IRGC NEWS

INTERNATIONAL RESEARCH GROUP ON CHAROPHYTES

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27

March 2016

CONTENTS

EDITORIAL

I am pleased to present you a new issue of the IRGC-News. We began the year 2016 with very sad news. Our colleague and friend, Michael Schudack passed away in January. Please find a memorial about his contributions to charophyte research herein. In this issue you will find another interesting summary prepared by Susi Schneider about charophyte research in 2016 as well as the report about the very nice GEC Meeting from Geneva. The IRGC-10 Meeting in Astana approaches. Aizhan Zhamangara and her team are preparing a promising meeting with very exciting scientific excursions and I hope you will be able to attend. This will be a very special occasion to know and contact colleagues from Kazakhstan and neighbouring countries that are otherwise difficult to reach. In Astana we will begin also a new period of our association since the executive board will be almost completely renewed. This is why I ask you to participate actively in the proposals for new candidates and later, in the elections of the new IRGC board. This is also the last IRGC-News issue that will be prepared by the present team. I wish to thank very specially Adriana García for the hard work she has done during more than 10 years, preparing our bulletin just after (and sometimes during) her summer holidays. Thanks also to all of you who helped us in keeping our association alive by sending us information related to charophyte research for this issue.

Carles Martín-Closas

EXECUTIVE COMMITTEE

Carles Martín-Closas (President)
Susanne Schneider (Vice-President)
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Dominique Auderset Joye (Switzerland)

Regional Correspondents
Uwe Raabe (Europe)
Simone Baecker-Fauth (North and South America)

The task of the Regional Correspondents is **to collect relevant information about meetings, books, etc. from their area and forward it to the IRGC Secretary** by February-mid-March every year.

WELCOME TO NEW IRGC MEMBERS

It is a great pleasure to welcome our new members. Andrea de Sosa Tomas (Argentina) and Roch-Alexandre Benoit (France) are studying Mesozoic charophytes. Cristina Ribaudo (IRSTEA, France) works on the biogeochemistry of charophytes. Swetha Balakrishnan (India) studies charophyte morphology and genetics, and Sara Calero, (University of València, Spain) works mainly on the phenology of charophytes.

FINANCIAL MATTERS OF THE IRGC

Please remember to update your membership in 2016 since according to the statutes of our association this is a requirement to participate in the elections for the new IRGC Board. Remember that the only way to pay your membership fee is by bank to bank transfer **(see page 19)**. It is also possible to pay to one of the members of the EC during meetings. I can then provide a receipt if requested.

Emile Nat (The Netherlands)
IRGC Treasurer

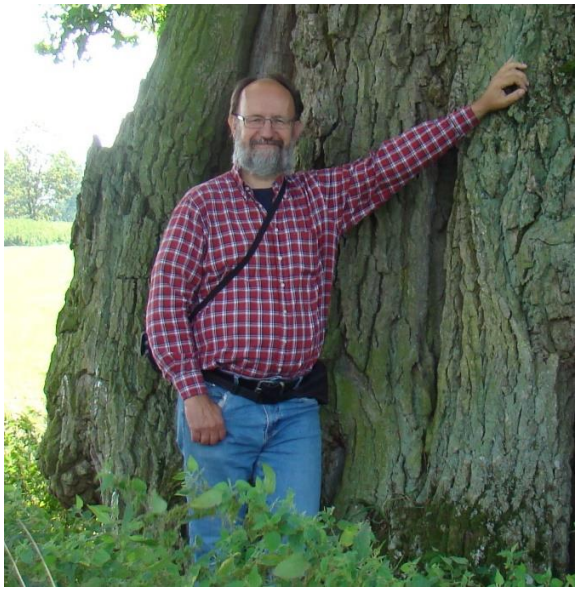
IRGC ELECTIONS FOR THE EXECUTIVE COMMITTEE

This is a very important task that we have to undertake this year during the 7th IRGC Symposium in Astana. The positions of President, Vice-President and Secretary need to be filled. **See document attached!**

Adriana García (Australia)

IN MEMORIAM

Michael E. Schudack (1954-2016)



Michael E. Schudack passed away suddenly on 13 January 2015, after suffering lung embolism. He was born and grew up in the industrial Ruhr region, northern Germany, where he graduated in geology. He presented his PhD thesis, devoted to Early Cretaceous charophytes from the Cameros basin, northern Iberian Chain (Spain), at the University of Bochum (Schudack, 1987a), following a long-lasting research tradition by German geologists in this lonely mountain region. Since then he always kept a strong professional relationship with Spain. Between 1995 and 1998 he taught at the University of Halle (northeastern Germany) but he spent most of his career at the Freie Universität Berlin. During the early 1990' he focused on the study of Upper Jurassic and Lowermost Cretaceous charophytes from northern Germany, mainly from the Saxony basin, where he developed a new local bi-

ozonation that was integrated later in the common work of a European biozonation (Riveline et al., 1996). In 1993 he presented his habilitation thesis based on the biostratigraphy and phylogeny of Upper Jurassic and Lower Cretaceous European charophytes (Schudack, 1993a). By this time he joined his wife Ulla Schudack in the study of Upper Jurassic and Lower Cretaceous ostracods and combined successfully the use of both groups of microfossils (charophyte fructifications and ostracod carapaces) to obtain significant biostratigraphic and biogeographic results. In the late 1990's he also published several studies about the Upper Jurassic and Lowermost Cretaceous ostracods and charophytes from North America, where he undertook several research stages. From the year 2000 onwards his work was mainly devoted to fossil ostracods, taking several responsible positions in the International Commission for Jurassic Stratigraphy and the ostracodologists association, but he always kept his interest in charophyte palaeontology.

His contributions to charophyte palaeontology were numerous and I would like just to mention some of his, in my opinion, more outstanding results. He had a special fifth sense to discover the minute and elusive basal plates of a number of important Mesozoic charophytes, such as *Porochara*, *Feistiella* or *Mesochara*, This was extremely helpful in elucidating their systematics and phylogeny. He disentangled the complicated utricle structure of the earliest clavatoracean *Echinochara*. He excelled also in the biostratigraphical analysis of charophytes from the Late Jurassic, which is a difficult time interval with which to work, due to the abundance of the less informative gyrogonites of the porocharaceans and early characeans.

