International Union of Geological Sciences

International Commission on Stratigraphy

International Subcommission on Stratigraphic Classification

ISSC

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NEWSLETTER N. 2

(Circular n. 103)

May 2003

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1. EDITORIAL

This is my second editorial for ISSC Newsletter, and I feel much better than this winter and more reassured. Indeed, the numerous letters received (see point 2) and your encouraging comments show that the new style may be successful. The dice is thrown!

The "new blood" operation is successfully completed with the six new members presented here (see point 3).

The postal ballot for the election of chairman and vice-chairman is here enclosed as point 9. We expect you to vote at your earliest convenience, any way within end July. Votes by e-mail are officially accepted, and welcome.

The second circular of the 32th International Congress is out: it is in the website http://www.32igc.org. Our planned workshop on "Post-Hedberg developments in Stratigraphic Classification" shows up at page 52 of the circular, with the following description as DWO 15:
New categories of Stratigraphic Units developed after the publication of the 1st International Stratigraphic Guide 1976 will be presented and tested in terms of acceptance status. Discussion will focus on: What type of changes and new avenues of classification stratigraphers are looking for? This workshop will include invited keynote papers, lectures, free contributions and a lot of discussion.
So, dress your plans now, and look for sponsors for your participation. A tentative program will be presented in Newsletter n. 3 that we plan to distribute in December, prior to the deadline for the electronic submission of Abstracts.

Meanwhile, the Task Group leaders appointed (see point 7) are expected to get organized and to start shaping up a concrete plan of work. One of the Task Group leaders (Ashton Embry) is already at work, as shown by the brilliant article prepared by him (see point 8).

The Glossary project survives and hopefully will be completed soon (see point 4).

We prepared a test for stratigraphic classification based on a "real life" situation (see point 6) and look forward receiving numerous responses. We should receive as many answers as we have members, old and new, voting and corresponding from various continents. Next tests should come from South Africa, New Zealand, Germany, Brasil, Russia, Canada …why not?

We need to have a reference scientific journal where to publish our documents, projects, workshop proceedings, etc., but a decision has not been made yet. Prof. Thierry is exploring with "*Newsletters on Stratigraphy*", which seems a natural issue, but we hesitate since the journal is undergoing some substantial changes. Today I received the announcement of a new journal "*Geologica Acta*", to be published in Spain, and is ready to accept short and long articles and welcomes.relevant conceptual developments in any area of the Earth Sciences, studies presenting regional synthesis, thematic issues or monographic volumes presenting, short papers reflecting interesting results or works in progress, as well as contributions and results from Research Projects, Workshops, Symposiums, Congresses and any relevant scientific activity related to Earth Sciences.
We will see, and if any of you has some ideas, please let us know. We need a no-cost journal because our budget does not allow to afford page charges.

Maria Bianca Cita
ISSC Chairman

2. LETTERS FROM MEMBERS, RESPONSES TO "CALL FOR PAPERS", "CALL FOR IDEAS" AND MORE

Tens of messages arrived after the distribution of the ISSC Newsletter n.1 (Circular. 102) thus demonstrating that electronic mail is efficient, rapid, unexpensive. We do not want to reproduce here all the writing, but extract some enlightening phrases, summarize the major points arising.

The first letter arrived is from Tim Anderson, a former student of Hollis Hedberg who captured the spirit of my approach to keep with the greatest respect what has been done to rationalize stratigraphy and create internationally agreed upon rules, but to eventually modify the rules if and when they cannot be properly applied.
From his letter (February 12, 2003) we cite:
Hurray for reiterating Hollis' point of separating observation and interpretation. I believe some of the stratigraphic problems of the present are rooted in a lack of such separation. For example, you quote from the working group on cyclostratigraphy, "The term sedimentary cycle (as used in cyclostratigraphy) should be restricted to the repetitive change in stratigraphic record that have or are inferred to have a time significance". Hollis would point out that stratigraphy should include both recognition of the cycles, without any regard for their time significance, and the interpretation of their time (or other) significance. Rolling the two things into an inseparable package is deadly. Sequence stratigraphy, as usually practiced, shares similar problems.
The recognition and interpretation of surfaces is one thing which the Hedberg approach never came appropriately to grips with. Hollis thought about bodies and layers (units), perhaps because that is where the problems of his day originated. If he were young today, his very pragmatic and thorough nature would have made surfaces part and parcel of his thinking (we should remember that Hollis was not a theoretician). In many ways, the heart of sequence stratigraphy is surfaces. Why? I believe because reflection seismic sections drove the development of sequence stratigraphy and surfaces are what are usually recognized and mapped using reflection seismic data.

Numerous messages, including letters, abstracts and short articles arrived from Hendrik de la Rey Winter, by far the most active member of ISSC, since several years. His main point is that Sequence Stratigraphy equals Chronostratigraphy especially in old cratonic areas. We reproduce here one of the documents received by him:
UNCONFORMITY-BOUNDED SEQUENCES REVISITED
Summary
What is required appears to be a basic unconformity-bounded framework for the sedimentological and volcanological environmental interpretation of all depositional basin styles in preserved and available successions of regionally limited basins.
Introduction
The theme is that sequence stratigraphy equals the unconformity-bounded [UBS] category of stratigraphic classification. Depositional basins [depobasins] are geographically limited and tectonically controlled successive units preserved and available for documenting on present-day crusts of lithospheric plates or during earlier Wilson cycles of oceanic opening and closure. Coupled to plate tectonic theory, their local geological history is linked to global geohistory via the interpretation of the sedimentology and volcanology of nested orders of successive UBS layers within and between basins. The principle of superposition confirms that each UBS unit in the hierarchy has a maximum time span of equivalent continuous deposition and is only measureable where the continuity has been disrupted by erosion, however small the removal of material may be. Sharp contacts of discontinuous deposition are replaced by gradational lithological changes towards basin depocentres along depoaxes of usually elongated units, such that the larger the order [but by convention the smaller the digit allocated] the closer to the depocentre these breaks are

distinguishable as sharp contacts. Interruptions between basins of different tectonic style are sharp because their within-basin sequences have characteristic assemblages, with the exception of deep-sea sediments where discontinuities do not relate directly to tectonics
All UBS are locally chronostratigraphic by definition, and the internal lithological representation is increasingly limited by onlap and truncated by offlap and increased periods of erosion towards the basin limit.
In contrast, lithostratigraphic units are defined not by boundaries that are dated approximately as relative or numerical ages of equivalent continuity, but by the presumed association of lithologies in the early stages of mapping. Consequently, where accuracy is essential, as for economic geological modelling of lateral changes in lithofacies [or aspect], lithostratigraphy have to be converted first to chronostratigraphy via UBS. Globally, only the geochronological equivalents of UBS, or geological time [time linked to stratigraphy], can be correlated.
Consequences
Let us therefore debate how to set up UBS nested assemblages, procedures to be followed, and how to apply the consequences, when linking stratigraphy to plate tectonics. Should one look for a basic model or step-wise modules for education?

Chang (the author of the term synthem in 1975) writes (letter of March 27, 2003):
As a response to your newsletter 1, my comment is confined on the matter of unconf.-b.-units as follows:
My view for the inadequacy of the term 'sequence' for unconformity-bounded (or -related) units is as ever. When I wrote my 1975 paper(GSA) I emphasized it (the above view) for the reason that 'sequence' is a word properly occupied by the meaning of 'succession.' In geology, in other sciences and also in every-day life, sequence means a sort of succession. Late Prof. H.D.Hedberg agreed upon my view that sequence is inadequate as a unit-term in stratigraphy. Late Prof. L.L. Sloss did not reply to my inquiry when I wrote my view to him. So, my synthem and its hierarchical terms were proposed to substitute 'sequence' and its hierarchical terms. My hope has been to see 'sequence' no more used as a unit-term.
Meanwhile, North-American stratigraphers coined allostratigraphic terms (Allo-group, Allo-formation etc.), which, I think, are the duplicates of synthems. Though they are the sorts of junior synonyms, a discussion should be open for a compromise of two terminologies--synthems and allos. My point is not using sequences as stratigraphic unit terms. I would like to see 'sequence' used only in the meaning of succession. It is a time-honored usage. As you know, 'subsequence' is an important geomorphological term. If it is used as a term of stratigraphic unit, people will see it awkward. It should be emphasized that the usage has been pre-occupied by a definite precise meaning for a long time. 'A guide' is needed only for stratigraphy to help geological masses including beginning geologists. Naturally, the principle of stratigraphic classification should be simple. In that sense, discriminating stratal sequence from depositional sequence should be reserved for technical people. Depending on criteria, unconformity-b units may be divided into more than two, even more than four, but they are the object of specialists. For the geological public, a lumping seems plausible in stratigraphic systematics.
I wish you and other my colleagues share time to consider the above.

