International Commission on Stratigraphy

SUBCOMMISSION ON CRETACEOUS STRATIGRAPHY

ANNUAL REPORT **2015**

TITLE OF CONSTITUENT BODY and NAME OF REPORTER

Subcommission on Cretaceous Stratigraphy (SCS)

SUBMITTED BY
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OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

- *To facilitate international communication in all aspects of Cretaceous stratigraphy and correlation*
- *To establish a standard global stratigraphic subdivision and nomenclature for the Cretaceous, as part of the ICS standard global stratigraphic scale;*
- *To produce a stratigraphic table displaying agreed subdivision to substage level and intervals of disagreement, marking boundaries that are defined by a GSSP.*

ORGANIZATION

SCS is a Subcommission of the International Commission on Stratigraphy.

Membership: Chair: Prof. Malcolm Hart, UK
Vice Chairs: Dr James Haggart, Canada
Dr Brian Huber, USA
Secretary: Prof. Bruno Granier, France

[Note that nominations/elections are in progress for the 2016–2020 period;
Dr James Haggart is standing down after serving two terms.]

In addition, there are **18** Voting Members of the Subcommission, from most continents. Over 130 Cretaceous scientists from all over the world and in many different disciplines belong to one or more of the 9 Stage Working Groups of the SCS still active, or to the Kilian Group. All WG members are treated as Corresponding Members of the Subcommission. Effectively, anyone with interest and expertise that can contribute to our objectives is welcome to do so. ***The great bulk of the Subcommission's work is carried out by these Working Groups***.

Officers for 2013-2016:

Chair:	Prof. Malcolm Hart (Plymouth, UK)
Vice-Chairs:	Dr James Haggart (Canada)
	Dr Brian Huber (Washington D.C., USA)
Secretary:	Prof. Bruno Granier (Brest, France)

Thanks to Silvia Gardin, former SCS secretary for her work with the website. The SCS website is now relocated at http://www.univ-brest.fr/geosciences/ISCS/

INTERFACES WITH OTHER INTERNATIONAL PROJECTS

The Subcommission has liaised with successive meetings of the *International Cretaceous Symposium*, which until 2004 have been promoted by the German *Subkommission für Kreide-Stratigraphie*. The SCS has since taken over the responsability for selection of future venues, though the successful applicants will organize individual congresses. The *8th International Symposium on the Cretaceous System* was held in Plymouth during September 2009, and the *9th International Symposium on the Cretaceous System* was held in Ankara (Turkey) during September 2013. This Symposium was held from the 1st to 7th September 2013 at the Middle East Technical University in Ankara. The local organisation was managed by Ass. Prof. Dr. Ismail Omer Yilmaz, who will also act as an Editor of a special volume of *Cretaceous Research*. The *10th International Symposium on the Cretaceous System* is planned for July or September 2017 and will be held in Austria (Vienna or Saltzburg) organised by Prof. M. Wagreich.

The Subcommission also liaises closely with the Subcommission on Jurassic Stratigraphy over the definition of the Jurassic/Cretaceous boundary.

The Subcommission had strong links with IGCP projects: IGCP 507 – "Cretaceous paleoclimatology", IGCP Project 506 - Marine and Non-marine Jurassic: Global correlation and major geological events (Project Co-Leader W. Wimbledon) and IGCP Project 608 "Asia – Pacific Cretaceous Ecosystems". The 1st Meeting of IGCP 608 was held at the Birbal Sahni Institute of Paleobotany over the Christmas period in December 2012.

IGCP 609 "Climate-environmental deteriorations during greenhouse phases:Causes and Consequences of short-term sea-level change" involves many Cretaceous workers and has had its 1st meeting in Ankara (2013), a 2nd meeting in Bucharest (2014) and a 3rd meeting in Nanjing (September, 2015).

SCS has always been directly or indirectly linked to important international Projects such as IODP, IGCP, CHRONOS (Mesozoic Planktonic Foraminifera Working Group, MPFWG), EARTH TIME EUROPE (ESF-European Science Fundation), and ICDP (International Continental Scientific Drilling Project).