Michael Schudack was a very active member of the International Research Group on Charophytes for a long time. He organized the GEC meeting in Berlin in 1991 and was secretary of our organization from 2000 to 2004. He also kept during these years an updated and useful charophyte bibliography. From the more personal point of view he was an enthusiastic fellow, extremely precise in his observations and efficient in his work. We have lost not only a colleague but also a friend.

Carles Martín-Closas (Catalonia, Spain)

Selected publications of M. E. Schudack dealing with fossil charophytes

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Schudack, M., 1987a. Charophytenflora und fazielle Entwicklung der Grenzschichten mariner Jura/Wealden in den Nordwestlichen Iberischen Ketten (mit Vergleichen zu Asturien und Kantabrien). *Palaeontographica* . Abt. B, 204, 108 pp.

Schudack M., 1987b. Charophytenflora und Alter der unter-kretazischen Karsthöhlen-Füllung von Nehden (NE-Sauerland). *Geologie und Paläontologie Westfalen*, 10:7-44.

Schudack, M., 1989. Charophytenfloren aus den unterkretazischen Vertebraten-Fundschichten bei Galve und Uña (Östpanien). *Berliner Geowissenschaftliche Abhandlungen* (A), 106: 409-443.

Schudack, M. and Schudack, U., 1989. Late Kimmeridigian to Berriasian Paleogeography of the Northwestern Iberian Ranges (Spain). *Berliner Geowissenschaftliche Abhandlungen* (A), 106 : 445-457.

Schudack, M., 1990. Bestandsaufnahme und Lokalzonierung der Charophyten aus Oberjura und Unterkreide des Nordwestdeutschen Beckens. *Berliner Geowissentschaftlche Abhandlungen* (A), 124: 209-245.

Feist, M. and Schudack M.E., 1991. Correlation of charophyte assemblages from the nonmarine Jurassic-Cretaceous transition of W Germany, *Cretaceous Research*, 12: 495-510.

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Schudack, M.E: and Martín-Closas, C., 1992. Correlation between charophyte evolution and sea-level changes in the Jurassic and Cretaceous. *Profil* 1: 44-45.

Schudack, M. E., 1993a. Die Charophyten im Oberjura und Unterkreide Westeuropas. Mit einer phylogenetischen Analyse der Gesamtgruppe, *Berliner geowissenschaftliche Abhandlungen* (A), 8, 209 pp., Berlin.

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Schudack, M.E., 1993c. Möglichkeiten palökologicher Aussagen mit Hilfe von fossilen Charophyten. Festschrift Prof. W. Krutsch. Musem für Naturkunde, Berlin, p. 39-60.

Schudack, M.E., 1995. Neue mikropaläontologische Beiträge (Ostracoda, Charophyta) zum Morrison-Ökosystem (Oberjura des Western Interior, USA). *Berliner Geowissenschaftliche Abhandlungen* (A), 16, 389-407.

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Schudack, M.E., Turner C.E. and Peterson F., 1998. Biostratigraphy, paleoecology and biogeography of charophytes and ostracodes from the Upper Jurassic Morrison Formation, Western interior, USA, *Modern Geology*, 22: 379-414.

Schudack, M.E., 1999. Some Charophytes from the Middle Dinosaur Member of the Tendaguru Formation (Upper Jurassic of Tanzania). *Mitteilungen Museum für Naturkunde Berlin*, Geowissenschaftliche Reihe, 2:201-205.

Schudack, M.E. 2000, Ostracodes and Charophytes from the Guimarota beds. In: Martin T. and Krebs, B. (eds.) Guimarota, a Jurassic Ecosystem, F. Pfeil Verlag, München, p. 33-36.

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Schudack. M.E. 2016. Vorkommen fossiler Charophyten in Deutschland, In: Arbeitsgruppe Characeen Deutschlands (eds.): Armleuchteralgen. Die Characeen Deutschlands. Springer, Berlin, p. 573-604.

REPORT ON PAST MEETINGS

2015

2 – 4 July
20th Meeting of the GEC (Group of European Charologists), Genève (Switzerland)
Scientific sessions

The meeting was organized by Dr Dominique Auderset Joye and Dr. Aurélie Rey-Boissezon (Aquatic Ecology Group – University of Geneva). It was attended by 15 participants. The meeting took place in the building of the Institute of Environmental Sciences, Site de Batelle, in Carouge, a quarter of Geneva. This building was located in the middle of a nice garden with big trees of different species.

The meeting started after the interesting and productive charophyte determination session held in the morning of Friday 3 July 2015. We observed and identifiethe charophytes collected the previous day in Lake de Joux and the Orbe river. Later, after a short opening and welcoming session offered by the IRGC President, Dr **Carles Martín-Closas**, the scientific sessions began with the oral presentations dedicated to fossil charophytes chaired by Dr **Ingeborg Soulié-Märsche**. The first oral communication was presented by PhD student **Alba Vicente** (*European charophyte floras during the K/PG global mass extinction, State of the Art.* A. Vicente, C. Martín-Closas). Alba concluded that the Cretaceous−Paleogene boundary represents a minor change in the composition of charophyte assemblages in comparison with the radiation of the characeans and the aquatic angiosperms already by the end of the Lower Cretaceous. In the second oral presentation, PhD student **Sha Li** talked about a comparison of Chinese and European taxonomies (*Comparing Chinese and European taxonomies of some late*

