INTERNATIONAL SUBCOMMISSION ON JURASSIC STRATIGRAPHY

Newsletter No. 19

Copenhagen, November 1989

A SUBCOMMISSION OF THE INTERNATIONAL UNION OF GEOLOGICAL SCIENCES (IUGS)

NEWSLETTER NO. 19

Information

After ten years as chairman and secretary we regret to announce that this will be the last newsletter issued by us. A retrospect is given below.

On October 1st, Dr. R. Enay took over as chairman and Dr. Ch. Mangold as secretary. We wish them a fruitful period as officers for the Subcommission. Both nominations have now been officially confirmed by the Commission on Stratigraphy.

Prof. A. Zeiss will stay in the Subcommission as voting member and Prof. O. Michelsen as corresponding member. We will continue to take active part in the promotion of the necessary work.

The next Symposium on Jurassic Stratigraphy will be organized in Poitiers, 1992. The first circular is in preparation and will soon be sent out by R. Enay.

The next meeting of the Working Group on the Callovian/Oxfordian Boundary will be organized in the first half of September 1990 in Switzerland by R. Gygi, followed by the first meeting of the Bathonian/Callovian Boundary Working Group in Suebia (Württemberg) organized by J. Callomon in the second half of September 1990. The first circulars for these meetings have been sent out by the convenors some weeks ago.

With regret we report that in the last year two honorary members and one voting member of the Subcommission died (R.W. Imlay, G. Jeletzky and M. Mesezhnikov). We will honour their memory. Three obituary notices review their lives and scientific work (see page 7-15).

Arnold Zeiss Olaf Michelsen

Contents

Enclosed: Voting sheet

A retrospect on our decade of activity for the International Subcommisssion on Jurassic Stratigraphy (1978-1989)

Dear colleagues,

At the end of our activities as chairman and secretary of the ISJS we look back on a period of the subcommission which was characterized in the beginning by an attempt to revive activities after the break down of the "Sous-Commission du Jurassique" in the mid seventies. At that time the subcommission had no distinct tasks to solve. Thus we thought correlation would be the most necessary problem, and we tried to obtain approval for an international project by the IGCP board called "Jurassic bioevents". Much labour and time was invested in that procedure, and for the practical work three working groups were established. But the result was not encouraging: by the contra-vote of only one member of the board the project was prevented.

After this disappointment we tried to organize work with our own possibilities. The working groups turned out to be too large in this respect, as we had the intention that it would be better to concentrate the subcommission work on correlation and subdivision problems of smaller stratigraphic units like stages and substages. Also specialization of most Jurassic stratigraphers proved to be rather advanced and limited to one or two stages in general. Thus we tried to establish working groups on all Jurassic stages and to find convenors for them. Also for some of the more important Jurassic non-ammonite fossil groups such working groups were established.

Then we prepared the First International Symposium on Jurassic Stratigraphy, which after a long series of discussions and one year of hard work finally could take place in Erlangen, 1984. It brought together again the whole Jurassic community after nearly two decades (the last "Colloque du Jurassique" took place in Luxembourg 1967!). According to all echoes we received from the participants, this Symposium can be considered as a great success. Three Symposium Volumes of contributions and a Guide Book for the two excursions in the Jurassic system of Northern

and Southern Franconia display an overlook of the activities and status quo of Jurassic stratigraphic studies in the early eighties (Michelsen & Zeiss, ed. 1985). - The reorganized working groups on the Jurassic stages had the opportunity to hold their first meetings in Erlangen. A joint research project was proposed by John Callomon at the opportunity of Excursion B at Sengenthal and consequently two small field parties were organized there. The results have been published by Callomon and others (1987). - The next symposium was planned to be organized by Rogerio da Rocha at Lisbon in 1987.

In the meantime, in 1986, the Commission of Stratigraphy edited new Guidelines and Statutes for the work of the commission and its subcommissions. Therefore, we could concentrate all further activities of the ISJS mainly on the tasks which the commission put forward to be solved primarily (cf. Cowie et al. 1986). These were the problems related to the appropiate choice of boundary stratotypes, in our case with those of stages and series of the Jurassic system. It was clear that due to the complicated requirements for choosing a GSSP (Global stratotype section and point), the working groups had now to be reorganized once more to concentrate their work mainly on the problems of the lower boundary of the stage concerned. Formally, the names of the working groups were changed in consequence to stage boundary working groups. Some changes were necessary in the convenorship of those working groups. We hope that a somewhat more stable organization has been reached than in 1984.