CHIEF ACCOMPLISHMENTS IN 2014 and 2015

Highlight

One of the most important highlights for 2014 was the inscription of the Stevns Peninsula (Denmark) on the UNESCO World Heritage List. The Stevns Peninsula was 'inaugurated' at a reception on the 22nd October 2014, graced by Her Royal Highness Princess Marie of Denmark. The Cretaceous Subcommission applauds the work of Tove Damholt and Finn Surlyk in achieving this international recognition for an important Cretaceous succession. Reference to the nomination document is given below.

Damholt, T. & Surlyk, F. 2012. *Nomination of Stevns Klint for inclusion in the World Heritage List*. Østsjælands Museum, St. Heddinge, Denmark

General Activities

A wealth of data on various aspects of Cretaceous stratigraphy has continued to be published during 2013 and 2014 providing a continuous stream of new data that spans the whole Cretaceous in increasingly higher resolution. This is particularly true in the fields of stable isotopes and the astronomical tuning of sedimentary sequences.

Battenberg, S.J., Sprovieri, M., Gale, A.S., Hilgen, F.J., Hüsing, S., Laskar, J., Liebrand, D., Lirer, F., Orue-Extebarria, X., Pelosi, N., and Smit, J., 2012, Cyclostratigraphy and astronomical tuning of the Late Maastrichtian at Zumaia (Basque country, Northern Spain): *Earth and Planetary Science Letters*, v. 359–360, p. 264–278.

N. Thibault, D. Husson, R. Harlou, S. Gardin, B. Galbrun, E. Huret, F. Minoletti, 2012. Astronomical calibration of upper Campanian–Maastrichtian carbon isotope events and calcareous plankton biostratigraphy in the Indian Ocean (ODP Hole 762C): Implication for the age of the Campanian–Maastrichtian boundary. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **337–338**, 52–71.

Important Cretaceous GSSP issues were discussed in two sessions at the STRATI meeting in Graz, July 2015. One session was a general meeting of the SCS at which the chair presented the current status of Cretaceous GSSPs, followed by general discussion. The other session was a Thematic Session comprising papers on the J/K boundary (base Berriasian GSSP).

The Kilian Group (Lower Cretaceous Ammonite Working Group).

The Kilian Group met in September 2013 at the 9th International Symposium on the Cretaceous System in Ankara (Turkey). The Kilian Group has focussed on the Berriasian, Valanginian and Hauterivian stages, attempting to calibrate different ammonite zonations of the Tethyan, Boreal and Austral realms with the "standard" Mediterranean region zonation.

Reboulet, S. & 18 others, 2014, Report on the 5th International Meeting of the IUGS Lower Cretaceous Ammonite Working Group, the Kilian Group (Ankara, Turkey, 31st August 2013). *Cretaceous Research*, v. 50, p. 126–137.

The Berriasian GSSP and the J/K boundary.

This is a summary of progress for the Berriasian WG, written by the chair, W.A.P. Wimbledon.

Since the setting up of a new Berriasian Working Group in July 2007, there has been a new phase of activity on refining Tithonian and Berriasian correlations, in particular, directed towards addressing the outstanding issue of the choice of a Jurassic/Cretaceous boundary. The J/K boundary level is one where long-range correlation is difficult. Both austral and boreal regions were isolated and far from Tethys, had more impoverished biotas; also, extensive areas of the world were then land with non-marine sedimentation and biotas. Therefore, there has always been much effort put into trying to improve correlation between marine to non-marine areas and from the core area of oceanic Tethys to isolated seas, seaways and landlocked basins towards the two poles.

A decision was made early by the Berriasian WG to dispense with previous diversions and pre-occupations, and to direct all energies towards factual matters that would promote a decision on selecting a primary marker for the base of the Berriasian. Therefore, the WG has concentrated on the detailed documentation of known key sections and seeking out new useful localities, giving special attention to integrating data from as many fossil groups as possible, vitally and preferably calibrated with magnetostratigraphy. Numerous sites, from California and Mexico to Tibet and the Russian Far East, have been studied and assessed. Past decisions dictate that a Tithonian/Berriasian boundary and a GSSP should be defined in marine sequences in Tethys. Tethys was the largest geographical entity at that time, and thus many sites in western Tethys have received special attention. Work in the last several years has concentrated on calibration of markers in an attempt to construct a useful matrix that will constrain a boundary level near to the base of the Berriasella jacobi Subzone, in magnetozone M19n. Unlike some upper Cretaceous stages, where one fossil taxon is the only useful tool for definition of a GSSP, in Tethys in the Tithonian/Berriasian boundary interval several groups may be present and complement one another, so that calpionellids, calcareous nannofossils, dinoflagellates, radiolarians and ammonites may all contribute to give an integrated matrix. The intention has always been to define a GSSP level in Tethys and then use all available proxies to derive correlations of chosen biotic markers with the more problematic marginal regions towards the poles and on the continents