Berggren (letter of March 15, 2003) writes:
I am happy to see the rejuvenation of the ISSC under your leadership. Hopefully we can address basic issues in Stratigraphy and continue to defend the basic concepts of chronostratigraphy as elaborated so clearly by Hollis Hedberg over 25 years ago. I/we have been very disappointed over the past 15 years by the manner in which the ICVS has undercut the philosophical underpinning(s) of the Hedbergian hierarchical approach to chronostratigraphy. The elevation of the GSSP/boundary stratotype and the concomitant, essential abandonment of the the unit stratotype

and "stage"(or at least its relegation to a relatively minor position) is disturbing. We are seeing a shift from reference to the rock-stratigraphy (and the geohistorical record it incorporates) to an event stratigraphy which serves to denote "sign-posts" in the course of time which, in turn, but neglects to incorporate the rich tapestry of geological history, the very essence of Historical Geology.

Embry (letter of April 4, 2003) writes:
Thank you for your recent messages.I have been away on a lecture tour presenting a talk on "Common Sense Sequence Stratigraphy" to various universites and government institutions in eastern Canada. It was a very worthwhile experience and I received lots of feedback. Many stratigraphers were very relieved to find out that their lack of understanding and enthusiasm for Exxon-style sequence stratigraphy is due mainly to fundamental logical flaws in the published methodology rather than to their ability to comprehend it.

Gladenkov (letter of March 27, 2003
The intention to hold a meeting in Florence in 2004 to discuss new ideas seems very expedient. I informed Russian geologists about the ICS meeting in Urbino. Its resolutions, especially the recognition of great significance of stratigraphy for geology, were met with approval. Here are some express-remarks. As I understood, you favor the multidisciplinary stratigraphy, which is not restricted to a single method and to distinguishing zones in oceans. Stratigraphy plays a very important role in the geological mapping and in establishing natural periods of the Earth history.
Among the topics to be discussed in Florence, there may be the following:
1. Debatable aspects of the International Stratigraphic Guide.
2. The Russian Stratigraphic Code: methodological grounds and application to the geological mapping of 1:200 000, 1:100 000 and 1:50000 scales.
3. General, regional and local chronostratigraphic subdivisions: hierarchy and relationships in the codes of different countries.
4. Ambiguous position of a zone as a stratigraphic unit: zones are constituent parts of stages or a tool of correlation of stages and regional stages.
5. Problem of parallel stratigraphic scales (Tethyan-Boreal, marine-continental) for different systems.
6. "Multiple" or "single" stratigraphy?
A particular remark on "sequences", which were subjects of special discussion in Moscow. Of course, sequences are widely used in practice. Now this notion is in fashion but it has many meanings. It would be desirable to distinguish though two types of sequences: one type is that of Sloss and seismostratigraphy and the second one produced by global sea level fluctuations is that of Veil (this type can be called Veilit or Veilothem). This could solve many problems.

Menning, the author of 2 spectacular stratigraphic tables for Germany, writes (letter of March 13, 2003):
In Fiorence 2004 we will give a talk approximately: Allostratigraphy / orbital forcing in epicontinental successions. When looking on the Stratigraphic Table of Germany 2002 you will find "Folgen" in the Zechstein and the Germanic Trias which we understand as allostratigraphic units bounded by approximately isochronous planes.

Petri (letter of March 5, 2003:
In addition, I would like to send you some points of view related to Stratigraphy of Sequence. I my country as well as, I think, in some other countrie, the Stratigraphy of Sequence is applied inmany instances, in a rather loosely way. It is applied locally to incomplete sequences with no connections to hole sequences, so these propositions had no ties to other propositions. Unconformities are

frequently ill defined with no evaluation of their importance, whether local or regional. The role of local tectonisms were not given a due stress. I think depositional systems might evolve over wide areas to make them useful for a Stratigraphic Code.

Zhamoida (letter of March 5, 2003):
WORKING GROUP ON SEQUENCE STRATIGRAPHY
At 2000 the ISC of Russia published "Supplements to the Stratigraphic Code of Russia" (the second edition of Stratigraphic Code was published in 1992), where the special supplement was carried on and it was dedicated to the Sequence Stratigraphic units. Definition, terminology and nomenclature, given in this supplement to Code, are obtained by most of the russian stratigraphers, including the members. So this supplement usually is used in the practical activity of our geologists. It is no mere change, this supplement is called by the Sequence Stratigraphic units but not the Sequence stratigraphy, as we are the supportes of the unity of the Stratigraphy, in which the different methods are using, including the sequence-stratigraphic one. In nearest future I will send you english translation of this supplement. It would be not bad to publish it in the newsletter.
WORKING GROUP ON CYCLOSTRATIGRAPHY
Most russian geologists, including the ISC members, don't admit the so called Cyclostratigraphy as the indipendent branch of the stratigraphy. We admit and use the cyclical (rythmostratigraphic) or cyclostratigraphic method. This problem was discussed as long ago as under the preparation of the first Stratigraphic Code of Russia. However, in our country there are fiery supportes of the Cyclostratigraphy. First of ll prof. Yuri N. Karogodin who has several large publications on this theme. At the 3rd of April 2002 I reported him the names of members of the Working Group on Cyclostratigraphy (Fritz Hilgen et al.) and their addresses. Now I 'll give him know about the continuation of the activity on this problem in the ISSC and give him the copy of the corresponding text from Newsletter n. 1 (p. 19-20).

Besides these letters, and as a response to the "call for papers, "call for ideas" we received the following proposals:

- Hasegawa (Japan): thoughts about sequence stratigraphy from the position of a biostratigrapher,
- Winter (South Africa): Mission= discontinuites date deposition (DDD). Application of the sequence stratigraphy concepts to the Precambrian of South Africa,
- Zhang (China): Develop stratigraphic classification terminology procedure to orogen stratigraphy (non-sedimentary, non layered rocks or tectonically disturbed rocks). Lack of a code of stratigraphic nomenclature (standardization required),
- Embry (Canada): Formal stratigraphic nomenclature and its proper application,
- Holland (Ireland): Fate of the Golden Spike idea,
- Tchoumatchenko (Bulgaria): Jurassic sequence stratigraphy in Western Bulgaria. Jurassic cyclostratigraphy in westen Bulgaria,
- Zhamoida (Russia): Sequence stratigraphic units as conceived in Russia,
- Gladenkov (Russia): Development of classification in different countries,
- Strasser (Swizerland): Potential of cyclostratigraphy for improving geological time-scale.

Please notice that this is by no way a workshop program but is simply a tentative list of answers received so far.
It is clear from the above that **we do not need a survival kit**.
We just have to make things happen!

3. MEMBERSHIP

The six new members presented in ISSC Newsletter n. 1 are now full members, and are entitled to participate to the postal ballot (see point 9).
Six additional members are proposed here, along with their curriculum and photograph.
After receiving several nominations from old members, and evaluating the international balance and field of expertise of the new candidates, I contacted the ICS directory in order to avoid eventual conflicts on the acceptable numbers.
The answers were quite positive, so that the "new blood" operation is considered successfully completed, and the new six are warmly invited to take an active part in the "Stratigraphic Classification Test" experiment (see Point 6).
The distinction between voting and corresponding members will be properly addressed and discussed in Florence at the 2004 IGC Congress, because we have to consider that according to the new Statute voting members have to rotate off after a maximum of 8 years, whereas corresponding members may stay as long as they wish.