The Second Symposium on Jurassic Stratigraphy took place in Lisbon 1987. Two volumes of contributions which demonstrate the enormous progress in Jurassic stratigraphy and related sciences during the last 3 years are in press. Also this symposium with its interesting and vivid discussion and excursions was successful and initiated the phase of active work in at least the majority of the working groups: In October 1987 we had the first meeting of the Tithonian Working Group in Pergola (Italy), in July 1988 the first field meeting of the Bajocian Working Group in Piobicco

and the Lessinian Alps (Italy), in September 1988 the first meeting of the Oxfordian Working Group in Zaragoza (Spain), in May 1989 the first meeting of the Bathonian Working Group in Nancy (France); for the Hettangian and Sinemurian Working Groups a field meeting was organized in the western United States (July 1989) which also included some Middle Jurassic sections.

The two workshops at Sengenthal in which members of various working groups participated, were organized in spring 1986 and 1987. A combined field meeting with English, French and German members of the ISJS took place in southern West Germany, spring 1989, to discuss the many new results of stratigraphic work in the area, especially those in the Middle Jurassic (Suebia and Sengenthal). Meetings of the Callovian and Oxfordian Working Groups are planned for September 1990 in southern Germany and Switzerland. All these working group meetings were organized to find appropriate boundary stratotypes, and possible candidates were discussed. The main problem has always been to find sections without break at the boundary and which can be documented by a continuous succession of guide fossils in the beds below and above the boundary. Also problems of having a too provincial faunal development in the type area have been recognized. Some possible candidates for stratotypes need a modern scientific research. These meetings, we hope, gave the stimulus to undertake such further investigation in the most important sections.

Very fruitful was also the collaboration with the Working Group of the Triassic/Jurassic Boundary, which held its first meeting at Lyons, November 1988, and with the Working Group of the Jurassic/-Cretaceous Boundary, which organized meetings in Moscow 1984, Sümeg 1985, and in the Caucasus 1987.

For the collaboration on a global aspect within the ISJS, we got very important suggestions and ideas by discussions at field meetings of the Circum Pacific Jurassic Research Group in Canada 1983, Argentina 1983, and Japan 1985. G. Westermann has provided an overlook over the Jurassic of many oversea areas, hitherto

rather unadequately known, in the series "Special Papers" and partly also in the Newsletter on Stratigraphy.

The subcommission itself tried to inform the members by editing a series of 19 newsletters, which besides the news often contained reviews of the Jurassic of various countries and other items of interest for Jurassic stratigraphy.

All these attempts would not have been possible if we had not had the cooperation of many members, who kindly sent us news of interest or a review for the newsletter; further we have to thank the convenors of the working groups in this respect as well as the members of the Circum Pacific Jurassic Research Group and its chairman, G. Westermann. Especially, we want to thank Rogerio da Rocha for the organization of the Second Symposium on Jurassic Stratigaphy, and G. Pavia, G. Melendez, G. Dietl, J. Callomon, F. Cecca, Ch. Mangold, and D. Taylor for the organization of smaller meetings of the subcommission and their working groups or field parties.

Without the active collaboration, interest and much idealism of many colleagues and friends to promote Jurassic stratigraphy, we would not have the good status as we have now. Of course, it is not possible to solve the boundary problems in short time, the rules being as complicated as they are, but we are at least close to be able to propose candidates for most of the Middle Jurassic stage boundaries at the Third Symposium on Jurassic Stratigraphy in Poitiers 1991, when the "Jurassic Family" will meet again. Thus we finish our short review of our activities, thanking all of you and saying

"Auf Wiedersehen in Poitiers, 1991!"

Arnold Zeiss Olaf Michelsen

Obituary notices

Ralph W. IMLAY (1908 - 1989)

We record with regret the passing of one of the great figures of all time in Jurassic geology. Ralph Imlay was born in 1908 in Hampton, Iowa. His parents were farmers, and the family moved west when Ralph was only about five years old, to a small rural community at Reedpoint, Montana, half-way between Bozeman and Billings. Those were still early days. As we drive through to-day on Insterstate 90, it is easy to forget that only this year, on November 8th, does Montana celebrate its first centenary of statehood in the Union. Ralph attended local school and it appears to have been one of his teachers there who awoke and nurtured his interest in natural history. He went on to study geology at the University of Montana in Missoula, obtaining his B.Sc. in 1930. The long summer vacations were spent helping on the farm, and this bred in him two habits that were to stay with him for the rest of his life - hard work and getting up at sunrise.