Prior to 2007, J/K correlation had already shifted away from a concentration on ammonites. This was because widespread endemism in ammonites had been been repeatedly recognised as an obstacle to correlation, even in western Tethys. Various authors have attempted definition of the boundary level using calpionellids, nannofossils, radiolaria etc, and magnetostratigraphy. In recent times, calpionellids have been seen as the most useful fossil group, and the turnover from *Crassicollaria* species to small orbicular *Calpionella alpina, Crassicollaria parvula and Tintinopsella carpathica* has been documented consistently as a widespread marker in the middle part of M19n.2n. At the WG meeting in Warsaw in October 2013, the consensus was in favour of using *C. alpina* as the primary marker for the boundary. This level lies in the interval traditionally labelled as the "Berriasella jacobi Subzone" (though the ammonite faunas are being radically revised), and it is constrained also by the FADS of species of nannofossil (*Cruciellipsis cuvillieri, Nannoconus wintereri, Hexalithus geometricus* and *Nannoconus globulus globulus*). Work focuses also on finding proxies for these key markers in the biotically impoverished austral and boreal regions and in non-marine areas. A decision by the Berrriasian Working Group on the primary marker for the Tithonian/Berriasian boundary is expected soon and the suggestion of a contender GSSP later in 2016.

In 2015, the WG held a workshop in France in May (St Privat, Gard) with a visit to Berrias; members contributed talks to the Strati Meeting at Graz in July; members of the WG were amongst the organisors and speakers at the IGCP 632 conference on J/K correlations at Shenyang, China, in September; and, simultaneously, Russian colleagues held an all-Russian meeting on the J/K topic at Samara, on the Volga.

Base Valanginian GSSP.

In the absence of magnetic signals in the Montbrun-les-Bains section, so far the primary candidate for the Valanginian GSSP, and in general in all the southern France successions, scientists from Spain suggest that the alternate sections near Caravaca (SE Spain) should be reconsidered by the WG. The detail synthesis of the biostratigraphic and magnetic events provided by Aguado et al. (2000) shows that the Spanish sections, especially the Caneda Luega, are the only ones in the world where a direct correlation could be made between magnetic chrons and ammonite-nannos-calpionellid zones at this level. Meanwhile, Stephane Reboulet and colleagues are currently gathering new data at Montbrun-les-Bains (S. France) and, in addition, undertaken the study with a multidisciplinary approach of the Vergol section, which has the advantage of including also the base of the Upper Valanginian.

Barbarin, N., Bonin, A., Mattiol,i E., Pucéat, E., Cappetta, H., Gréselle, B., Pittet, B., Vennin, E. & Joachimski, M. 2012. Evidence for a complex Valanginian nannoconid decline in the Vocontian basin (South East France). *Marine Micropaleontology*, **84-85**, 37–53.

Base Hauterivian GSSP.

The section at La Charce section (Drome, France), is the probable candidate for the Hauterivian GSSP. There was an 'event' (on the 5th December 2014) at Serre de l'Ane near La Charce in the Department of Drôme (France). This is at the site of the proposed GSSP for the Valanginian-Hauterivian boundary, and accepted by the Hauterivian Working Group. Luc Bulot and Stephane Reboulet have indicated that the formal proposal will shortly be submitted to the SCS. Once this is done, and approved, there should soon be an agreement on the proposal and the GSSP can proceed to official ratification.

Base Barremian GSSP.

In the 2014 Report of SCS there were extracts of a report, prepared by Peter Rawson (Chairman of the WG) and Miguel Company (Vice-Chair), is a summary of the formal proposal of the Río Argos section as GSSP of the Barremian stage, which will be submitted shortly to the Sub-commission for approval.