Proposed new members listed alphabetically

D. K. Choi, Korea
L. E. Edwards, USA
P. Giannolla, Italy
Y. N. Karogodin, Russia
M. Menning, Germany
W. E. Piller, Austria

They are welcome to join ISSC and to share with us their experience in stratigraphic classification.

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Curriculum Vitae

Duck Choi was graduated from Seoul National University in 1971 (BSc) and 1975 (MS), respectively and received his PhD from the Pennsylvania State University, USA in 1983. He worked for the Korea Institute of Energy and Resources from 1983 to 1986 and then joined the Department of Geological Sciences, Seoul National University in 1986. In 1999, the Department of Geological Sciences transformed to the School of Earth and Environment Sciences along with other disciplines in earth sciences in Seoul National University. He is presently a professor of paleontology and also serves as the Associate Dean of the organization.
He is mainly working on the Cambrian-Ordovician trilobites of Korea and, based on the paleontological information, he has been deeply involved in stabilizing the lower Paleozoic stratigraphic nomenclature of the Korean peninsula. He is currently a Voting Member of the International Subcommission on Cambrian Stratigraphy and is also a Corresponding Member of the International Subcommission on Ordovician Stratigraphy.

Selected Publications

Choi, D.K. 1998. The Yongwol Group (Cambrian-Ordovician) redefined: a proposal for the stratigraphic nomenclature of the Choson Supergroup. Geosciences Journal, v. 2, p. 220-234.

Kim, D.H., Choi, D.K. 2000. *Jujuyaspis* and associated trilobites from the Mungok Formation (Lower Ordovician), Yongwol, Korea. Journal of Paleontology, v. 74, p. 1031-1042.

Chough, S.K., Kwon, S.T., Ree, J.H., Choi, D.K. 2000. Tectonic and sedimentary evolution of the Korean peninsula: a review and new view. Earth-Science Reviews, 52, 175-235.

Kim, D.H., Choi, D.K. 2000. Lithostratigraphy and biostratigraphy of the Mungok Formation (Lower Ordovician), Yongwol, Korea. Geosciences Journal, v. 4, p. 301-311.

Choi, D.K., Kim, D.H., Sohn, J.W. 2001. Ordovician trilobite faunas and depositional history of the Taebaeksan Basin, Korea: implications for palaeogeography. Alcheringa, v. 25, p. 53-68.

Sohn J.W. & Choi D.K. 2002. An uppermost Cambrian trilobite fauna from the Yongwol Group, Taebaeksan Basin, Korea. Ameghiniana, v. 39, p. 59-76.

Kim, D.H., Choi, D.K. 2002. Facies of a Lower Ordovician carbonate shelf (Mungok Formation: Taebaeksan Basin, Korea). Facies, v. 47, p. 43-56.

Choi, D.K., Kim, D.H., Sohn, J.W., Lee, S.-B. 2003. Trilobite faunal successions across the Cambrian-Ordovician boundary in Korea and their correlation with China and Australia. Journal of Asian Earth Sciences.

Kim, D.H., Lee, J.G. Choi, D.K. 2003. A proposal for regional stages for the Cambrian-Ordovician in Korea. Newsletters on Stratigraphy, v. 40.

Choi, D.K., Lee, J.G. Sheen B.C. 2003. Upper Cambrian agnostoid trilobites from the Machari Formation, Yongwol, Korea. Geobios.

Hong, P.S., Lee, J.G., Choi, D.K. 2003. Trilobites from the *Lejopyge armata* Zone (Upper Middle Cambrian) of the Machari Formation, Yongwol, Korea, Journal of Paleontology, v. 77, no. 5.

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Curriculum Vitae

Born: February 28, 1952

Ph. D., 1977, Geological Sciences, University of California, Riverside B.A., 1972, Geology, University of Oregon

More than 25 years experience in dinoflagellate biostratigraphy and paleoecology, with emphasis on Atlantic and Gulf Coastal Plains; additional studies include Bangladesh, Enewetak, Pakistan, Abu Dhabi, and the North Slope of Alaska. Extensive publications on methods of stratigraphic correlation. USGS representative to the North American Commission on Stratigraphic Nomenclature (1986-present; chairman 1992, 2002). Broad experience in stratigraphic drilling and subsurface mapping.

1977-present Research Geologist, U.S. Geological Survey, Reston, Virginia. Courses taught at George Washington University, Indiana University, University of Kansas, University of Oslo, George Mason University.

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Piero Gianolla was born in Venice in 1961. He earned PhD degree at the Padua University. At present his position is assistant professor at the University of Ferrara where he teach Stratigraphy and Mapping Geology. He was research associated at the Department of Geology & Geophysics, Rice University Houston Tx and visiting scientist at the Institut für Geologie und Paläontologie, Universität Innsbruck (Austria). His main research fields consist in the sequence stratigraphy, paleoclimatological and sedimentological investigation of carbonate platforms and mixed basins. He is involved in a stratigraphic revision of the Triassic aimed at establishing a supra-regional sequence stratigraphic framework, through the correlation of sections from the Southern Alps, the Northern Calcareous Alps, the southern Appennines and Hungary. In the last years he is involved in different mapping project of the Southern Alps area related to the new Geological map of Italy (1: 50.000) promoted by Italian Geological Survey.
He was coordinator for the Tethyan realm of the international project of Mesozoic-Cenozoic Sequence Stratigraphy of European Basins. He is corresponding members of the I.U.G.S. Subcommission on Triassic stratigraphy and member of the ”Working Group on the Triassic Stage Boundaries”. He is also member of the Italian working group on stratigraphic nomenclature about traditional formation names.

Selected Publications

De Zanche V., Gianolla P., Mietto P., Siorpaes C. and Vail P. R., 1993 - *Triassic sequence stratigraphy in the Dolomites (Italy).* Mem. Sci. Geol., v. 45, pp. 1-27, Padova.

Gianolla P. and Jacquin T., 1998 - *Triassic Sequence Stratigraphy of Western European Basins. An introduction*. In: P.C. de Graciansky, J. Hardenbol, T. Jacquin, P.R. Vail and D. Ulmer-Scholle (Eds.): Mesozoic-Cenozoic Sequence Stratigraphy of European Basins, SEPM Special Publication n°60, pp. 647-654, Tulsa/Oklahoma.

Gianolla P., De Zanche V., & Mietto P. 1998 -*Triassic Sequence Stratigraphy in the Southern Alps. Definition of sequences and basin evolution.* In: P.C. de Graciansky, J. Hardenbol, T. Jacquin, P.R. Vail and D. Ulmer-Scholle (Eds.): Mesozoic-Cenozoic Sequence Stratigraphy of European Basins, SEPM Special Publication n°60, pp. 723-751, Tulsa/Oklahoma.

Gianolla P., Ragazzi E. and Roghi G., 1998 - *Upper Triassic amber from the Dolomites (Northern Italy). A paleoclimatic indicator?* Riv. It. Strat. Paleont., v. 104, pp. 381-390, Milano.

Broglio Loriga C., Cirilli, S., De Zanche V., di Bari D., Gianolla P., Laghi G.F., Lowrie W., Manfrin S., Mastandrea A., Mietto P., Muttoni G., Neri C., Posenato R., Rechichi M.C., Rettori R. & Roghi G. 1999 - *The Prati di Stuores/Stuores Wiesen section (Dolomites, Italy): a candidate Global Stratotype section and Point for the base of the Carnian Stage*. Riv. It. Strat. Paleont., Milano, v. 105, pp. XX.

De Zanche V., Gianolla P. e Roghi G. 2000 - *Upper Carnian stratigraphy in the Raibl area (southern Julian Alps, Italy).* Ecl. geol. Helvetiae,v,.93/3.