Cretaceous to Paleocene charophytes, Biogeographic implications. Sha Li, Q. Wang, H. Lu, C. Martín-Closas). She explained to us how difficult the comparisons of fossil charophyte records from China and Europe are due to the different taxonomic ways of describing new species between the two regions (obtaining sources: boreholes vs outcrops, for example). A large effort has to be done to reduce synonyms between Chinese and European species. Changing to Session II devoted to the phenology of extant charophytes, Dr **Dominique Auderset Joye** chaired the presentation of two oral communications and two posters. Dr **Josep Sanjuan** (*Light and temperature controls on the gyrogonite production and polymorphism of* Chara: *Preliminary results*. J. Sanjuan, A. Vicente, N. Flor-Arnau, J. Cambra, C. Martín-Closas) showed results from a laboratory experiment in which high temperatures and high light intensities inhibited the development of large gyrogonites and suggested an adaptation of *C. vulgaris* to reproduce in critical environmental conditions. The author also stressed that the results are in agreement with the general pattern distribution observed in several fossil charophyte assemblages through time. PhD student **Sara Calero** (*Time for sex. Comparison in the reproductive phenology of Spanish and Swiss populations of* Chara hispida. S. Calero, D. Auderset Joye, A. Rey-Boissezon, M.A. Rodrigo) showed initial results of a comparative Spanish-Swiss medium-term study, to understand the sexual reproduction of *C. hispida* at a global scale in order to predict the effects of current and foreseeable scenarios of climate change on charophytes. She pointed out how all phenological events in *C. hispida* happened for the first time around 40 days before in the Valencian pond than in the Swiss one, agreeing with the prediction of the Hopkins' Bioclimatic Law.
After a short coffee break the two posters were presented. The first one, with Dr. Núria Flor-Arnau as first author but presented by **Josep Sanjuan**, was entitled *Development of two charophyte species under light and temperature controlled conditions* (N. Flor-Arnau, J. Sanjuan, A. Vicente, T. Monleón-Getino, J. Cambra, C. Martín-Closas). It was stressed how the results of the indoors experiment are in agreement with the present ecological behaviour of the two studied species, *C. vulgaris* and *C. globularis*, in the Mediterranean climate and how this information can be useful for a better understanding and interpretation of palaeoecology. The second poster was presented again by **Sara Calero** and was entitled *Applying circular statistics to the study of charophyte phenology under southern climate* (S. Calero, M.A. Rodrigo). Sara presented this statistical tool as an emergent field in the analysis of charophyte phenology, to unravel phenological patterns in charophytes. The third session devoted to ecosystem functioning had Dr. **Aurélie Rey-Boissezon** as a chairperson. Three interesting oral communications were presented. The first one by Dr **Mariusz Pełechaty** on behalf of coauthors Dr Aleksandra Pełechata and Dr. Andrzej Pukacz (*Responses of a small Chara-lake to contrastive winters*). Mariusz stressed the important and positive role of charophyte meadows to control the phytoplankton biomass and community structure in Chara-lakes. The second one was presented by the new participant in GEC meetings, the Italian **Cristina Ribaudo** (representing France) and it was entitled *Ecology and distribution of Characeae communities in Lobelia lakes of South-West France* (C. Ribaudo, V. Bertrin, S. Boutry, E. Lambert). Cristina highlighted the potential role of charophytes and associated bacterial associations on methane oxidation at the sediment-water interface, showing their intrinsic value for shallow lakes ecosystem functioning. Finally, the third communication was presented by Dr **Andrzej Pukacz** (*Lake-to-lake differentiation of dry weight and $CaCO_3$ in two charophyte species*. A. Pukacz, M. Pełechaty, Marcin Frankowski, E. Pronin). Based on the studies of *C. tomentosa* and *C. globularis* from seven lakes in western Poland, Andrzej highlighted species-specificity in dry weight and carbonate encrustation, as well as depth-dependency in dry weight, suggesting light availability as a crucial factor for growth.

Later, the GEC General Assembly was held while tasting good Swiss wine and beer. After the assembly, we went to the Conference dinner. We stayed in the terrace of a nice restaurant of the Carouge quarter and we enjoyed delicious food, with more wine and beer.

The presentations continued next day, Saturday 4th July. The IV session was chaired by Dr **María A. Rodrigo** and it was devoted to diversity, ecology and distribution of charophytes. The first speaker was again Dr **Mariusz Pełechaty** (*Charophytes of lake Lednica (Western Poland): Species and phytocoenotic diversity at different time scales.* M. Pełechaty, S. Rydzynska, A. Pukacz). Mariusz described the trends of changes in the charophyte flora and vegetation

of a large Chara-lake subject to long-term anthropogenic pressures, comparing former and current vegetation data and also data from sediment cores. After it, we attended the presentation of a poster by Dr. **Ingeborg Soulié-Märsche** on behalf of other authors from Algeria **(***Charophytes as bioindicators of phosphate contamination in Mediterranean wetlands.* H. Zouadia, G. De Belair, M. Benslama, I. Soulié-Märsche, S.D. Muller). The study of 41 wetlands in NE Algeria during 4 years revealed 7 *Chara* and 5 *Nitella* species in the study area and a clear negative relationship between richness and health of charophytes and the water phosphorus concentration. The session continued after a short break for taking coffee with the presentation of PhD student **Eugeniusz Pronin** (*Species composition, structure and environmental conditions of* Chara tomentosa *L. and* Chara globularis *Thull. meadows in lakes of Western Poland.* E. Pronin, M. Pełechaty, K. Apolinarska, A. Pukacz). Eugeniusz showed how the differences of morphology and growth form of these two species influenced the species composition and structure of stands they form in lakes: more compact and dense meadows created by *C. globularis* resulted in poorer species composition. And finally **Mariusz Pełechaty** presented the last communication (*A comparative analysis of species composition and structure of* Chara globularis *and* Chara virgata *stands in lakes of Western Poland*. M. Pełechaty, S. Rydzynska, A. Pukacz). After the study of 11-13 lakes, Mariusz concluded that higher species richness characterized *C. virgata* communities, however, the species frequencies were relatively low compared to those found in *C. globularis* community.

All the presentations of these intense sessions met a warm welcome and suggested interesting debates and exchange of ideas.

Unfortunately, some of the announced oral communications and posters were not presented because the authors could not attend the meeting in the last moment. This was the case for Roman E. Romanov (from Russia) and Jelena Blaženčić and Branka Stevanović (from Serbia).