The candidate section is located on the right bank of the River Argos, some 8 km west of Caravaca (SE Spain). From a geological point of view it belongs to the Subbetic Domain, which corresponds to the pelagic domain of the southern passive margin of the Iberian plate during the Alpine cycle (Triassic-Miocene). The analyzed interval of the section (beds 144 to 193) is 40 m thick and encompasses the uppermost Hauterivian (*Pseudothurmannia ohmi* Zone, with the *Ps. ohmi*, *Ps. mortilleti* and *Ps. picteti* Subzones) and the lowermost Barremian (*Taveraidiscus hugii* Zone, with the *T. hugii* and *Psilotissotia colombiana* Subzones). The lithological succession consists of a monotonous alternation of marls and marly limestones, belonging to the Miravetes Formation, only broken by the occurrence of a thin laminated black shale interval near the base of the section (bed 148), which represents the local equivalent of the Faraoni Level, a well-known organic-rich horizon that has been recognized within the uppermost Hauterivian sediments in several basins of the western Mediterranean Tethys.

The Río Argos section has provided a rich and diverse ammonite fauna, which has been the subject of several studies. We have collected more than one thousand specimens from the studied interval. All of them belong to Mediterranean taxa.
The primary marker event of the base of the Barremian stage (first occurrence of *Taveraidiscus hugii*) has been recorded in bed 171 (23 m above the base of the studied interval). Other significant bioevents that take place in this interval are the first occurrences of *Pseudothurmannia ohmi* (bed 144), *Pseudothurmannia mortilleti* and *Pseudothurmannia sarasini* (148), *Discoidellia favrei* (149), *Ps. picteti* (156), *Barremites* spp. (160), *Taveraidiscus intermedius* (170), *Psilotissotia chalmasi* (174), *Psilotissotia colombiana* (183), and *Kotetishvilia nicklesi* (193).

Although foraminifera are present in all the samples studied, their abundance and degree of preservation varies throughout the section. The diversity of planktonic foraminifers is, in general, relatively low, whereas the benthic ones are more abundant and diverse. The calcareous nannofossils assemblages are mostly composed of cosmopolitan and Tethyan taxa, the dominant genera being *Watznaueria*, *Nannoconus* and *Micrantholitus*. All of the interval studied corresponds to the Zone NC5. The most significant events recognized in the section are: the last occurrence of *Lithraphidites bollii* (which marks the base of Subzone NC5C, in bed 148), the first occurrence of typical forms of *Nannoconus circularis* (154) and the first occurrence of *Micrantholitus* sp 1 (194). The last occurrence of *Calcicalathina oblongata*, which defines the base of Subzone NC5D, takes place somewhat above the interval studied, within the *Kotetishvilia nicklesi* Zone.

Stable isotopes and organic matter, cyclostratigraphy have all been investigated, but magnetostratigraphy is not possible as the area is over-printed by Neogene remagnetization. The Cretaceous outcrops of the Río Argos area are catalogued as a Site of Geological Interest in the General Urban Development Plan of the municipality of Caravaca. We expect the next declaration of the Río Argos section as Palaeontological Zone, with the category of Heritage of Cultural Interest, according to the Law of Cultural Heritage of the Region of Murcia.

Base Aptian GSSP.

A wealth of data have been collected and published on the Aptian stage in the last years by our French collegues on the stratotype sections of the Bedoulian and Gargasian substages including revised biostratigraphies, $\delta^{13}C$ curve and cyclostratigraphy. Although magnetic signature in the French stratotype sections cannot be detected, carbon isotope data allowed a precise correlation between the base of magnetic chron M0, recommended at the 1995 Brussels Meeting for identifying the base of the Aptian, and the Aptian basal ammonite *Deshayesites oglanlensis* Zone. The formal proposal of the Aptian GSSP at Gorgo a Cerbara (central Italy) is still pending and the new data from the 'historical' French sections have recently been summarized by Moullade *et al*. (2011, 2015) potentially making these sections more suitable.

Moullade, M., Granier, B. & Tronchetti, G. 2011. The Aptian Stage: Back to Fundamentals. *Episodes*, **34**(3), 148–156.