Gialanella P.R., Heller F., Mietto P., Incoronato A., De Zanche V., Gianolla P. e Roghi G. 2001 - *Magnetostratigraphy and biostratgiraphy ofthe Middle Triassic Margon section (Southern Alps, Italy).* Earth and Planetary Sciences Letters, V.187, pp. 17-25.

Yuri N. Karogodin

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Curriculum Vitae

Yury N. Karogin was born in 1935 in Kharkov (the Ukraine). He graduated at the Saratov State University in 1958. Since 1958 Yury N. Karogodin is concerned with the problems of genesis and oil and gas deposits in West Siberia. He entered the Institute of Geology of RAS in 1971 and since that time focused his effort on the development of new theoretical trend in general and oil geology – lithmology and sequence stratigraphy.

Yury N. Karogin , doctor of geological sciences, professor of the Novosibirssk State University, Chief of the Laboratory of Theoretical Problems of Oil & Gas Geology, Institute of Geology Siberian Branch of Russian Academy of Sciences , the State and the academician Troifimuck prize laureate.

He actively participates in the work of AAPG, being its member form 1994. Yury N. Karogodin is married and has an adult child.

In 1975 Yu.N. Karogodin and academician A.A. Trofimuck hold the first All Union conference on Sedimentary Cyclicity and Regularities of Fossil Placement. It resulted in the development of the same name section under the guidence of Yu.N. Karogodin. This section hold 20 meetings (conferences, seminars) throughout the former USSR regions and abroad (Bulgaria, USA, China).The work of section and data on cyclicity (and lithmology) were presented at the international symposia in Russia, USA,Japan, Germany, Checkoslovakia and Bulgaria.

Fundamental Publications

1. Regularities of sedimentations and oil and gas deposits. Moscow, 1974
2. Sedimentary cyclicity, Moscow, 1980
3. Regional stratigraphy. System aspect, Moscow,1985
4. Introduction to oil lithmology, Novosibirsk, 1990
5. The Priobskoye Oil–Zone of Wester Siberia (system – lithmologic aspect), Novosibirsk, 1996
6. The North Priobie of West Siberia. Geology and the neocomian presence of gas and oil (system – lithmologic approach), Novosibirsk, 2000
7. Crises of the basin startigraphy and how to drop out of this crisis (system – cyclostratigraphic approach), (in press)

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Curriculum Vitae

Manfred was born in 1947 in Rostock, Germany. He studied Geology at the Humboldt-Universität Berlin and the Ernst-Moritz-Arndt-Universität Greifswald 1966 to 1971.
1974: PhD thesis The reorientation of unoriented borecores using palaeomagnetism.
1973-1991: Zentralinstitut für Physik der Erde Potsdam
1992-recent: GeoForschungsZentrum Potsdam
1973-1980: Lithologic-palaeogeographic map of the Upper Buntsandstein (Olenekian-Anisian) of East Germany
1975-1977: reorientation of borecores from the Rotliegend (Carboniferous-Permian)
1977-1980: remote sensing
1977-recent: Magnetostratigraphy in Late Palaeozoic and Triassic sequences, time analysis, time scale calibration and stratigraphic terminology and classification.
Secretary of the German Stratigraphic Commission, Chairman of the German Subcommission on Permian-Triassic Stratigraphy, Member of the IUGS Subcommissions on Carboniferous Stratigraphy, Permian Stratigraphy (Voting M.), and Triassic Stratigraphy (Voting M.).

Selected Publications

Menning, M. (1986): Zur Dauer des Zechsteins aus magnetostratigraphischer Sicht. Z. geol. Wiss., Berlin, **14**, 4: 395-404.

Menning, M., Katzung, G. & Lützner, H. (1988): Magnetostratigraphic investigations in the Rotliegendes (300-252 Ma) of Central Europe. Z. geol. Wiss., Berlin, **16**, 11/12: 1045-1063.

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Curriculum Vitae

27. 5. 1951: born in Vienna, Austria
1957 - 1961: Primary school
1961 - 1970: High School; 20. 5. 1970: Leaving examination
1972 - 1973, 1974 - 1975: Scientific assistant at the Palaeontological Institute, Univ. of. Vienna
1972 - 1975: Collaborator with the Austrian oil company OeMV AG
1973 - 1974: Collaborator with the City of Vienna (Dept. of groundwater) and the Geological Survey, Vienna
1975: Ph. D. degree (Palaeontology and Geology) at the University of Vienna
1975 -1988: University Assistant at the Institute of Palaeontology, University of Vienna
since: 1979: Lecturer at the University of Vienna
1979: Marriage with my wife Rosa
1982 - 1985: Free collaborator with the "Österreichische Donaukraftwerke AG" (a company responsible for the power plants along the Austrian part of the Danube)
since 1988: Assistant-Professor at the Institute of Palaeontology, University of Vienna
1. 8. 1991 - 30. 7. 1992: Max Kade Scholarship at the Department of Integrative Biology/Museum of Paleontology at the University of California at Berkeley
June 1994: Venia docendi for Palaeontology at the Institute of Palaeontology, University of Vienna
September 1, 1997: Full Professor (o. Univ.-Prof.) for Palaeontology and Historical Geology at the Karl-Franzens-University Graz
1998: Chairman of the Austrian Commission on Stratigraphy
Member of the Austrian Committee of the International Geological Correlation Program (IGCP)
January 1999: Head of the Department for Geology and Palaeontology, Karl-Franzens-University Graz
May 1999: Corresponding member of the Austrian Academy of Science
June 1999: Chairman of the "Commission for the palaeontological and stratigraphical research in Austria" of the Austrian Academy of Science
October 2000: President of the Austrian Palaeontological Society
Research activities: Micropalaeontology – foraminifera and calcareous algae, Carbonate sedimentology (modern and ancient), Marine Geology; Stratigraphic range: Triassic, Palaeogene, Miocene, recent
Research areas: Austria, Greece, Turkey, Iran, Egypt, Indonesia, Caribbean

4. GLOSSARY OF STRATIGRAPHIC TERMS (Prof. Chlupac project)

After announcing with sorrow the death of Prof. Chlupac and the uncertain fate of his project on the Glossary of Stratigraphic terms, we were unable to get any input from the Charles University of Prague, but received the following translations:

- in Bulgarian (from Prof. T. Nicolov)
- In German (from Prof. Steininger)
- In Italian (from us)
- In Lithuanian (from Prof. Grigelis)
- In Russian (from Prof. Zhamoida)

If we are able to get the announced translation in Portuguese (from Prof. Petri) and in French (from Prof. Thierry), we could start looking for a journal interested in the publication.
May we look for a translation in Chinese or in Japanese? Please, let us know.
It would be good to complete the project by the end of this year, before being involved in new projects.

5. COMMENTS ON THE PROPOSALS FOR GSSP FOR THE TURONIAN AND FOR THE TORTONIAN

As you know, the main responsibility of most Subcommissions of ICS is to define GSSPs for the various stages recognized in the System involved.
When a proposal is ripe (an operation that may last for several years, after time-consuming discussions on the selection of the site), it is voted within the Subcommission and (if accepted by a postal ballott requiring a quorum) by ICS, that is by the chairmen of the various Subcommissions.
Last week, I received two GSSPs Proposals and, before casting my vote, I sent a message to ICS secretary general Jim Ogg with my comments.
They are reported here (without further comments) for your information.

TURONIAN GSSP

This proposal has been around for several years, starting from the Bruxelles meeting in 1995, but it still lacks a full documentation on the microfossil content of the El Pueblo section. The information provided is very important, but is based on personal communications and is not documented graphically. Ammonoids are not a common record in general, as well as Inoceramids, but Planktonic Foraminifera and Calcareous Nannofossils are the most widely used index fossils in the Third Millennium.
This is a revised version, I suggest to wait for the publication of the Keller and Pardo paper, and to point out more clearly (also in the abstract) the presence of the Oceanic Anoxic Event 2 just across the boundary.
Minor revision requested.