After his first degree, Ralph moved to the University of Michigan at Ann Arbor to undertake postgraduate work. He became involved in geological exploration of Mexico, directed by E.C. Case and L.B. Kellum and supported by the petroleum industry. He assumed the primary responsibility for the stratigraphy and palæontology of the regional Jurassic and Lower Cretaceous. Here he learned the American style and tradition of stratigraphy, with its heavy emphasis on the delimitation and naming of Formations and their Members. After obtaining his Ph.D. at Michigan, in 1933, Ralph took up a teaching position at Rutgers for a brief period before returning to Michigan as a member of the teaching staff in the Geology Department. This allowed him to continue his studies of the Mesozoic of Mexico, not only of material he had collected but also increasingly of that sent in by other field-parties from oil-companies needing dates for their rocks. He therefore became increasingly preoccupied with the identification of fossils, which led directly and naturally to the study of ammonites, their biostratigraphy and systematics. It was not an easy introduction to this intricate subject in those pre-*Treatise* days, but there at least existed already a substantial literature in the works of Burckhardt and others to serve as guide. These early studies involved mainly faunas from the Upper Jurassic and Lower Cretaceous They set Ralph off on a sustained career as a prolific author

with a series of papers carefully written with a clarity and maturity of style that was to stay with him throughout his career.

In 1940 Ralph Imlay joined the U.S. Geological Survey's Paleontology and Stratigraphy Branch in Washington, where he remained until his retirement. Its chief after 1942 was John B. Reeside, himself a lifelong student of the American Mesozoic, who was to exhert a strong influence in him. For the first five years he continued with researches in Mexico, which he expanded into a study of the Jurassic and Lower Cretaceous of the Gulf States and adjacent Caribbean islands. The evidence at outcrop was now integrated with subsurface data to produce a synthesis of the Mesozoic history of this important petroleum province that remains a standard to this day. But in 1945 began the programme that was to occupy him for the rest of his life: a systematic revision of the Jurassic sediments and molluscan faunas of the United States and Alaska.

The impetus seems to have been severalfold. The wide extent and distribution of Jurassic rocks in North America were by this time well known from a century of systematic mapping, by the Federal Survey, various State Surveys, and numerous oil companies. The details of age, facies and faunas were in general not known. Unlike Europe, there was no academic tradition in such studies, and with some halting exceptions in California by Crickmay, Lupher and Muller, the universities had contributed almost nothing. In the meantime there had accumulated in Washington a large store of spot collections of fossils from innumerable localities waiting to be evaluated, with an ever-increasing stream of new requests for dates and identifications from the Survey's field-men and others. There was also the programme of correlation-charts of all the Formations of North America initiated by the Stratigraphy Committee of the National Research Council in 1942 to be completed. The compilation of the Jurassic was undertaken by Ralph Imlay and published by the American Geological Society in 1952. It served as a valuable general survey which revealed amongst other things the presence in North America of a richness and diversity of Jurassic fossils hardly to be guessed at from the literature.

Leading amongst these faunas were once again the ammonites, now ranging in age from Lias to Upper Cretaceous. In describing them, there were now few precedents to serve as guide, and some

special problems. Although widespread and diverse, ammonites were rarely abundant at any one locality. By far the majority of the descriptions had to be based on the spot collections that had accumulated over the years, mostly from scattered localities whose relative stratigraphical positions ranged from the hazy to the unknown. Many of the forms were completely new, with only the barest resemblance to the classical standards of Europe. The few that had been described were buried in the pioneering literature of the previous century. Imlay found himself in 1953 the first reviser based on new collections of important species collected in 1855-5 by the Exploring Expeditions under Lieut. Warren of the U.S. Topographical Engineers to the Upper Missouri country, known as the Nebraska Territory; or by mineralogical expeditions under Peter Doroschin sent by the Imperial Ministry of Finance of St Petersburg to the settlements of Alyaska in 1847-52. The best that could be done, therefore, was to recollect, to rediscover the localities from which the old material had come and hence to establish the stratigraphical relationships as far as this was possible - an enormous task, considering the vast areas involved. Ralph tackled it with energy and enthusiasm, for he loved field-work. Every summer would find him somewhere in the far corners of the U.S., away from the steamy heat of Washington, either on his own or in the company of one of the mapping parties. The importance of his contributions in this direction may not immediately strike the reader of his monographs, for they are modestly hidden among the details of all the other sources. But they emerge clearly in the enormous breadth of knowledge that he demonstrated in his more general reviews. Many new taxa had to be named, but Imlay deliberately took a conservative approach because he never regarded himself really as an expert qualified to pronounce with deep authority on matters palaeontological.

