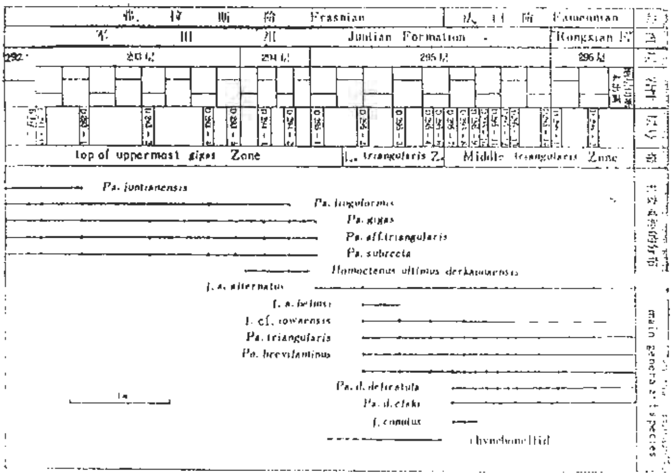
From the Givetian/Frasnian up to the Frasnian/Famenian boundary, the outcrop is continuous and well exposed. Such section is rare in the world, and may at least be considered as a regional type section for East Asia.

3. Icriodus obliquimarginatus was found at the base of Jide Fm., at the level where Stringocephalus first occurs. Thus the base of Jide Fm. is a little higher than the base of Trois Fontaines Fm. of the Givet Limestone in the type area reported in the SDS Newsletter no. 1, 1986, Doc. F, p. 5.

4. The Frasnian/Famenian boundary is placed at the base of Middle triangularis Zone, 1.1 m below the top of Juntian Fm. The lithology of the boundary beds is homogenous limestone. The boundary is within a thick grey limestone unit; the colour of the limestone from the upper Uppermost gigas Zone to the lower Lower triangularis Zone is darker. This phenomenon is similar to the section of Schmidt quarry Kellerwald, F.D.R. (SDS Newsletter no. 1, 1986), Doc. C, p. 2, Fig. Possibly it reveals the Frasnian-Famenian global event, but the lithological character of Ma-anshan section is more homogenous. We recommend Ma-anshan section as the F/F fourth boundary stratotype candidate.

Messrs. Jia Hui-chen, Zhou Huai-ling, Yang De-li and Han Ying-Jian of the 562 Brigade at the Chinese Academy of Geological Sciences, Sanhe, regard this section as excellent for a reference section and wish to hear from colleagues who are interested. They will be happy to provide more details of the section.

The Range of Conodonts near Frasnian/Famennian Boundary at the Maanshan Section



Iridium Anomaly in the Huangmao Section, Guangxi

The Huangmao section, 80 km SE of Liuzhou City, Guangxi, has been noted (Ning, Z. et al., 1984)* as similar to that at Guizhou and at Oberrödinghausen, Germany, and revealing beds containing the D/C boundary. The 34 cm thick black shale (Changshun Shale) rests on nodular limestone and may be correlated to the Hangenberg Shale. Overlying it is a siliceous limestone with S. sulcata. The Daihua limestone beneath it contains a praesulcata conodont fauna.

Now Bai, Ning and Chai (informal Communication August 1986) report that present in the shale are high concentrations of Ir, Ni, Co, Cr, Fe, As, Sb, Se and Sc, 20 to 100 times greater than the background levels. These anomalies occur in the basal 14 cm of the back shale. The iridium abundance is 1.4 ppt to 156 ppt - an anomaly similar to that at the K/T boundary. The ratios Au/Ni = 2.94×10^{-5}, Co/Ni = 0.036, Cr/Ni = 0.23 are similar to those of C1-type chondrites.

The authors suggest that, based on the conodont succession and the iridium anomaly two levels for the D/C boundary are attractive:-

1. base of Changshun Shale - representing a drastic event, caused by meteor impact.

2. duplicata Boundary. The D/C boundary has been recommended as at the praesulcata/sulcata level. S. sulcata occurs at the base of the Wangyou Limestone but its lowermost level is not known on account of the facies change. The authors prefer the sulcata/duplicata Boundary because it is said to mark the initiation of a world-wide increase in conodont diversity following the impact event. At Muhua (and Hönnetal) the early form of S. duplicata slightly precedes Gattendorfia, so this is very close to the Gattendorfia Boundary.

The duplicata Boundary can be clearly defined within the continuous limestone succession in South China, not only in the basinal facies but also in some shallow-water facies.