TORTONIAN GSSP

Several formal and/or substantial reasons suggest a revision. Reasoning as a reviewer of an international scientific journal, I would suggest “major revision”. The points to be clarified and/or modified are as follows.

1) Referencing is accurate for the text (only one citation missing) but includes several manuscripts in press and entirely ignores papers quoted in the tables and figures, but not in the text.
2) The GSSP proposed is definitely older (approximately one million years) than the base of the Tortonian at Tortona, as stratotypified by Gianotti (1953) and consistently used since. The reasoning for such a decision should be better expressed, and motivated.

3) The well exposed section of Monte dei Corvi, characterized by spectacular astronomically controlled cycles, yields poorly preserved micro and nannofossils and nothing else. The precision dating is obtained by a multidisciplinary integrated approach, with astronomical tuning and to a lesser extent paleomagnetic stratigraphy playing a major role. Since most stratigraphers worldwide date the rock units by studying their fossil content, I consider essential that at least the index fossils discussed in point 1.2 listed in fig. 7 (ie. *Neogloboquadrina acostaensis*, *N. atlantica*, *Globigerinoides subquadratus*, *Paragloborotalia mayeri*, *P. siakensis*, *Discoaster kugleri*, *Coccolithus miopelagicus*, *Calcidiscus praemacinthyrei*, *Catinaster coalithus*) are illustrated in appropriate manner.
4) The markers used for correlation of the GSSP are *Discoaster kugleri* (Last Common Occurrence) and *Globigerinoides subquadratus* (Last Common Occurrence). I have serious doubts on their worldwide correlation potential. Indeed, the former is very rare so that high resolution studies are requested for its identification, and moreover, has taxonomical problems. Whereas the latter has a very wide stratigraphic distribution both above and below the proposed GSSP and displays several variations in frequency (not just one) as clearly shown in figure 7 of the proposal.
5) The Tortonian was introduced in the literature because of its rich fossil content (Mollusks) but no word is found concerning this fossil group.
6) The Tortonian is very important for the evolution of Vertebrates. The very limited comments concerning the mammal ages are considered inadequate.
7) The "auxiliary" section of M. Gibliscemi, previously proposed by (part of) the same authors for the Serravallian/Tortonian boundary looks better to me, notwithstanding some tectonic disturbances, having better preserved fossils.

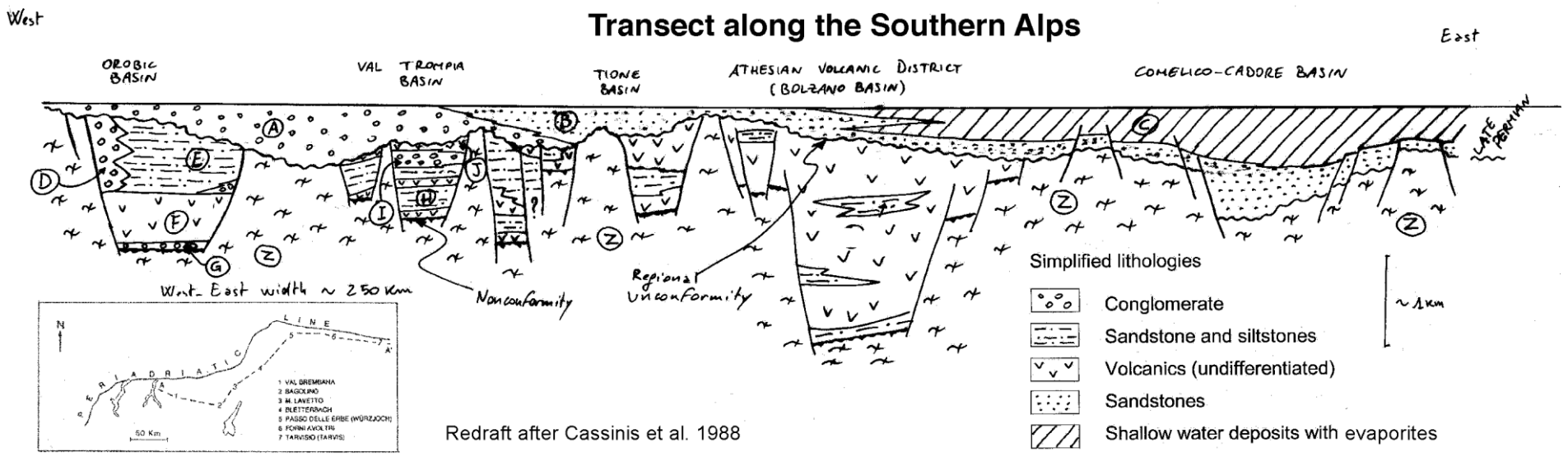
In conclusion, I suggest that the proposal is revised, and further and thoroughly discussed within the Neogene Subcommission before being voted and eventually approved by the Commission.

6. A NEW APPROACH (BOTTOM-UP) TO FORMAL STRATIGRAPHIC CLASSIFICATION

The main responsability of ISSC is to set up clearly defined rules for stratigraphic classification, to publicize and make them worldwide used, and to periodically update them, in accordance with new methodologies applied, and scientific progress.
Before starting with the difficult project to write new chapters or to revise and update existing chapters of the International Guide, I want to make a series of a few (3 or 4 are sufficient) tests of stratigraphic classification among old and new ISSC members.
Purpose of this experiment is to check and evaluate the degree of coherence and consistence in the application of the existing rules to real situations.
I asked to my collegues who work on the stratigraphy of the Southern Alps under the umbrella of the Italian Geological Survey and of the Italian Commission on Stratigraphy to present the framework of the Permian stratigraphy, well known and studied for over 150 years, and warmly thank them for their appreciated efforts, especially Fabrizio Berra and Dario Sciunnach, who prepared the test (see FIG. 1 and FIG. 2)
At least 20 answers are required to make a statistical evaluation by comparing the answers to the simple questions posed. So, please, answer ASAP!
I do hope that two or three other tests will be submitted by volunteers dealing with real cases from different parts of the world, and different parts of the time scale.
So, we should have a real, bottom-up basis for discussing at the "Post-Hedberg developments of Stratigraphic Classification" workshop in Florence 2004.

STRATIGRAPHIC CLASSIFICATION TEST n. 1

FIG. 1



Redraft after Cassinis et al. 1988

"STRATIGRAPHIC CLASSIFICATION TEST" n. 1
Transect along the Southern Alps
LEGEND of FIG. 1
Lithostratigraphic units
Late Permian succession (locally at the base an angular unconformity can be recognized)
A: Verrucano Lombardo: fluvial conglomerates and sandstones, with basement-derived clasts
B: Val Gardena Sandstone: fluvial sandstones
C: Bellerophon Formation: evaporites and shallow-water carbonates
Early Permian succession (deposited during an important extensional tectonic stage)
Orobic Basin
D: Ponteranica Conglomerate: alluvial fan conglomerates with scarce basement-derived clasts
E: Orobic Collio Formation: sandstones, siltstones and shales of alluvial-lacustrine environment, generally mapped individually
F: "Volcanic orobic complex": prevailing volcanic flows
G: "Basal Conglomerate": fluvial conglomerate with no volcanic clasts
Val Trompia Basin
H: Trumpline Collio Formation: sandstones, siltstones and shales of alluvial-lacustrine environment, generally mapped individually, with intercalation of ignimbritic layers
I: Dosso dei Galli Conglomerate: alluvial fan conglomerates with scarce basement-derived clasts
J: Auccia Volcanics: ignimbritic layer capping the Lower Permian succession
Tione Basin
Prevailing volcanics with two intercalations of continental sediments
Athesian Volcanic District
Z: Metamorphic basement

FIG. 2 specifically documents the chronostratigraphy (after the excursion guidebook of the Permian Subcommission published in 1998)