The main outlet of his scientific results was in the *Professional Papers of the U.S. Geological Survey*, of which some 30 bear his name. They are written in a very uniform style which differs markedly from that of analogous European works, and those of us brought up in the European tradition have not always found them easy to use. But this style was deliberately adopted in response to the special circumstances mentioned above. In

choosing it, Ralph again had few precedents to guide him. It was probably no accident that the style he finally adopted was that set by his mentor during his early years at the Survey, Reeside, for his monographs are modelled closely on the latter's famous study of the American Cardioceratidae that appeared as *U.S. Geological Survey Professional Paper 118* in 1919. They culminated in a masterly and exhaustive review, "Jurassic paleobiogeography of the conterminous United States in its continental setting" that appeared as *Professional Paper 1082*, in 1980, two years after his formal retirement at the age of 70. In its breadth it is almost as if it had been planned all along as a final report on a lifetime's work, completed and on time. Nothing brings out more strikingly the progress made than to compare the review of 1980 with that of the *Correlation Charts* of 1952. Ralph Imlay's contributions to our knowledge of the Americal Jurassic and Lower Cretaceous are monumental. They have become famous, are authoritative, and will endure.

As a man, Ralph Imlay might perhaps have been most simply described as "old-fashioned" by the standards of to-day. He was wholly devoted to his work and to his family. His modesty made him avoid public office or administration as much as he could, although he was elected President of the Paleontological Society in 1964. He did not like travelling abroad and going to conferences although he was always ready to contribute review articles on the Jurassic of North America to their volumes of proceedings. The William Smith Symposium in 1969 was one, perhaps even the only, occasion when we could show him something of the classical Jurassic in Europe. Above all, he was proud to be a "Survey man" which he regarded as a privilege, for he had a deep historical sense of tradition. In return he had strong sense of professionalism as a duty, which he expressed in an unstinting readiness at all times to help his colleagues and other enquirers outside. Collections submitted to him for evaluation resulted in prompt Reports; the volume of these on file in the Survey probably exceeds all his published works. I last met Ralph in 1982 when I stayed with him at his home in the northern suburbs of Washington. We talked about many things: his family, which he had managed to trace back to immigrants in the late eighteenth century (Gilbert Imlay: *A topographical description of the Western Territory of*

North America; containing a succinct account of its climate, natural history, population, agriculture, manners and customs; ... laws and government of the State of Kentucky, London, 1792 [*Brit.Mus.Gen.Cat.Pr.Books* 980.g.28], with later editions in Dublin and New York, 1793 (... *including the adventures of Col. D. Boon* ...)); his wife Bertha, whom he had met at the University of Montana and married in 1931, and whose death in 1978 was a loss from which he never recovered; his three sons, each launched on a successful career, in which he took great pride; and those whom he regarded as his teachers, notably John Reeside. The qualities that he admired in others come out very clearly in the Memorial Notice he wrote for Reeside in 1959 (*Geological Society of America Proceedings*, Annual Report for 1959, p.173-8). He was modestly proud of his own achievements and thankful for a career that had given him fulfillment in allowing him to do what he loved most, geology. He was a remarkable man. I shall always remember him with respect and affection.

J.H. Callomon
University College London
September 1989

Jurij (George) Alexander Jeletzky

June 18, 1915 - December 4, 1988

From the "Citizen", Ottawa, December 7, 1988

JELETZKY, George
(40 years - scientist with Geological Survey of Canada). On Sunday, December 4, 1988. Friends may attend a Memorial Service at Hulse and Playfair, Central Chapel, 315 McLeod Street, on Tuesday at 8 p.m. Funeral Service at Hulse and Playfair on Wednesday at 10 a.m. Interment Pinecrest Cemetery. Donations to the Ottawa General Hospital Cancer Clinic, 501 Smyth Road, Ottawa, Ontario, K1H 8L6 would be appreciated. Grieving family.

J. A. Jeletzky (1915-1988)

J. A. (George) Jeletzky was one of the major figures in Jurassic and Cretaceous paleontology when he died on December 4, 1988. Born Jurij Alexandrovich Romanov at Pensa, Russia, Dr. Jeletzky adopted his stepfather's name Jeletzky in 1930 and became 'George' to friends and colleagues upon arrival in Canada in 1948. George graduated as a geologist in Kiev in 1938, completed graduate work in 1941, and moved to Germany in 1943. During these difficult times he supported his extended family, continued to publish on Late Cretaceous stratigraphy and belemnites of Europe and was able to keep his belemnite collection intact, demonstrating the tenacity and determination for which he is known.