Moullade, M., Tronchetti, G., Granier, B., Bornemann, A., Kuhnt, W. & Lorenzen, J. 2015. High-resolution integrated stratigraphy of the OAE1a and enclosing strata from core drillings in the Bedoulian stratotype (Roquefort-La Bédoule, SE France). *Cretaceous Research*, **56**, 119–140.

Base Albian GSSP.

In 2015, the paper by Kennedy *et al*. (2014) has been circulated to the Voting members of the SCS and, aside from one vote, has been agreed. This has now been submitted to ICS for ratification. Some supplementary data have been added to that contained in the following paper.

Kennedy, W.J., Gale, A.S., Huber, B.T., Petrizzo, M.R., Bown, P., Barchetta, A. & Jenkyns, H.C. 2014. Integrated stratigraphy across the Aptian/Albian boundary at Col de Pré-Guittard (Southeast France): A candidate Global Boundary Stratotype Section. *Cretaceous Research*, **51**, 248-259.

Base Coniacian GSSP.

The main paper describing the criteria for identifying the base Coniacian and the proposal of a candidate composite GSSP section was published in *Acta Geologica Polonica* at the end of 2010. Besides multiple up-dated biostratigraphies, the paper also includes the isotope curves for both the Salzgitter-Salder (northern Germany) and Slupia Nadbrze~na (central Poland) sections. It is confirmed that the inoceramid-based lower Coniacian boundary (= first appearance of *C. deformis erectus*), slightly post-dates the traditional ammonite (FAD of *Forresteria petrocoriensis*) position of the boundary.

In September 2011 the chair of the WG, Irek Walaszczyk, circulated the published proposal to the Working Group members asking for comments and eventual approval. All comments received indicated support for a composite GSSP, although the Working Group has been advised that a single GSSP (with a subsidiary location providing additional information) is the preferred option.

In 2013-2014 there was research on the Turonian/Coniacian sections in the US and Canadian Western Interior, northern Mexico, and in Mangyshlak Mountains, Kazakhstan. It seems that neither of the US and Canadian western interior sections is promising. The sections are either quite condensed or the boundary succession is with gaps (Walaszczyk et al. 2014). A potential has the Rosario section in Mexico studied and described by Ifrim et al. (2014); the sections still needs further works, and moreover, there are some safety issues in this part of the country. Attention is now focussed on successions in the Big Bend National Park in SW Texas, which is a part of the same basin to check the succession there. The Big Bend area is in a National Park and, if the succession appears complete and with good potential for the basal Coniacian stratotype, it could easily be accessible and studied.

Walaszczyk, I., Wood, C.J., Lees, J.A., Peryt, D., Voigt, S. & Wiese, F., 2010. Salzgitter-Salder Quarry (Lower Saxony, Germany) – Slupia Nadbrzena river cliff section (central Poland): a proposed candidate composite Global Boundary Stratotype Section and Point for the Coniacian Stage (Upper Cretaceous). *Acta Geologica Polonica*, **60**/3, 445-477.

Ifrim, C., Wiese, F. & Stinnesbeck, W., 2014. Inoceramids and biozonation across the Turonian - Coniacian boundary (Upper Cretaceous) at El Rosario, Coahuila, northeastern Mexico. *Newsletters on Stratigraphy*, **47** (2), 211–246.

Walaszczyk, I., Shank, J.A., Plint, A.G., & Cobban, W.A., 2014. Interregional correlation of disconformities in Upper Cretaceous strata, Western Interior Seaway: Biostratigraphic and sequence-stratigraphic evidence for eustatic change. *Geological Society of America Bulletin*, in press.

Walaszczyk, I., Kopaevich, L.F. & Beniamovski, V.N., 2013. Inoceramid and foraminiferal record and biozonation of the Turonian and Coniacian (Upper Cretaceous) of the Mangyshlak Mts., western Kazakhstan. *Acta Geologica Polonica*, **63** (4), 469–487.

Base Santonian GSSP.

This is now approved and an inaugural event at the site is being held in late November 2015. The article in *Episodes* was published in 2014.

Lamolda, M.A., Paul, C.R.C., Peryt, D. & Pons, J.M. 2014. The Global Boundary Stratotype Section and Point (GSSP) for the base of the Santonian Stage, "Cantera de Margas", Olazagutia, northern Spain. *Episodes*, v. **37**/1, p. 2–13.