After the last presentation, the Closing Ceremony took place. Carles Martín-Closas thanked the GEC 20 organizers, Dominique and Aurélie, for their excellent work. The president also envisaged a future with stronger interactions between charophytologist researchers (*e.g.* the preparation of a European project). Some participants emphasized that current collaboration was already observed during the meeting (between "fossil" and "extant" researchers, between different research groups,…). But, of course, this can be improved in the near future.

I would like to finish this summary of the scientific sessions stressing that the GEC 20 meeting was very well organized, in a kind and almost "familiar" atmosphere. Thus, I wish to thank the two organizers, and also all the participants, for making the GEC20 meeting 2015 in Geneva a real success.

María A. Rodrigo (Spain)

2 July 2015

Field Excursion Report
Macrophytes from the alpine Joux Lake and Orbe River, northern Geneva
(Group photo on page 20)

Our group consisted of 15 people including participants and the organizers, Dominique Auderset Joye and Aurélie Rey-Boissezon from the Aquatic Ecology Group of the F. A. Forel Institute, Univ. of Geneva. The field excursion started boarding a bus in the cozy Carouge neighbourhood of Geneva. Surrounding the large Lake Geneva (Léman Lake), we headed northward to the Joux Lake, "Lac du Joux", crossing a beautiful vineyard landscape and a nice and dense forest dominated by fir (*Abies alba*). This beautiful scenario was completed with panoramic views of the Jura Mountains at the background. This chain consists in massive limestone representing the type area of the Jurassic system.

Joux Lake is a glacial freshwater lake located at 1004 m altitude in the Joux valley. In order to look for macrophytes and specially charophyte meadows we boarded pedal boats sailing the cold waters of the north-eastern lakeshore. Many of us harvested the lake bottom using a tangle-fork and the bravest ones dived the deepest parts of the lakeshore. After the preliminary attempts in the deepest areas of the lake using the tangle-fork, most of the participants left the pedal boats in the lakeshore and proceeded to hand harvest in the shallower parts of the lake.

Harvesting of charophyte meadows from Joux Lake. Photo by Dominique Auderset Joye and Aurélie Rey-Boissezon.

The clear waters of this lake contain high diversity of submerged macrophytes. We collected a rich assemblage including at least 8 different charophyte species i. e. *Chara strigosa*, *Chara contraria*, *Chara aspera*, *Chara vulgaris*, *Chara hispida*, *Tolypella glomerata* and *Nitellopsis obtusa*. The presence of *N. obtusa* may result from warming waters. Moreover most of the charophyte species found in the shallower part of the lake show highly calcified thalli. Other macrophytes such as *Hippuris vulgaris*, *Myriophyllum spicatum*, different species of *Potamogeton* including *Potamogeton crispus* and *Deschampsia littoralis* were identified. *D. littoralis* mainly occurs in fluctuant shorelines of the pre-alpine lakes. In the Joux Lake it was found along *T. glomerata* meadows.

Views of the Jura limestone at the northern coast of the Lake de Joux. Photo by Alba Vicente Rodríguez

Our harvesting morning finished by boarding a motorized boat and sailing through the western part of the lake. We had the opportunity to observe a nice section of the Jura limestone located all along the northern lakeshore. The southern shore allowed us to enjoy again the fir forest views. During this placid sailing time we could discuss and learn from our Swiss colleagues more about the ecology and taxonomy of alpine charophytes. We finished this enjoyable morning having lunch in a nice restaurant terrace very close to the lakeshore.

After the lunch, the group headed to Vallorbe town to visit a specific charophyte locality of the Orbe River. The improvement of the quality of the water resulted in the development of wide *Nitella opaca* meadows which grow better in these cold waters fed by the karst resurgences of Jura limestones.

Andrzej Pukacz collecting charophytes from Orbe River using a tangle-fork. From left to right: Basia Pelachata, Eugeniusz Pronin, Mariusz Pelachaty, Dominique Auderset Joye and Andrzej Pukacz. Photo by Cristina Ribaudo.

Nitella meadows were found alon g withother charophyte species i. e. *Chara vulgaris* and other macrophytes such as *Ranunculus trichophyllus*, *Ranunculus circinatus*, *Groenlandia densa* or the invasive *Elodea canadensis*.

Before we returned to Geneva city, we had the opportunity to visit the Romainmôtier village in the Orbe district. This small town housed a surprising Romanesque church, one of the oldest in Switzerland. This cultural stop was the perfect place to say goodbye to the countryside of Geneva and to learn a bit more about the historical heritage, culture and architecture of Switzerland. The day after the field excursion, the participants met at the Institute of Environmental Science (LEBA laboratory), and had time for charophyte identification and taxonomic discussions.

We would like to thank Dominique Auderset Joye and Aurélie Rey-Boissezon for organizing the excursion and showing us these marvelous Swiss charophyte localities. We also want to thank them for letting us enjoy the alpine lakes and landscapes beauties. Special thanks also to Aurélie and to Carles Martín-Closas for reviewing the text.

Alba Vicente and Josep Sanjuan
(Catalonia, Spain)

GEC Assembly

The GEC Assembly was held in Geneva, Faculty of Sciences, on 3rd September 2015 at 18:15. The IRGC President thanked the organizers, Dominique Auderset Joye and Aurélie Rey-Boissezon for the perfect organization and especially for the nice ambiance they created and that stimulated very much the participation of the delegates. Following the GEC agreements, Dominique and Aurélie will hold the Presidency of the GEC until the next GEC assembly and will encourage and help in the organization of the next GEC Meeting. The president spoke about several issues concerning the IRGC, including the present status of the next IRGC Meeting of Astana (Kazakhstan) in 2016. During the Assembly the main subject of discussion was the organization of the next GEC Meeting. María Rodrigo and Sara Calero presented their proposal to organize the next GEC in València (Spain) in 2017, including a field trip in the Albufera wetlands that the team of María Rodrigo studied for so many years. This proposal was enthusiastically supported by the delegates. The assembly was closed at 19:30.