George began his prolific career in Canada when the Geological Survey of Canada required expanded paleontological expertise and was hiring specialists from around the world. He began primarily as a Jurassic worker but soon switched into the Cretaceous where he was to remain. His scientific interests were broad and he made major contributions to several fields. He fitted well into the Survey's policy of conducting fieldwork and office studies simultaneously and became known for wide-ranging publications on Canada's geology and Cretaceous molluscan paleontology. He maintained strong ties with colleagues from outside the Survey, for whom he was always available to identify and date fossils and discuss regional geology.

In Canadian geology, George's first field area was northwestern Vancouver Island on the Pacific coast. This is an area of limited exposure, complex stratigraphy, faulting and folding. As became his trademark, George worked hard to find fossils where there are few and to get the utmost out of the data available to produce descriptions and interpretations that set a style for both detail and regional synthesis, extending far beyond his mandate to unravel Cretaceous biostratigraphy and stratigraphy. In the early 1950's George's work centred mainly on northern Yukon, where he made major contributions to our knowledge of the Mesozoic stratigraphy and structural geology. Subsequently, George worked extensively in many areas of western British Columbia, collecting fossils and describing strata and relationships from some of the world's most beautiful and demanding terrain.

Internationally, George Jeletzky is best known for his comprehensive evolutionary study of the Coleoidea, an outgrowth of his first love, the belemnites. Recognized long ago as the principal authority on this group, he was invited to coordinate the Coleoidea volume of the "Treatise on Invertebrate Geology", with which he was still concerned at the time of his death. A major preliminary report was published by the University of Kansas Press in 1966. He is also known for his detailed studies of the bivalve Buchia. Superficially a small and uninspiring shell, this genus has immense importance in the Boreal Province, including Canada, for correlation and subdivision of Upper Jurassic and Lower Cretaceous strata, which contain few other fossils. George's work of synthesizing and revising the buchias worldwide, and applying the results in Canada, is of major importance to western Canadian geology, where strata of this age are thick, lithologically monotonous, complexly deformed and areally extensive.

More recently, he published extensively on latest Jurassic and Early Cretaceous ammonite taxonomy. Each of his taxonomic endeavours has been accompanied by major studies of the evolutionary, biogeographic and biostratigraphic significance of the group. His broad knowledge of Late Jurassic and Early Cretaceous molluscs led to an invitation to study the fossils recovered by the Deep Sea Drilling Project from Falkland Plateau.

He had a strong sense of responsibility for teaching and defending what he thought was right. For protegés, including myself and others who became professional paleontologists or geologists, and colleagues alike he could be counted on to give of his time with instruction and advice, always frank and outspoken. Much of the advice related to the need for good detailed work before reaching conclusions, and for maintaining a strong defense of what one believed to be right. His defense of paleontology as the supreme tool for dating rocks was legendary. George had no time for the lazy, the hypocritical, nor for the bandwagon. Till near the end he continued to battle against plate tectonics, which he considered to be unsupported by the distribution of the fossils and rocks that he knew best. Colleagues with what he thought to be imperfect arguments could expect forthright criticism, while others earned his open respect with hard work and diligent attention to detail. A source of both frustration and respect for some of his scientific managers, George championed the role of science and scientist as central to the Geological Survey of Canada.

George worked "part-time" for the Survey after his official retirement in 1981, still out-working colleagues half his age until a few days before his death, which followed a two-year battle with cancer. Even while ill, George continued to advocate his causes and, by his optimistic fortitude, to increase the respect he has earned in the paleontological community.

George Jeletzky was honored as Fellow and Miller Medalist of the Royal Society of Canada and Billings Medalist of the Geological Association of Canada. In 1982 he was honored, together with R.W. Imlay, also recently deceased, at a symposium of the Geological Association of Canada Symposium on the Jurassic and Cretaceous of North America, published as GAC Special Paper 27 in 1984.

T. P. Poulton
Geological Survey of Canada

TO THE MEMORY OF PROFESSOR
MIKHAIL SEMENOVICH MESEZHNIKOV

An outstanding Soviet geologist, stratigrapher and paleontologist, M.S.Mesezhnikov, aged 57, passed away on February 27, 1989, in Leningrad. He was the leader in the studies on the Jurassic system of the USSR. His scientific interests were exclusively broad; they covered the problems of regional and general stratigraphy and interregional correlation, the Boreal Jurassic ammonoids, the theory and practical use of zonal stratigraphy, including its application in petroleum geology . All this was reflected in his numerous (over 200) and widely known scientific publications.