Base Campanian GSSP.

Members of the WG have been searching for a new section across the Santonian/Campanian boundary to be proposed as base Campanian GSSP. So far, the only section not affected by hiatus and/or major dissolution is the Bottaccione section (Gubbio, central Italy), in which the calcareous plankton bioevents are calibrated to magnetostratigraphy. The distribution of planktonic Foraminifera across the Santonian-Campanian interval at Bottaccione was recently revised and up-dated (Petrizzo *et al.,* 2011). Moreover, as the available carbon isotope stratigraphy was considered at too low a resolution for reliable supra-regional correlation, a new set of carbon isotope analyses across the critical interval has been undertaken by Silke Voigt on the original samples (Premoli Silva & Sliter 1995), calibrated to paleomagnetic scale, and on new samples collected at higher resolution along the same road section and on the opposite side of the valley by Gale and Voigt. A paper with the new carbon isotope curves correlated to that from Lägerdorf (Northern Germany) is ready to be submitted for publication. The main bias of the Bottaccione section is that planktonic foraminifera across the critical interval could not be properly disaggregated from the hard limestones, using cold acetolysis method, and are poorly preserved.

M.R. Petrizzo, F. Falzoni & I. Premoli Silva, 2011. Identification of the base of the lower-to-middle Campanian *Globotruncana ventricosa* Zone: Comments on reliability and global correlations. *Cretaceous Research*, **32**, 387-405.
S. Bey, J. Kussa, I. Premoli Silva, M.H. Negrab, S. Gardin, 2012. Fault-controlled stratigraphy of the Late Cretaceous Abiod Formation at Ain Medheker (Northeast Tunisia). *Cretaceous Research*, **34**, 10-25.

Base Maastrichtian GSSP.

To overcome the problem of correlation between the ratified GSSP and coeval sections, stable isotopes were measured in high resolution from Tercis-les-Bains GSSP (Thibault *et al*., 2012). In this paper the Tercis $\delta^{13}C$ isotope curve was successfully correlated to the isotope curves from two Danish Basin cores (DK) that could represent the standard carbon isotope curve for the Boreal Realm, being calibrated to the nannofossil and dynocyst biostratigraphies. Moreover, Gardin *et al*. (2012) revised the biostratigraphy of the Bottaccione section, already calibrated to magnetostratigraphy, and gathered new calcareous plankton biostratigraphic and magnetostratigraphic data of the upper Campanian-Maastrichtian interval form the nearby Contessa section (Gubbio, central Italy). In addition, both the Contessa and Bottaccione sections have been analysed for stable isotopes by Voigt (2012) who reconstructed carbon isotope curves for both sections and correlated them to her new isotope curve from the Tercis GSSP.

S. Gardin, B. Galbrun, N. Thibault, R. Coccioni, I. Premoli Silva, 2012. Bio-magnetochronology for the upper Campanian – Maastrichtian from the Gubbio area, Italy: new results from the Contessa Highway and Bottaccione sections. *Newsletters on Stratigraphy*, **45**/1, 75–103.
M. Machalski, 2012. Stratigraphically important ammonites from the Campanian–Maastrichtian boundary interval of the Middle Vistula River section, central Poland. *Acta Geologica Polonica*, **62**/1, 91–116.

F. Surlyk, S.L. Rasmussen, M. Boussha, P. Schiøler, N.H. Schovsbo, E. Sheldon, L. Stemmerick, N. Thibault, 2013. *Cretaceous Research*, **46**, 232-256.

N. Thibault, R. Harlou, N. Schovsbo, P. Schiøler, F. Minoletti, B. Galbrun, B.W. Lauridsen, E. Sheldon, L. Stemmerik, F. Surlyk, 2012. Upper Campanian-Maastrichtian nannofossil biostratigraphy and high-resolution carbon-isotope stratigraphy of the Danish Basin: Towards a standard $\delta^{13}C$ curve for the Boreal Realm. *Cretaceous Research*, **33**, 72-90.

N. Thibault, D. Husson, R. Harlou, S. Gardin, B. Galbrun, E. Huret, F. Minoletti, 2012. Astronomical calibration of upper Campanian–Maastrichtian carbon isotope events and calcareous plankton biostratigraphy in the Indian Ocean (ODP Hole 762C): Implication for the age of the Campanian–Maastrichtian boundary. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **337–338**, 52–71.