Carles Martín-Closas
(Catalonia, Spain)

27 July - 2 August
XIX INQUA Congress, Nagoya, Japan

Theme: *Quaternary Perspectives on Climate Change, Natural Hazards and Civilization.*

The meeting was a success with the participation of 1,790 people. The areas of research covering the past 2.6 M years involved research on chronology, palaeoclimate, sea level changes, volcanism and human origins. There were several sessions dealing with the use of biological proxies, mostly diatoms, pollen, macrophytes, forams and ostracods, and charophytes were also present.

It is interesting to see the complementary and exclusive ecological information that charophytes provide in Quaternary studies.

Adriana García (Australia)

FORTHCOMING MEETINGS

2016

31 August – 2 September
7th Symposium of the International Research Group on Charophytes, Astana, Kazakhstan

The 7th IRGC Symposium will be held at the L.N. Gumilyov Eurasian National University, Astana, Republic of Kazakhstan, 31 August – 2 September (28 August – 6 September including both fieldtrips) **(Second Circular included with this issue)**.

Please keep updated with deadlines for Abstract submission and payments.

Organiser
Dr Aizhan Zhamangara, L.N. Gumilyov Eurasian National University, 5 Munaitpasov Street, 010008 Astana, Kazakhstan
e-mail: kashagankizi@mail.ru

28 August - 4 September
35th International Geological Congress, Cape Town, South Africa

The 35th International Geological Congress (IGC) will be held in Cape Town, South Africa from 28 August to 4 September 2016. This is one of the largest international geological congresses. Every four years the IGC is held under the auspices of the International Union of Geological Sciences (IUGS). IUGS together with the IGC African Organising Committee seeks to make this Congress a prime scientific event. The event will showcase the region's geoscientific superlatives; world-famous geology and geoheritage together with its geological and scenic wonders. There will be an extremely diverse scientific program of oral and poster presentations, workshops, short courses and business meetings.

Contact: Daniel Barnardo, General Secretary
barnardo@geoscience.org.za
Website: http://www.35igc.org

NEW CHAROPHYTE BOOKS

"Armleuchteralgen. Die Characeen Deutschlands"

Arbeitsgruppe Characeen Deutschlands (eds.)
Springer Verlag, Berlin, 618pp.
ISBN 978-3-662-47796-0

Arbeitsgruppe Characeen Deutschlands, Springer-Verlag Berlin Heidelberg, ISBN 978-3-662-47796-0, (eBook ISBN 978-3-662-47797-7).

This book, published by the German research group on charophytes, intends to give an overview about the recent state of knowledge about German charophytes.
Written in German, with English abstracts, it is dedicated to the German field botanists mainly, trying to interest them in this alga group and therefore enhancing field activities.
However, during the process of preparation it grew from the brochure planned to a full-size Springer book, now covering all aspects from history to evolution, including systematics, palaeontology, ecology, bioindication and management & conservation aspects - missing just oospores because of ongoing debates and work in progress.

This book of course includes a determination key and detailed species presentations; the latter spiced with Heiko Korsch's marvellous distribution maps, basing on all the numerous information gathered not only by the Chara-D community, but also many enthusiasts providing their data – it is a pity that, despite the page-long list of contributors we missed some of them there. There is no error-free book, but the editors regret deeply that some of these contributors have been "lost" during preparation and they'll get a free copy.

The book can be bought as a whole or individual chapters downloaded – the latter is not recommendable because of the high price of the individual chapters – downloading 3 of them will pay for a whole print version – so better buy the book, because the editors fought hard to get an affordable price of 89,99 € (D) by reducing the number of free samples to just 5 and renouncing any kind of royalties.

The book may raise some discussion about nomenclatural issues as it has already during the preparation process – all authors agreed beforehand to accept nomenclatural rules. The tedious work of Thomas Gregor and a group of enthusiasts around him revealed indeed a number of problems – some of them are known, which had been just ignored, but also some surprising facts. Irrespective of the work done, still some problems exist which could just be decided upon, without having the ultimate answer – but the nomenclatural changes made are supported in a way that there was "no escape" according to the nomenclatural rules.

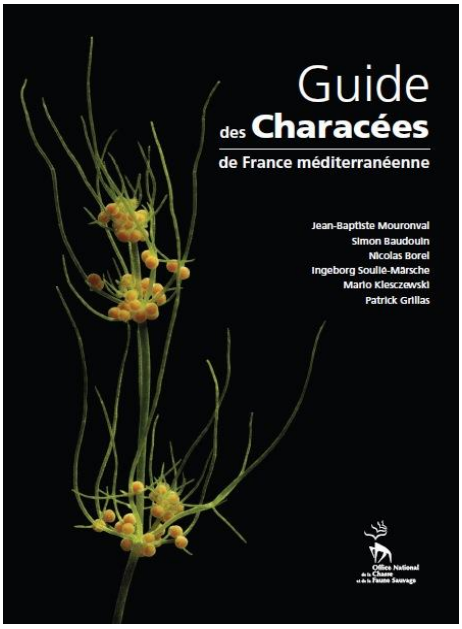
Hendrik Schubert (Germany)

«Guide des Characées de France méditerranéenne»

Authors: Mouronval, J.P.; Baudoin, S.; Borel, N.; Soulié-Märsche, I.; Klesczewski, M.; Grillas, P.
Ed.: Office National de la Chasse et de la Faune Sauvage, Paris, 214 pp.
ISBN 978-2-85692-020-6

This ***«Guide for the Characeae of the Mediterranean regions of France»*** describes and illustrates the 42 stonewort species, varieties and forms currently recorded for Mediterranean, continental France and presents determination keys for genera and species. The first part of this guide provides general information about the

family and the specific vocabulary applied to these plants.



Price: 12 Euros, postage included.