QUESTION 1 – The Dosso dei Galli (I) and Ponteranica (D) formations have been formally defined in a strictly hedbergian style; they have the same stratigraphical position and paleogeographic significance, a somewhat different lithological composition, no lateral continuity: the two depositional basins have always been separated. Do you judge them:

a) a single lithostratigraphic unit? ☐
b) two discrete lithostratigraphic units? ☐
c) an UBSU? ☐

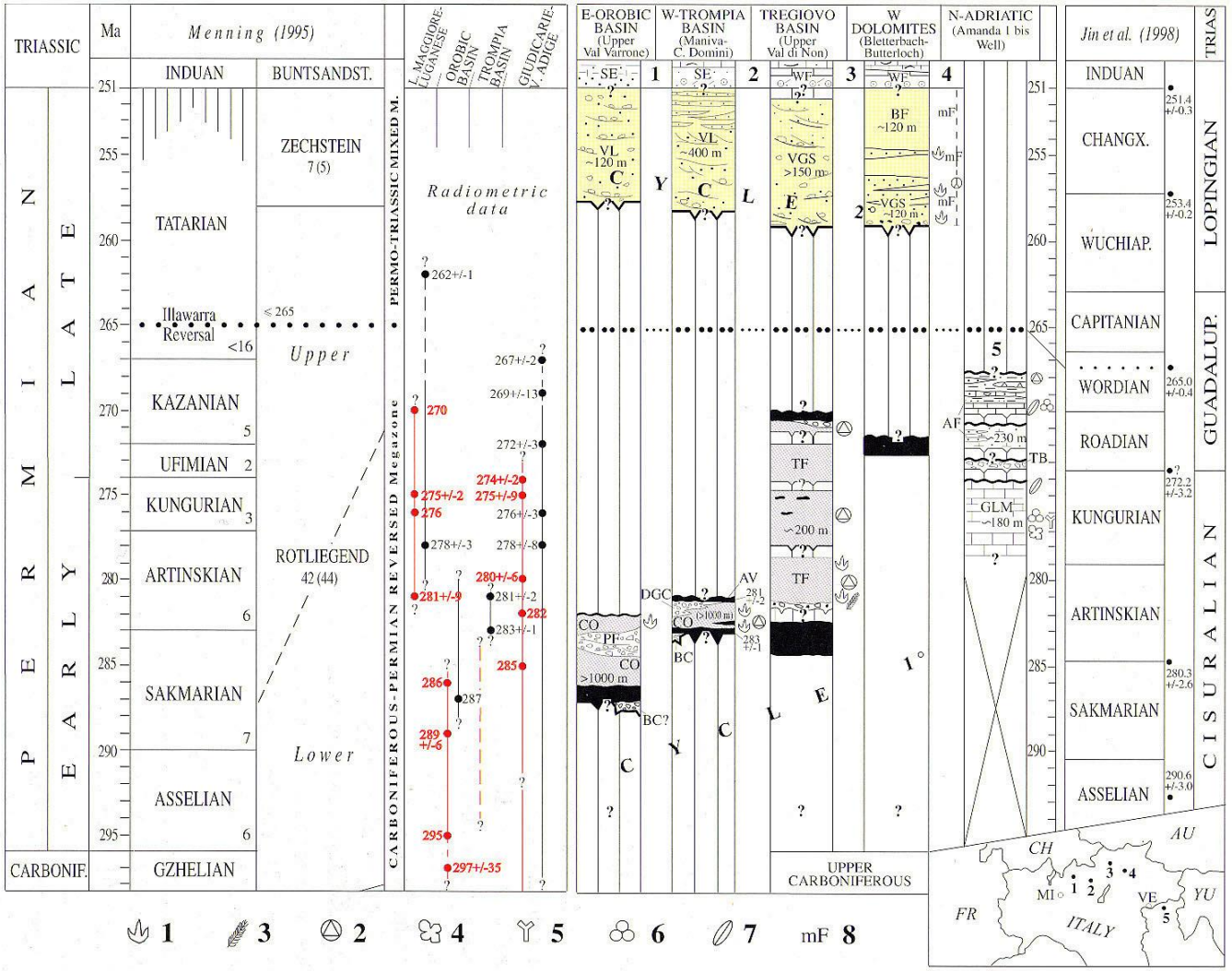
QUESTION 2 – "basal conglomerate" (G): never formalized so far; discontinuous in nature, and not always mappable, with a transitional upper boundary and separated by the metamorphosed variscan basement by a major unconformity. Is it:

a) a formation? ☐
b) an UBSU? ☐
c) other? ☐

QUESTION 3 – How would you classify the classical historical Collio unit?

a) a formation? ☐
b) a group? ☐
c) a synthem? ☐
d) a complex? ☐

FIG. 2



Permian successions of both the central-eastern Southern Alps (between Lake Como and the Dolomites) and the northern Adriatic sea (Amanda 1bis Well; Sartorio & Rozza, 1991) (adapted from Cassinis *et al.*, in press b). *Traces* on the *inset* map. In the columns, the volcanic deposits are indicated in black, and the alluvial-lacustrine sediments in grey. The yellow shading highlights the Upper Permian cycle (cycle 2). Abbreviations and symbols (from bottom): **BC**: Basal Conglomerate; **CO**: Collio Formation; **PF**: Ponteranica Formation; **DGC**: Dosso dei Galli Conglomerate; **AV**: Auccia Volcanics; **TF**: Tregiovo Formation; **TB**: Tarvisio Breccia; **GLM**: Goggau Limestone; **AF**: Amanda Formation; **VL**: Verrucano Lombardo; **VGS**: Val Gardena Sandstone; **BF**: Bellerophon Formation; **SE**: Servino Formation; **WF**: Werfen Formation; vertical lines: stratigraphic gap; crossed lines: cover. Fossils: **1**: tetrapod footprints; **2**: palynomorphs; **3**: macroflora; **4**: algae; **5**: bryozoans; **6**: foraminifera; **7**: fusulinids.; **8**: marine fossils.

Chronostratigraphical scales conform to those of Menning (1995) and Jin *et al.* (1998). The scheme includes a large number of radiometric data (in Ma) on intrusive (red) and volcanic (black) rocks generally cropping out between Lake Maggiore and the Val d'Adige region; the respective vertical lines indicate the assumed duration of the igneous activity in each area.

7. TASK GROUPS

In the few months elapsed since I took over from Alberto Riccardi the responsability to lead ISSC, I had to realize that the problems dealing with Sequence Stratigraphy and Cyclostratigraphy cannot be postponed or pushed back or ignored.

We have to arrive at the Florence Workshop with some new documents or white papers elaborated by ad-hoc groups to discuss among us and with the large community of geologist-stratigraphers.

However, it is too early now to appoint individually members of Task Groups, or to dictate precise mandates and deadlines. But, I was fortunate enough to find two strong, high profile, internationally well-known geologists who accepted to be leaders of Task Groups.

They are **Asthon Embry** from the Geological Survey of Canada for Sequence Stratigraphy and **Andreas Strasser** from the University of Freiburg for Cycles.

I will forward to them all the pertinent documents (letters, proposals, manuscripts) received by old and new ISSC members in the last few months, and invite the members interested to take an active part to contact the leader of the Task Group.

Next fall, prior to the preparation and dissemination of ISSC Newsletter n. 3, I will meet first with A. Strasser, then with A. Embry. I do hope that we will be able to shape up the Task Groups and to dress a realistic plan of work for Florence and beyond.

8. COMING TO GRIPS WITH SEQUENCE STRATIGRAPHY

by Ashton Embry

The ISSC has been wrestling with various forms of sequence stratigraphy (e.g. unconformity–bounded units, synthems) for over 25 years with seemingly little success in reaching any agreement in regards to nomenclature and methodology. The 1994 Guide was a disappointment due to its failure to adequately deal with sequence stratigraphy, which, by that time, had become a very important and widely used stratigraphic practice. The blue ribbon ISSC Working Group, which was subsequently formed to resolve the inadequacies of the Guide regarding sequence stratigraphy, spent 6 years trying to come up with a definition of a sequence but failed to reach a consensus. Not surprisingly, given this lack of progress combined with the importance of the discipline, our chair has asked the obvious question, "What do we do next on this issue?" In answer to this, I thought I would provide my perspectives on sequence stratigraphy and on how ISSC might move forward on this important topic.