S. Voigt, Gale A., Jung C., Jenkyns H., 2012. Global correlation of Upper Campanian - Maastrichtian successions using carbon isotope startigraphy: development of a new Maastrichtian timescale. *Newsletters on Stratigraphy*, **45**/1, 25–53.

P.D. Ward, J.W. Haggart, R. Mitchell, J.L. Kirschvink, T. Tobin, 2012. Integration of macrofossil biostratigraphy and magnetostratigraphy for the Pacific Coast Upper Cretaceous (Campanian–Maastrichtian) of North America and implications for correlation with the Western Interior and Tethys. *GSA Bulletin*, **124** (5/6), 957–974.

One issue of some concern to those working on the Maastrichtian is the gradual closure of the classic ENCI quarry near Maastricht, Netherlands. Parts of the quarry are being landscaped for biological conservation and there are on-going discussions about the preservation of the geological interest. This is especially important now that some of the oldest sea grass fossils (and associated macrofauna/microfauna) have been described from the location – including an almost complete sea grass meadow that was discovered in October 2015.

CHIEF PROBLEMS ENCOUNTERED IN 2015

The need, today, for a high-resolution stratigraphical framework that is applicable worlwide has resulted in the necessity of re-visiting several candidate sections, already studied paleontologically, by implementing multiple biostratigraphies and stratigraphic tools other than fossils (many of which are profoundly affected by provincialism in several intervals), such as like magnetostratigraphy, stable isotope stratigraphy, etc. In several cases, especially in the Late Cretaceous, the integration of multiple biostratigraphical data, together with physical stratigraphies, has shown that the candidate sections were unsuitable as a potential GSSP. Consequently, new sections have had to be considered and studied from scratch. This has resulted in a delay in submitting some GSSP proposals, also taking into account that scientists from different sub-disciplines do not necessarily work at the same speed.

Another problem is the lack of fundings in most countries for carrying out studies that are strictly stratigraphical in nature as these are often deemed of low priority when compared to other more 'sexy' proposals. Funds for just attending workshops and/or conferences are also becoming more limited.

SUMMARY OF EXPENDITURES IN 2015:

I. INCOME

ICS subvention for 201	£ 0.00
Other income	£ 0.00
Carried forward	£ 5152.99

Total income	**£ 5152.99**

II. EXPENDITURE

Attendance of a number of participants at STRATI 2015 in Graz	£ 2547.07
Attendance at a GSSP discussion at GFC meeting in Paris in December 2015 (being done by video-conference)	£ 80.00 (estimate)
Total expenditure (to date)	**£ 2547.07**
Current Reserves (26th November 2015)	**£ 2605.92**

WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED IN 2016:

During late 2015 it is hoped that the ***Albian GSSP*** will be approved by the ICS. It is also expected that proposals for the ***Hauterivian GSSP*** and the ***Coniacian GSSP*** will be submitted to SCS early in 2016, closely followed by the ***Barremian GSSP***. With the Albian GSSP proposal submitted, it is the Hauterivian GSSP that is the leading priority for 2016.

Meetings

- The 4th meeting of IGCP 609 will be held in 2016; location not yet decided..
- The International Geological Congress (IGC) which will be held in Cape Town (South Africa), 27th August to 4th September 2016.
- The 10th International Symposium on the Cretaceous System will be held in 2017 in either Saltzburg or Vienna. This will be hosted by Michael Wagreich and Hans Egger.

BUDGET AND ICS COMPONENT FOR 2015

Office expenses (Fax, phone, postage, etc)	£ 50.00
Contribution to a J/K boundary Meeting (organization+ participants' support), April 2016	£ 1000.00
Contribution to a J/K boundary Meeting (organization+ participants' support), October 2016	£ 1000.00
Some support for SCS representation at IGC in 2016	£ 5000.00
Albian/Hauterivian Inauguration events	£ 2000.00
Total estimated expenditure in 2016	**£ 9550.00**

10. SUMMARY OF CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2011–2015)

See Accomplishments in ICS Annual Reports 2007 to 2014 for additional details.