To receive a copy of the Guide, you may go directly to the order form at:

http://www.oncfs.gouv.fr/IMG/file/publications/bon_de_commande_Guide_Characees_english.pdf

Ingeborg Soulié-Märsche (France)

REFERENCE ARTICLE: STUDIES ABOUT CHAROPHYTES

What's new about Chara? A short overview of some of the interesting charophyte studies published in 2015

It really is an extremely interesting and rewarding exercise to get an overview of last year's publications on charophytes. I simply searched ISI Web of Science using the terms "Chara" and "2015", and in the middle of January 2016 this resulted in nothing less than 102 hits. Many of them dealt – as usual - with astrophysical sciences (when I retire I will try to find out more about what type of astrophysical phenomenon Chara actually is!), but there was still an incredible lot of interesting publications dealing with "our" *Chara*. The number of interesting papers was so overwhelming that I simply did not manage to summarize all of them. Sorry to all authors whose paper is not included in this short overview; this does not say anything about scientific quality, only about my personal interest (and my limited time). As you know, charophytes are used in many different fields of science. One of the more "exotic" (at least to me) publications I stumbled over was one about a "fibre-reinforced viscoelasto-viscoplastic model of plant cell wall growth" which was published in the Journal of Engineering Mathematics. I have to admit that I did not fully understand what this was about … apart from the fact, that charophytes are still used as models for plant cell growth.

Not entirely unexpected, many papers dealing with charophytes were published in January 2015 in volume 120 of the journal *Aquatic Botany*. This is the special issue which resulted from the IRGC conference in Mendoza, Argentina. It includes 15 original papers, plus an introductory overview describing the role of charophytes in past and present environments. The papers reflect the fact that charophytes are a "multidisciplinary research object". Very briefly, the special issue includes papers that 1) explain the differences between oospores and gyrogonites (Soulié-Märsche and García), 2) study the biogeographic history of a *Nitellopsis* and a *Lychnothamnus* lineage since the Eocene (Sanjuan and Martín-Closas), 3) investigate the usefulness of charophytes for reconstructing environmental conditions during the Quaternary in western Argentina (Font and Chiesa), 4) study environmental changes in the Murray-Darling Basin in eastern Australia, based on charophytes (Yu et al.), 5) analyse trace-element and stable-

isotope chemistry of *Lamprothamnium* gyrogonites (Dux et al.), 6) describe oospore morphometry of selected *Chara* species (Holzhausen et al.), 7) analyse ultrastructural characteristics of *Tolypella*, and compare them with those of *Chara* and *Nitella* (Vouilloud et al.), 8) model possible changes in charophyte distribution in Switzerland due to expected climate change (Auderset Joye and Rey-Boissezon), 9) describe habitat requirements of different charophyte species in Switzerland (Rey-Boissezon and Auderset Joye), 10) study habitat characteristics of *Chara tomentosa* meadows in Poland (Pelechaty et al.), 11) analyse the role of charophytes in a Mediterranean pond (Rodrigo et al.), 12) study the effects of UVB radiation on different charophyte species (plus *Myriophyllum spicatum*; Rubio et al.), 13) study different aspects of light acclimation in *Chara* (Schneider et al.), 14) describe the biogeography of charophytes in Chile (Schubert et al.), and 15) model the distribution of charophytes in Estonia based on environmental variables (Torn et al.). We do not have sufficient space here to print full references of all these papers, nor describe their findings in greater detail. If you have not yet done it, please visit the *Aquatic Botany* website, and look up Volume 120 at http://www.sciencedirect.com/science/journal/03043770/120/part/PA. I am sure you will find several papers within your field of interest. I expect most of you will be able to download the papers. If you do not have access, please send an email to the corresponding author (or to me). Someone will certainly be able to assist you!

However, also outside the special issue, many interesting charophyte studies were published. An extremely interesting study, in my view, was done by Wiik et al. Traditionally, marl lakes have been considered resilient to eutrophication owing to the coprecipitation of phosphorus with calcite, particularly when dense charophyte meadows are present. However, this resilience must not be overstretched. Wiik et al. reconstructed changes in aquatic macrophyte communities of a marl lake in the U.K. by analysing historical macrophyte surveys and plant macrofossils in sediment cores. They described an upslope creep of maximum colonisation depth that has reduced habitat for among others *Chara rudis*, and its replacement by the floating-leafed *Nuphar lutea*. At the same time, the margins of the lake shifted from an open, light and diverse habitat to a dense, silted and shaded reeds swamp with limited occurrences of charophytes. Therefore, the reduction in deep macrophyte habitat was not met with refugia in the shallows. Wiik et al. also mention a phenomenon which I have suspected for quite a while, without being able to provide evidence: unfortunately for all "charophytes lovers", there are indications that "starved beds of *Chara*" and large areas of "white chalky bottom" are likely to reflect the natural status of marl lakes in reference condition. This means that the very abundant stands of charophytes we like to see in lakes indeed may be a first sign of eutrophication, rather than an indicator of very good ecological status. This means that we have to seriously reconsider our perception that dense charophyte stands are an indicator of pristine and unpolluted ecosystems.

Baastrup-Spohr et al. studied niche specialization and functional traits in charophytes of the Nordic countries. Not surprisingly, they discovered that charophytes contain a larger fraction of threatened species compared with other groups of autotrophs. Interestingly, however, they found that four functional traits: shoot height, salinity tolerance, bulbil production and flexible life cycle duration were significantly positively related to commonness of charophytes. The few common charophytes they found were generalists tolerant of a wide range of conditions, while specialists often had short stature, restricted life cycle variability and were rare in the disturbed contemporary landscape. They conclude with recommending that it should be a conservation priority to delineate accurately the environmental conditions preferred by the threatened species and protect or restore proper habitats.

The results of a study by Van Zuidam and Peeters are perhaps not so surprising either, but nevertheless I find it very good indeed that someone finally was able to present data on this topic. Van Zuidam and Peeters showed that wave forces reduced the emergence of *Chara globularis* by an amazing 91%. While these results were generated in an indoor experiment, they match field observations from the IJsselmeer area in the Netherlands, where *Chara* hardly occurred in areas where a large bottom shear stress had occurred in spring. Regressions showed that the effect of wave forces came in addition to the effect of light availability. Consequently, large wave forces may inhibit the establishment of charophytes in large lakes, and the authors suggest that reducing large wave forces potentially can promote macrophyte development.