In the last years, M.S.Mesezhnikov was at the head of the Jurassic Commission of the Interdepartmental Stratigraphic Committee of the USSR (ISC). He took an active part in the work of international groups on the Jurassic stratigraphy and the Jurassic Cretaceous boundary.

M.S.Mesezhnikov was an excellent friend and a thoughtful leader for many stratigraphers and paleontologists. His death is a tragic loss which will be felt for a very long time.

G.Ya.Krymholts
Professor
Honorary Chairman of the
Jurassic
Commission of the ISC of the USSR

Proceedings of Juras. Subcomm./IGCP # 171 meeting in Washington,D.C., July 15. 1989 on:

JURASSIC STAGE BOUNDARIES IN SOUTH AMERICA

During the last 15 years many ammonite assemblage zones have been defined for west-central Argentina and northern Chile by A.C. Riccardi, G.E.G. Westermann, A.v. Hillebrandt, H. Leanza, , etc., and, most recently, also several standard zones , especially for the Middle Jurassic; several standard zones established in Europe and two from North America have also been applied in the Southern Andes. Precise correlation of the Andean zones with the standard European succession, however, naturally remains difficult to achieve, especially during times of strong endemism, e.g. the mid-Jurassic East Pacific Subrealm. Thus , while all Jurassic stages can be identified in the Andes, their precise boundaries will remain uncertain to place in the sections. We therefore propose to define Andean supplementary stratotypes for the Jurassic stages, i.e. for the respective Andean standard zones.

Base of Jurassic (Hettangian)

Transitional Triassic/Jurassic section in marine (ammonite bearing) facies is required, but the uppermost Triassic is usually non-marine or unfossiliferous, even where marine Hettangian is present,e.g. at Arroyo Malo in the Rio Atuel area, Argentina (Riccardi et al.1988, V. Cong.Geol. Chil.,2:C359-379).

A possibility exists in central Chile, where south of Los Vilos (Coquimbo & Aconcagua Provs.). The Shaly Member (205 m) in the lower Los Molles Formation has yielded below a Norian fauna of Arcestes cf. andersoni Hyatt & Smith, Cladiscites sp., Oxytoma cf. inaequivalvis (Sow.) and (?)Minetrigonia aff. otamitensis (Trech.); in the middle a bivalve fauna of Cardinia? cf.listeri (Sow.) and Otapiria cf. ussuriensis (Vor.) of possibly latest Triasic age; and above an Hettangian ammonite sequence of the Planorbis and Angulata Zones, closely resembling sequences in Peru (Cecioni & Westermann 1968, Pac. Geol. 1: 41-73). However the sequence is in continental- slope facies and the latest Triassic faunas are not very useful chronostratigraphically. New investigations of this section may improve this record, although the Triassic part yields few ammonites, and turbidites tend to confuse biostratigraphy.

Better sections yielding more usefull ammonite and bivalve faunas have been reported from northern Chile (Hillebrandt & Groschke 1986, Berliner Geowiss.Abh.,A, 66: 169-190), including the cosmopolitan, uppermost Norian zonal index Choristoceras and Lower Hettangian. Other good Triassic/Jurassic marine sections

are currently being investigated by A.v. Hillebrandt (pers. comm.) in Peru, so that this critical boundary may best be regionally defined (supplem. stratotype) in either N.Chile or Peru.

Sinemurian

Supplementary stratotype: Arroyo Malo, Rio Atuel area, Mendoza (Riccardi et al.1988, op.cit.); base of Badouxia canadensis Zone (of Frebold 1957, Geol. Sur. Can. Bull. 158: 1-35--N. America).

The Canadensis Zone (standard zone for North and South America, needs to be defined), to be placed at the basis of the Sinemurian (Guex & Taylor 1976, Ecl. Geol. Helv. 69: 521-526; Taylor 1986, Newsl. Strat. 16: 57-67); stratotype could be designated either at Lake Taseko, British Columbia or at Shoshone Mountains, Nevada (Frebold 1957, op.cit.; Guex & Taylor 1976, op.cit.)

Pliensbachian

Supplementary stratotype: Rio Atuel area, Mendoza (Riccardi et al.1988, op. cit.); at base of Miltoceras faunule(= upper Apoderoceras-Eoderoceras Zone of Hillebrandt 1987, Biostrat.Sist. Reg. Jur. Cret. Am. Sur : 111-147; see Riccardi et al. 1989, Newsl. Strat., in press). But additional work is required to establish zone. Following widely distributed East Pacific Dubariceras Association (with Tropidocera"zone", below, and Dubariceras "zone",above; zones of Hillebrandt 1987, op.

cit.; see Riccardi et al. 1989, op. cit.).