- The 9th International Symposium on the Cretaceous System, Ankara, September 2013. This major meeting at the Middle East Technical University, Ankara, Turkey was organised by Ass. Prof. Ismail Omer Yilmaz. Though less well attended than comparable meetings in Western Europe, there was a full programme of lectures, although the number of posters was down on the symposium held in Plymouth. There were informative mid-symposium and post-symposium field trips. Prof. Bruno Granier was accepted as the new SCS Secretary and there were thanks to the past Chair (Isabella Premoli Silva) and Secretary (Sylvie Gardin). There were updates on outstanding GSSP definitions. The 10th International Symposium on the Cretaceous System will be held in 2017 in Austria. It is expected that this could be well-attended and prove to be a scientifically good meeting at which **remaining** GSSP issues should be resolved.
- The inauguration of the Turonian GSSP at Pueblo, Colorado, 25th October 2013. At an event organised by Rangers at the Pueblo State park, the GSSP 'marker' was ceremonially placed in the succession. Within the park there is now a comprehensive display board, static binoculars that can be used by visitors to view the 'marker' and a programme of outreach events to involve the community (especially schools). Dr Brad Sageman was thanked for preparing the information boards and choreographing the event. There were speeches by Stan Finney (Chair, ICS), Malcolm Hart (Chair, SCS), Suzanne Mahlburg Kay (President, Geological Society of America) and Brad Sageman. All the speakers and guests were thanked for their attendance and support by the Park Ranger responsible for education and outreach. Later, Brad Sagemen led a geological walk around the site and the various features of the Cenomanian to Turonian succession.

- The inauguration of the Santonian GSSP is scheduled for late November 2015, in northern Spain.

OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2016-2020)

Future Meetings

- August 2016 – International Geological Congress, Cape Town, South Africa.
- September 2017 – 10th International Symposium on the Cretaceous System (Vienna or Saltzburg, Austria).

Details of other meetings are not yet available.

Objectives

- To submit the proposal for the Hauterivian GSSP to the Cretaceous Subcommission Voting Members, then submit it to ICS, and possibly to *Episodes* for publication;
- To submit the proposal for the **Coniacian GSSP** to the Cretaceous Subcommission Voting Members, then submit it to ICS, and possibly to *Episodes* for publication;
- To submit the proposal for the **Barremian GSSP** to the Cretaceous Subcommission Voting Members, then to submit it to ICS, and possibly to *Episodes* for publication;
- To bring recommendations for the remaining GSSPs to ICS as soon as possibile;
- **To prepare the definition of the criteria for the recognition of the base of the Berriasian and the J/K boundary. This is deemed as 'High Priority' and the Working Group have**

been informed of this, with the expectation that this will be resolved as soon as possible (end-2016).

Work Plan

2016 – Finalize proposals for the base of Hauterivian, Barremian, Aptian, and Coniacian Stages, and to continue with work on the Valanginian and Campanian.
2016 – Finalize the proposal for the base of Berriasian (Jurassic/Cretaceous boundary)
2017 – Definition of substages for discussion at the ISCS in 2017.

APPENDIX [Names and Full Addresses of Current Officers and Voting Members]

Subcommission officers (with addresses)

Chair: Prof. Malcom Hart
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[Note James Haggart has served 2 terms and replacement being sought]

Vice Chair: Dr Brian T. Huber
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Secretary: Prof. Bruno Granier
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List of Voting Members

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List of Task Groups and their officers

Maastrichtian WG: *GSSP ratified.* Giles Odin, France. gilodin@moka.ccr.jussieu.fr
Campanian WG: Andy Gale (UK). Andy.Gale@port.ac.uk
Santonian WG: *GSSP ratified*. Marcos Lamolda <gpplapam@lg.ehu.es>
Coniacian WG: Irek Walaszczyk, Poland. i.walaszczyk@uw.edu.pl
Turonian WG: *GSSP ratified*. No chairman at present.
Cenomanian WG: *GSSP ratified.* No chairman at present.
Albian WG: *GSSP submitted* Paul Bown and Brian Huber. HUBER@si.edu
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Berriasian (J/K boundary) WG: William A. P. Wimbledon, UK. mishenka1@yahoo.co.uk

Kilian Group *[formerly Lower Cretaceous ammonite WG]:*
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