We all are very well aware of the fact that charophyte morphology is quite variable,

and that one and the same species may look very different, depending on environmental conditions and genetic predisposition. However, also oospores may exhibit polymorphism. Perez et al. tested the utility of oospore characters for identifying North American species of *Tolypella*. They measured the typical parameters used to characterize oospores (length, width, length to width ratio, colour, ridge number and shape, wall ornamentation, and basal impression number). Statistical analyses showed significant differences in length, width, and length to width ratios among most *Tolypella* species and populations but there was considerable overlap. This suggests that species identification based on oospore measurement alone is not wholly reliable. In addition, Perez et al. found that oospore morphology was not unique for every species. Sanjuan and Martín-Closas have done a quite similar study, but on palaeolimnological material. They showed that polymorphism also exists in gyrogonites of two ancient *Lychnothamnus* species, which existed in the Late Palaeogene, more than 30 million years ago. Sanjuan and Martin-Closas found that both species displayed remarkable variation in the size, apical ornamentation and basal pore morphology of their calcified fructifications depending on the extent of calcification. This intrapopulational gyrogonite polymorphism was consistent with the general tendency observed in the only extant representative of the same genus, *L. barbatus*, which produces gyrogonites differing by up to 250 µm in height and 225 µu m in width. So, determination of charophytes is difficult, not only based on plant morphology, but also on oospore/gyrogonite morphology. So what about genetics?

Unfortunately, genetic analyses are helpful in some, but not in other cases. We recently published a barcoding study of *Chara* (Schneider et al.), where we analysed the ITS2, matK and rbcL regions of 91 specimens, to test if the distribution of barcode haplotypes among individuals was consistent with species boundaries as they are currently understood. The tree resulting from the concatenated data matrix grouped the 91 specimens into six main groups, while the traditional morphological approach divided these same samples into 14 different taxa. A large unresolved group consisted of *C. intermedia*, *C. hispida*, *C. horrida*, *C. baltica*, *C. polyacantha*, *C. rudis*, *C. aculeolata*, and *C. corfuensis*. A second unresolved group consisted of *C. virgata* and *C. strigosa*. The taxa within each of the unresolved groups shared identical barcode sequences on the 977 positions of the concatenated data matrix. In contrast to other authors, which advocate searching for more and more possible differences between these taxa, we suggest that these taxa indeed are very closely related with each other, and possibly may not be regarded as species. The morphological differences of taxa within both unresolved groups include the number and length of spine cells, stipulodes, and bract cells. So we simply may have to face the fact that these morphological traits have less taxonomic relevance than hitherto assumed. We did a follow up study, analysing 324 samples collected from 19 countries that – according to commonly used identification keys represented 29 species – and the paper has already been accepted by European Journal of Phycology. I will not summarize the results here (cause the publication year is 2016), but if you are interested you are welcome to check the website of European Journal of Phycology (or send me an email, then I can send you a reprint).

One of several possible explanations for the occurrence of different morphology in spite of similar DNA sequences is polyploidy. Michelle Casanova summarized the results of 25 years of research on karyotypes of Australian charophytes. For example, dioecious *Chara* species mostly had n = 14, while monoecious species had twice as many chromosomes. An exception was *Chara braunii*, which has always been recorded as having n = 14 despite being monoecious. I wish such an overview also was available for European charophytes …

Another contribution to the "origin of land plants" discussion was published by O'Rourke et al. They analysed sugar composition in the cell wall of different charophytes, and the bryophyte *Anthoceros*. O'Rourke et al. found that charophyte and land-plant hemicelluloses differed substantially, indicating major changes during terrestrialization. Thus, although cell walls of *Chara* and land plants are often regarded as being quite similar, some differences nevertheless exist. The story is not straightforward, however, since a certain type of galactose (3-MeGal) is present in charophytes and lycophytes, but not in the 'intervening' bryophytes. This confirms that cell-wall chemistry changed drastically between major phylogenetic grades, but it still leaves us wondering what exactly happened during the step when land-plants arose from algal ancestors.

Other publications dealt with more applied issues. Laffont-Schwob et al. wondered

whether the spontaneous vegetation that develops in motorway ponds would take up heavy metals. They analysed four ponds, which contained *Chara* and *Typha*, and found that the biomass of both species contained significant amounts of heavy metals (Cd, Cu, Zn and Pb). For *Typha*, the highest contents of metals were found in the root system. Pond sediments were moderately contaminated with heavy metals, but water concentrations were very low. Laffont-Schwob et al. concluded that the plants probably did not extract an awful lot of heavy metals from the sediment, but that they prevent the transfer of heavy metals to other ecosystems, or groundwater. However, you have to collect the dry and crumbly *Chara* biomass during summer before it is blown out of the pond by strong winds. But then, what do you do with the collected *Chara* biomass? Baltrenas and Misevicius tested a new idea: the use of *Cladophora glomerata*, *Spirogyra neglecta* and *Chara globularis* as feedstock for biogas production. They found that *Cladophora* and *Spirogyra* gave rise to almost twice as much methane than *Chara globularis*, and conclude that *Chara globularis* is less suitable for biogas production. Maybe this is just as fine, because I really wonder from where they would have harvested the huge amounts of *Chara* you need for running a bioreactor.

Even if much of my daily work is related to microscopic benthic algae, I have to admit that excessive growth of benthic biofilms often is unwanted. Gette-Bouvarot et al. tested if *Vallisneria spiralis*, *Berula erecta*, *Ceratophyllum demersum* or *Chara globularis* could prevent excessive biofilm development. They planted these species in outdoor mesocosms which were colonized by benthic biofilms, and found that *V. spiralis* and *C. globularis* significantly reduced the biofilm after the six weeks the experiment lasted. However, I wonder why they attribute this effect so confidently to allelopathic effects. In my view, it is equally likely that competition for light and nutrients was a major driver. Anyway, if you can choose between benthic biofilm and *Chara*, I think most of us agree that *Chara* usually is preferred …

Two teams from Poland studied how weather conditions influence submerged aquatic vegetation. Ejankowski and Lenard found that charophytes dominated submerged aquatic vegetation during a dry weather period, while during the period when precipitation and water level increased, the charophyte population declined and vascular plants and bryophytes dominated. They related these changes to variations in water chemistry, which in turn where determined by precipitation and mean air temperature in March. Pelechata et al. did a similar study, but analysed changes in the density and extent of charophyte meadows in relation to warm versus cold winters. They suggested that, after mild winters, overwintering charophytes may control phytoplankton abundance. Jakubas and Gabka studied charophytes in a lowland stream in Poland. They found *C. vulgaris* in stream sections with high current velocity (0.3 m/s), and *C. globularis* in sections with slow current velocity (0.2 m/s). I am not so sure that these results are transferable to other streams, however. Personally, I have seen *C. globularis* thrive happily at much higher current velocities.