Firstly, I would like to relate some of the things that 30 years of field work and countless hours of attempting to correlate sections have taught me about the practical usage of sequence stratigraphy. First and foremost I use sequence stratigraphy as a methodology for constructing a quasi-chronostratigraphic framework for constraining facies analysis and for interpreting depositional history and paleogeographic evolution. I expect many others use it in the same way and that is why sequence stratigraphy has become the dominant form of stratigraphic analysis. I would emphasize that I do not equate sequence stratigraphy with chronostratigraphy because the sequence stratigraphic correlation lines (e.g. subaerial unconformities, maximum flooding surfaces and maximum regressive surfaces etc.) are not isochronous. However, in most cases such surfaces have a low diachroniety or are time barriers and, importantly, there are lots of them available. It would be great to have a framework of closely spaced time lines for guiding facies analysis but our current concepts and technologies do not allow such an ideal situation to be realized. For the time being I have to be satisfied with a quasi-chronostratigraphic framework provided by non-isochronous sequence stratigraphic surfaces. Biostratigraphy of course contributes to any correlation framework and, most importantly, provides critical constraints on sequence stratigraphic correlations. However, compared with sequence stratigraphic data, biostratigraphic data are much sparser in most situations and are much harder and costlier to obtain. Other stratigraphic disciplines such as

magnetostratigraphy and chemostratigraphy also have potential to contribute to a framework but such data are usually very rare, especially for the subsurface. Overall, sequence stratigraphic correlation lines, because of their abundance in both surface and surface sections and their relative ease and low cost in attainment, have constituted the bulk of any quasi-chronostratigraphic correlation framework I have ever built.

I have come to the realization that sequence stratigraphy is very similar in many ways to the other types of stratigraphy, which provide correlation horizons that approximate time surfaces (e.g. biostratigraphy, magnetostratigraphy). Basically such stratigraphies are based on the recognition and correlation of changes in a specific property of the strata. For example, biostratigraphy depends on various changes in fossil content whereas magnetostratigraphy depends on changes in magnetic properties (e.g. magnetic polarity) of the strata. This begs the question of what type of property change is utilized in sequence stratigraphy. The best answer I can come up with is that sequence stratigraphy uses changes in depositional trend as its foundation. Examples of changes in depositional trend utilized in sequence stratigraphy are the change from deposition to subaerial erosion and the change from a shallowing-upward trend to a deepening-upward one. Within each type of stratigraphy, each type of change can regarded as a specific type of surface or boundary and it is best if each is given a specific name (e.g. subaerial unconformity for the change from deposition to subaerial erosion).

For the correlation and creation of a sequence stratigraphic framework, I use four different types of surfaces, which are produced by four different types of change in depositional trend. More may well exist. Importantly each of these surfaces can be objectively recognized by scientific analysis and each is either of low diachroniety (time lines pass through it at a very low angle) or is a time barrier (ie time lines do not pass through it in most cases). Obviously surfaces which cannot be objectively recognized or which have substantial diachroniety (time lines pass through at a high angle) would not be suitable for such a framework. The useful surfaces are:

1) Subaerial unconformity which represents the change from deposition to subaerial erosion (time barrier).
2) Shoreface ravinement surface which has eroded a subaerial unconformity. This represents a change from sedimentation to subaerial erosion to transgressive shoreface erosion (time barrier).
3) Maximum regressive surface which represents the change from shallowing-upward deposition to deepening-upward deposition (low diachroniety). At the shoreline position this would be called the onset of transgression.
4) Maximum flooding surface which represents the change from deepening-upward sedimentation to shallowing-upward sedimentation (low diachroniety). At the shoreline position this would be called the onset of regression.

These surfaces are determined mainly by sedimentological analysis and geometric relationships and I correlate as many of the different types of sequence stratigraphic surfaces as I can on a stratigraphic cross section. Notably if I cannot put a specific surface-type name on a correlation line (eg a maximum flooding surface) then it doesn't remain on the cross-section. I do not use the vague term "marker" for a correlation line in this methodology. In terms of nomenclature, I think it is important that agreement be reached on how to define and what to call each of these specific surfaces. Each of them is referred to by at least two different names in the literature. One important contribution that ISSC can make to sequence stratigraphy is to formulate a clear definition of each type of sequence stratigraphic surface and to recommend a specific name for each.

The recognition, correlation and naming of the surfaces of sequence stratigraphy can be done without any concern for naming the units that are bounded by these surfaces. However there can be little doubt that units of sequence stratigraphy should also be defined and named for the purposes of regional mapping and clear communication. The term sequence was proposed by Sloss et al over 50 years for the unit bounded by unconformities which are represented by either a subaerial

unconformity or a shoreface ravinement which has eroded a subaerial unconformity. Such a unit did not gain widespread acceptance mainly because it was plagued by an intractable nomenclatural problem related to the fact that most such unconformities die out basinward. Every time an unconformity terminated basinward, a new sequence had to be named and the end result was nomenclatural chaos (see Wheeler, 1958, fig. 2). This nomenclatural nightmare was resolved by Vail et al's (1977) revised definition of a sequence that extended the sequence boundary along a "correlative conformity". This simple and brilliant suggestion allowed unconformity-bounded sequences established on a basin margin to be extended into parts of the basin where the unconformities were no longer present with no changes in nomenclature. Many people do not realize that this critical change in sequence definition that resulted in the cutting of the Gordian knot is the main reason for the ascent of sequence stratigraphy. I have little doubt if this had not had happened, sequence stratigraphy would still be languishing in the backwaters of stratigraphic thought.

Clearly any attempt to revert to the Slossian definition of a sequence (using the term sequence or some other name such as synthem), that is a unit bounded solely by unconformities, would be folly and must be avoided at all costs. The inclusion of a "correlative conformity" as part of sequence definition is absolutely essential in any pragmatic and acceptable approach to sequence stratigraphy but it leaves us with the not-so-trivial problem of what constitutes a correlative conformity. To me a scientifically acceptable correlative conformity must meet the following self-evident criteria:

1) It needs to tie to the termination of the corresponding unconformity so as to form a through-going sequence boundary.
2) It must be delineated by objective scientific criteria compatible with the tenets of sequence stratigraphy (i.e. it must represent a change in depositional trend) just as any biostratigraphic boundary must be defined on paleontological criteria.
3) It must be widespread in most basins.
4) It must have low diachroneity.

Another very important potential contribution of ISSC to sequence stratigraphy would be a clear definition of a practical correlative conformity that meets the above criteria and any others that become evident.

Once a decision is made on the definition of a sequence (i.e. what types of surfaces are used to form both the unconformable and conformable portions of the boundaries), then the question of how to define component units of a sequence can be examined. Such units are now referred to as systems tracts and this topic represents perhaps the most hopelessly confusing aspect of sequence stratigraphy. I defy anyone to provide a workable (scientific) definition of a forced regressive systems tract or a shelf margin systems tract.

Once again ISSC can potentially make a huge contribution to sequence stratigraphy by sorting out the systems tract mess and by coming up with some clear definitions of systems tracts that are deemed to be scientifically acceptable and useful. This seemingly can be accomplished by following a few practical guidelines such as ensuring that any defined systems tract is bound by well-defined surfaces of sequence stratigraphy.

So in answer to Dr Cita's question of "what now", I would answer we need to:

1) Define and name the surfaces of sequence stratigraphy. I have come up with four surfaces which need to be dealt with and there are likely others that would qualify.
2) Define what constitutes a sequence by defining what surfaces of sequence stratigraphy are used for both the unconformable and conformable portions of the sequence boundary. More than one type of sequence may be necessary.
3) Define component systems tracts by defining what surface of sequence stratigraphy is used for each boundary of each systems tract. For example a transgressive systems tract would be a unit bound by a maximum regressive surface (or whatever name is agreed upon) below and a maximum flooding surface above.