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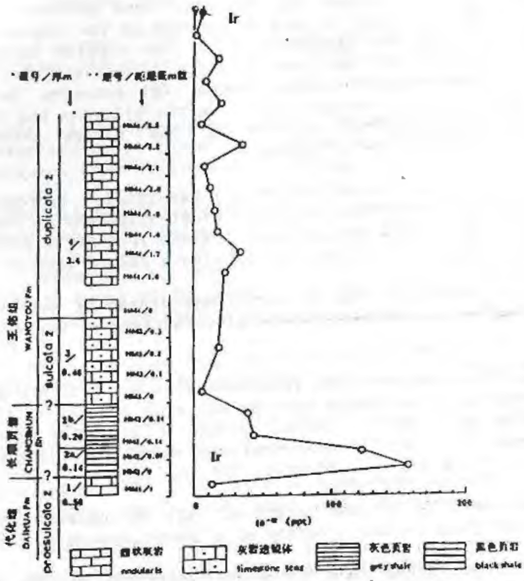
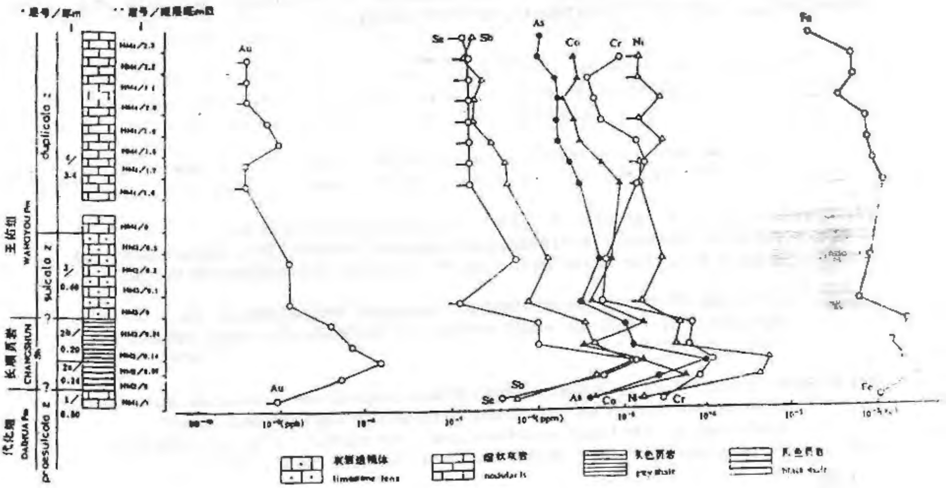
* Ning, Z., Bai, S. & Jin, S. 1984. Geology of Guangxi, pp. 36-44, Nanning City, Guangxi.

Iridium Anomaly in the Huangmao Section, Quangxi, China.





New records of Vertebrates in Devonian stratigraphy

(Numbers refer to papers listed below)

Forgive your editor indulging a predeliction for these fossils, but in recent years the literature has included some accounts of remarkable fossils of interest perhaps to many colleagues on the Subcommission. These contributions enlarge our understanding of the fossils themselves and the environments of the day and they enhance biostratigraphy. A special publication of the Royal Society, London, (6) concerns the evolution of non-marine environments and their biota in the Silurian and Devonian, and I hear that palaeoecological studies of the famous vertebrate-bearing sections in Yunnan are now in progress.

Meanwhile, work by French colleagues has greatly improved the account of Lower Devonian vertebrates and their biostratigraphy in Podolia (2, 10), Spitsbergeu (3, 4, 7, 11) and of other regions from North Africa to Tnrkey, Iran and Thailand (5, 9). There is now also a record from S. America (8).

Chinese contributions come in a constant stream of papers dealing with new species and with palaeogeographic distributions of vertebrates (19, 20, 21, 22).

Devonian placoderms and fish from Australia now indicate some very rich Middle and Late Devonian faunas with an Antiarch succession that will soon bear comparison with that of China, though it does not extend below the Middle Devonian (13, 14, 15) Antiarchi and other vertebrates continue to appear in the literature on Antarctica (14, 23, 24).

Both American (17, 18) and Soviet (1, 12, 16) palaeontologists record new species and there is now a record of a Soviet Devonian tetrapod (12).

The remarkable faunas from China and Australia include many endemic species as well as cosmopolitan forms and it is clear that both marine and non-marine facies may contain vertebrates, commonly abundaut and unusually well-preserved. Migration and dispersal of these animals will be better understood as the biogeography of the Devonian is unravelled and stricter chronological control is achieved via biostratigraphy.

D.L. Dineley

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