Toarcian

The choice of possible supplementary stratotype is large because of the ubiqitous distribution .

Hillebrandt and Schmidt-Effing (1981, Zitteliana 6: 3-74)) have recognized the Europoean Tenuicostatum Zone in Chile and ? Argentina. No new Andean zone, yet a regional suppl.stratotype for this cosmopolitan standard zone would be required. However, basal Toarcian ammonite faunas in the Andes are notoriously empoverished , at least in Argentina.

The zonal suppl. stratotype will have to meet two conditions:

1.Established presence of Tenuicostatum Zone, based on dactylioceratids (Hillebrandt & Schmitd-Effing 1981, op. cit.) and harpoceratids.

2. Presence of uppermost Plienbachian.

Aalenian (Lower/Middle Jurassic boundary).

At the base of the Manflasensis Zone (Bredyia manflasensis Assemblage Zone of Hillebrandt & Westermann 1985, Zitteliana 12: 3-55). Suppl. stratotype either

1. Manflas (loc. 4 of Hillebrandt in. Hill.&West., op.cit.); thin and partly probably "condensed" section; present subjacently is the uppermost Toarcian "Pleydellia fluitans Zone". The presence of beds coeval with the Opalinum Zone, however , cannot be established , but is probable.

2. Sierra de Reyes, Mendoza (Riccardi & Westermann , in press).

The somewhat remote section has so far been studied by C. Gulisano only : it appears to be relatively thick and compete at the Aalenian/Bajocian boundary ; the Manflasensis Fauna is well developed.Additional work is required.

Bajocian

The base of the Singularis Zone (for Pseudotoites singularis Assemblage Zone of Westermann & Riccardi 1979, Palaeontographica, A, 164:85-188) needs to be defined as the stage boundary, although it may be within the Discites Zone (impossible to establish precisely because of quasi-absence of Graphoceratidae from Circum Pacific area). The subjacent Malarguensis Zone fauna has clearly Aalenian affinities.

The zonal (and ,hence, stage) stratotype is at Cerro Puchenque, Mendoza Prov., and the base is defined as between bed 13 (with Sonninia cf. zitteli) and bed 14 (with Puchenquia malarguensis), 3 m below (Westermann & Riccardi 1972, p.17).

Bathonian

Problematic because ammonite fauna of clearly Early Bathonian age are yet unknown from the Andes (as elsewhere in the Circum Pacific). Possible sections are:

1. Chacay Melehue, Mendoza Prov.(Riccardi et al. 1989, Geobios, in press); latest Bajocian beds with Lobosphinctes appear to be directly overlain by turbidite bearing a mixed Middle/Upper Bathonian fauna ,i.e. the Cadomites-Tulitidae mixed assemblage in which the Cadomites fragments are reworked and early Tulitidae

in the matrix. The beds with Lobosphinctes and the superjacent levels need to be reinvestigated for possible basal Mid-Bathonian.

2. Cordillera Domeyko (Quebrada del Profeta) in northern Chile (Hillebrandt 1970, N. Jb. Geol. Pal. Abh. 136: 166-211 and 1973, Münster. Forsch. Geol. Pal. 31/32: 167-199; Riccardi & Westermann, unpubl.) appears to have a thick Late Bajocian/ Early Bathonian section, but it is poorly fossiliferous.

Callovian

Suppl. Stratotype at Chacay Melehue, Mendoza Prov.; stratotype of Vergarensis Zone (Riccardi et al. 1989, Geobios, in press; for Eurycephalites vergarensis Assemblage Zone); base defined at level 267. Subjacent is the Stehnocephalites gerthi horizon of the Steinmanni Zone : or , in Chile, the Choffatia jupiter horizon of the Steinmanni Zone. The Vergarensis Zone is also recognized in Southern Mexico (Sandoval et al. 1989, Paleontographica, A, in press).

Oxfordian

Sections with Callovian/Oxfordian marine transition are unknown from Argentina. In northern Chile this transition may be present (Groeschke & Hillebrandt. 1985. N. Jb. Geol. Pal. Abh.170: 129-166). (Hillebrandt, pers. commm.).

Kimmeridgian

Note that the "Kimmeridgian" of A. Leanza (1947, Dir. Nac. Geol. Minas Inf. Prelim. Comun. 1: 1-24) from Neuquen has turned

out to be Callovian (Dellape et al.1979, Obra Cent. Mus. La Plata 5: 81-105). Marine Kimmeridgian is missing in Argentina, with the possible exception of the High Andes : Ataxioceratids ("Virgatosphinctes") appear to ber present in the Cerro Aconcagua area, Mendoza Province (Aguirre Urreta M.B., pers. comm.).