If ISSC is able to make substantial progress in the above three areas, then I think we can look forward to some stable nomenclature and pragmatic methodologies for the practice of sequence stratigraphy.
In regards to establishing one or more committees to address these issues, I think it would be worthwhile to recruit mainly those ISSC members who have had substantial experience in delineating and correlating sequence stratigraphic surfaces in both surface and subsurface sections. I envision one important aspect of resolving these issues will be the demonstration of the practical applicability of any proposal to a number of varied real world situations and participating ISSC members will be looked to to provide such test cases. Of course all ISSC members can and should have a kick at the cat once some concrete proposals are brought forward.

9. BOOKS AND REPRINTS RECEIVED

We sincerely thank the ISSC members who sent their publications to us.

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10. ISSC POSTAL BALLOTT

VOTE FOR THE TERM 2004-2008

VOTE FOR **CHAIRMAN**
FIRST CHOICE_____
SECOND CHOICE _____

VOTE FOR **VICE-CHAIRMAN**
FIRST CHOICE_____
SECOND CHOICE _____

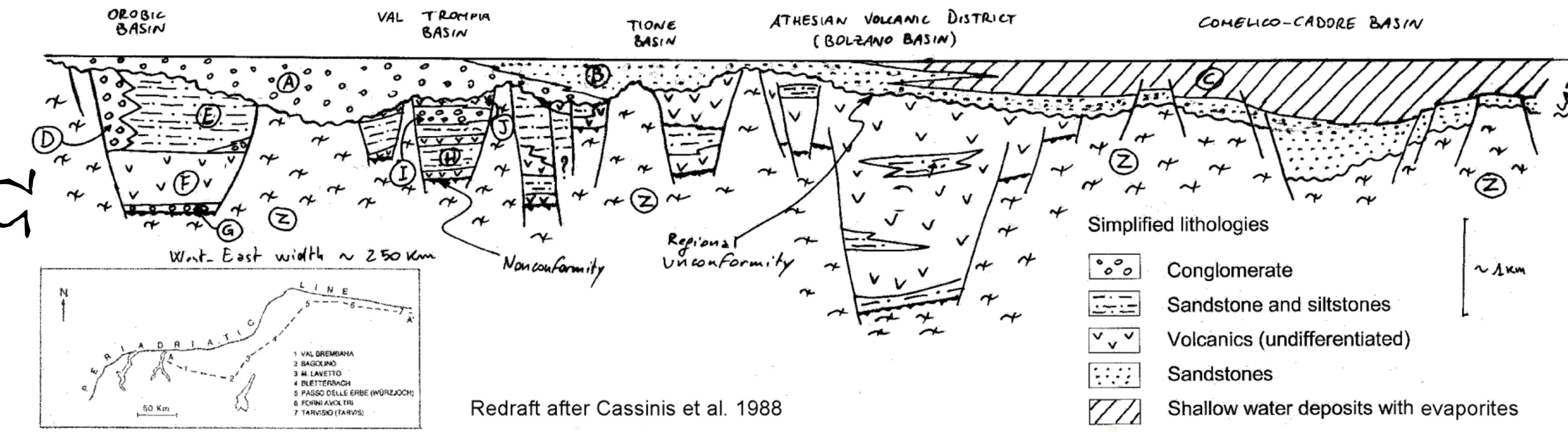
NAME OF THE MEMBER_____

DATE_____

For the nominations proposed by end March, see our e-mail of April 3, 2003, "Announcement". Please cast your vote **within end July**. Votes by e-mail are officially accepted, and welcome.

FIG. 1

Transect along the Southern Alps

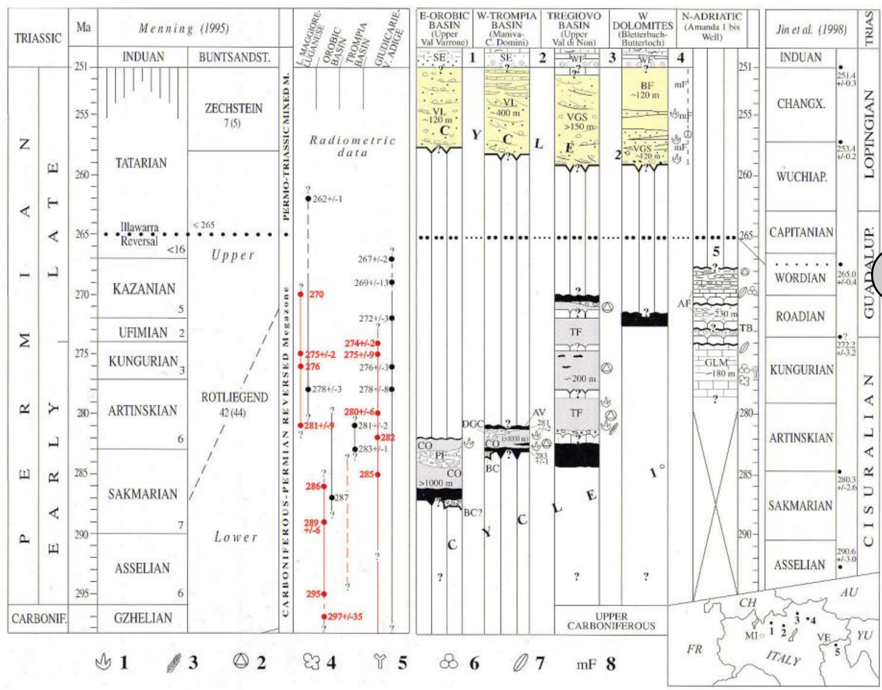


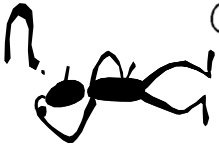
Redraft after Cassinis et al. 1988

FIG. 2

Permian successions of both the central-eastern Southern Alps (between Lake Como and the Dolomites) and the northern Adriatic sea (Amanda 1bis Well; Sartorio & Rozza, 1991) (adapted from Cassinis *et al.*, in press b). *Traces* on the *inset* map. In the columns, the volcanic deposits are indicated in black, and the alluvial-lacustrine sediments in grey. The yellow shading highlights the Upper Permian cycle (cycle 2). Abbreviations and symbols (from bottom): **BC**: Basal Conglomerate; **CO**: Collio Formation; **PF**: Ponteranica Formation; **DGC**: Dosso dei Galli Conglomerate; **AV**: Auccia Volcanics; **TF**: Tregiovo Formation; **TB**: Tarvisio Breccia; **GLM**: Goggau Limestone; **AF**: Amanda Formation; **VL**: Verrucano Lombardo; **VGS**: Val Gardena Sandstone; **BF**: Bellerophon Formation; **SE**: Servino Formation; **WF**: Werfen Formation; vertical lines: stratigraphic gap; crossed lines: cover. Fossils: **1**: tetrapod footprints; **2**: palynomorphs; **3**: macroflora; **4**: algae; **5**: bryozoans; **6**: foraminifera; **7**: fusulinids.; **8**: marine fossils.

Chronostratigraphical scales conform to those of Menning (1995) and Jin *et al.* (1998). The scheme includes a large number of radiometric data (in Ma) on intrusive (red) and volcanic (black) rocks generally cropping out between Lake Maggiore and the Val d'Adige region; the respective vertical lines indicate the assumed duration of the igneous activity in each area.





Question 1

The (**I**) and (**D**) formations have the same stratigraphical positions and paleogeographic significance, no lateral continuity. Do you judge them:

STRATIGRAPHIC CLASSIFICATION TEST n. 1

Question 2

What is (**G**)?

- a formation?
- an UBSU?
- other?

Question 3

How would you classify (**E**) and (**H**) ?

1) a formation ?
2) a group?
3) a synthem?
4) a complex?

Stratigraphic classification test n. 1