Isolated Middle Kimmeridgian occurrances are known from northern Chile (Forster & Hillebrandt 1984, Mitt. Bayer. Staatssamml. Palaeont. Hist. Geol. 24: 67-84), where the best prospects exist to find the Oxfordian/Kimmeridgian boundary beds.

Jurassic/Cretaceous boundary

(a Cretaceous problem !)

A good marine transition is exposed in west-central Argentina, between the koeneni and noduliferum zones (A. Leanza 1947, Geol. Soc. Amer. Bull. 58: 833-842).

Gerd E. G. Westermann (Hamilton, Canada)

Alberto C. Riccardi (La Plata, Argentina)

The problem of the name of the uppermost Jurassic stage

During the Second Symposium on Jurassic Stratigraphy at the working group meetings on the Oxfordian/Kimmeridgian boundary and the Kimmeridgian/Tithonian boundary the present usage of the stage names Kimmeridgian and Portlandian (s. gallico, s. anglico), Tithonian and Volgian was thoroughly discussed. The different present usage may be demonstrated in the following table:

Mediterranean, Submediterranean, Pacific, Indian Antarctic	Subboreal	England	Boreal, France p.p. Portugal
Tithonian	Volgian	Portlandian Kimmeridgian	Portlandian
Tithonian	Volgian		Portlandian
Kimmeridgian	Kimmeridgian	Kimmeridgian	Kimmeridgian

This different usage leads to many confusions, especially if it is not indicated in the text, in which sense the chronostratigraphic units are used. At the meeting in Lisbon, 1987, most of the participants were fully aware that a unification of the usage is urgently needed. Subsequent discussions showed a nearly unanimous opinion of the participants to use the term Tithonian as the general stage name for the uppermost Jurassic stage in future, as this term is used already now in most parts of the world. The base of the Tithonian stage is the base of the Hybonotum Zone, which needs to be fixed in a stratotype section. The base of the Hybonotum Zone is approximately corresponding to the base of Gravesia Zone of the subboreal realm, or to the time-equivalent zone of the type Volgian (Klimovi Zone).

The term Portlandian (sensu gallico, sensu anglico) is only used in a very restricted area of the globe and in different meanings,

following a different interpretation of d'Orbigny in France and England. Therefore, despite the historical role of the stratigraphic name in NW-Europe and Portugal and some other countries, further confusion is possible, especially for those geologists, who are not acquainted with the different meanings of this name.

Therefore, we propose in future only to use the name "Tithonian" for the uppermost Jurassic stage. Until the difficult correlation problems between the mediterranean, pacific, and boreal regions have been solved better, the term Volgian may be used in boreal regions. The time-span of the Volgian seems to be approximetely equivalent to the Tithonian stage, and both stages have nearly the same lower boundary level. The same solution has been proposed by the Jurassic/Cretaceous Boundary Working Group.

The top of the uppermost Jurassic stage has to be fixed by the Jurassic/Cretaceous Boundary Working Group by choosing a stratotype for the lower boundary of the lowermost Cretaceous stage. At this moment the top of the Volgian and Tithonian seems to be somewhat different in age (depending on the definition of the base of the lowermost Cretaceous stage, the Berriasian), what has also been recognized by the Jurassic/Cretaceous Boundary Working Group.

As a voting on the further usage of the name of the uppermost Jurassic stage has been proposed in Lisbon, we ask you to mark your opinion on the enclosed voting sheet by a cross, and to send back the filled-in votes to Arnold Zeiss, chairman of the uppermost Jurassic Stage Working Group.

At the meeting of the Kimmeridgian Working Group a voting has also been proposed to formalize the usage of the Kimmeridgian sensu gallico. The Kimmeridgian is a continuous source of misunderstandings, similar to those of the Portlandian. In most regions of the globe the Kimmeridgian is used in the restricted sense as it has been used already by Albert Oppel in the last century (with the only minor modification of the inclusions of the H.beckeri Zone in the upper part), while mainly in England it is used in the expanded form (as redefined by Arkell). As we have prefered to use the Tithonian as the uppermost Jurassic stage in

future, it is strongly recommended consequently to use the Kimmeridgian in the sensu gallico (i.e. in the reduced) version. Therefore, a voting seems useful also on this problem, and we also ask for your opinion about this question, which is closely related to the first problem.

We ask all members to return the filled-in voting sheets; for the decision, of course, only the votes of the voting members are valid. The others will be counted in order to get a picture of the general opinion on the problem by all members.

Arnold Zeiss