Pajusalu et al. studied how increased CO_2 concentrations in the Baltic Sea affected photosynthesis of three *Chara* species (*C. aspera*, *C. tomentosa* and *C. horrida*). They showed that elevated CO_2 levels in brackish water may enhance the photosynthetic activity of charophytes and suggested that increasing CO_2 in the Baltic Sea could have implications for interspecific competition and community structure in a future high CO_2 world. But not only temperature and CO_2 are expected to undergo future changes, but also salinity (at least in some areas). Beilby explained in detail how salt-tolerant species (*Chara longifolia* and *Lamprothamnium* sp.) exhibit proton pump stimulation and regulate turgor, such that they, in case of *Lamprothamnium*, can survive hypersaline media up to twice seawater strength and withstand large sudden changes in salinity. In contrast, salt-sensitive species exhibit no pump stimulation, and turgor is not regulated, such that the plants succumb to enhanced salt concentrations in few days. Finally, Rojo et al. studied the ability of *Chara vulgaris* to adapt to different water temperature. Most of us have probably seen *Chara vulgaris* populations thriving in tiny water holes, which can get quite hot in the burning summer sun (although such conditions – unfortunately – rarely exist in Norway). Rojo et al. wondered if *C. vulgaris* populations collected from different altitudes – hence living at different mean temperatures – were able to equally cope with such heat waves. The answer was "no". Rojo et al. indeed found differences in growth, which suggested that lower-altitude populations had a greater tolerance to temperature increase.

As you have seen, a lot of really interesting charophyte studies have been published last year. I am happy to see that charophytes are – let us be honest: maybe not the very hottest topic

science has ever seen – but nonetheless sound and interesting objects for doing good science. I hope and believe that this will continue over many years, and I am sure that IRGC members will significantly contribute to this progress. A key to success is often the exchange of experiences among scientists, and I already look forward to the next opportunity of doing so: in Kazakhstan at the IRGC meeting. Hope to see many of you there!

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Van Zuidam, B.G., Peeters, E.T.H.M. (2015). Wave forces limit the establishment of submerged macrophytes in large shallow lakes. Limnology and Oceanography 60, 1536-1549.

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Susanne Schneider (Norway)

NEWS FROM INDIVIDUALS AND REGIONAL GROUPS

News from Individuals

During 2015 and early 2016 a number of PhD students and researchers visited the Dept of Stratrigraphy, Paleontology and Marine geosciences in Barcelona in order to collaborate with C. Martín-Closas: Li Sha (China), Andrea de Sosa (Argentina), Aizhan Zhamangara (Kazakhstan) and Roch-Alexandre Benoit (France).

PhD THESIS COMPLETION

Petra Nowak, University of Rostock
Supervisors: Ralf Schaible & Hendrik Schubert

PhD thesis title: Applicability of different species concepts for macroalgae - molecular phylogeny supports the phenetic discrimination of *Chara* and *Fucus* species.

On 29 January 2016 Petra Nowak defended her thesis at the Faculty of Mathematics and Natural Sciences of Rostock after receiving positive reviews from C. Martín-Closas (Barcelona) and H. Schubert (Rostock).
The thesis examined the applicability of phylogenetic methods for species delineation of macrophytes. For this, examples of brown algae (genus *Fucus*) and charophytes were analysed;

these groups were chosen because both are used as bioindicators for the European Water Framework Directive, so reliable species determination is a prerequisite for applied purposes.
For both groups species determination of field gathered individuals can be a painstaking experience, irrespective of rather clear species descriptions and "field keys". In an attempt to solve the problem at least in part, phylogenetic analyses were conducted to estimate the value of the phenetic characters used for species determination.
For this, a database consisting of "undoubted forms only" excluding specimens which did not show all characters clearly in order to avoid confusions by misdeterminations or hybrids was analysed.
On the other hand a large number of markers were sequenced as deeply as possible to achieve a sound database for phylogenetic analysis.
Levels of discrimination varied largely among studied groups: Sequences of chloroplast *rbc*L provided 100% species identification for the genus *Nitella*, while the discriminative power of multiple molecular loci used for the genus *Chara* revealed relatively modest species discrimination. The highest genetic variability was observed for the genus *Fucus* but without connection to the phenetic system.
For charophytes neither the microspecies nor the macrospecies could be supported fully by the results. For some diplostichous taxa no differences could be found between microspecies, which could be interpreted as a support for the macrospecies-concept. However, members of the subsections of the macrospecies-concept were scattered over the branches of the consensus trees indicating that at least the characters chosen for grouping higher taxonomic levels are probably not reliable.

Hendrik Schubert (Germany)

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CHAROPHYTE DISCUSSION FORUM

Dr Robin Scribailo (USA) has established **charophyte-L**, our quick and new way of communication.

<***charophyte-L***>is an open forum for discussion about all aspects of Charophyte research.

How to subscribe to charophyte-L?

Just send the message to the listserver:
listserv@pnc.edu

In the body (not the subject) of the message type: ***subscribe charophyte-L*****your name**. **Leave the subject blank. Also make sure your signature is turned** off **for this email. It** must **be sent as a text message.** You will receive an automatically generated message telling you

how to make use of the list. Once you are subscribed, you can send messages to the list server which will distribute them to all subscribers.

CHAROPHYTES ON THE WEB

The **IRGC** homepage is hosted at: http://irgc.uow.edu.au/
Members who would like to have their personal homepage connected with the IRGC-website please send relevant information to Adriana García.

The **GEC** homepage is the responsibility of the organizers of the successive GEC meetings. The last GEC homepage was:
http://www.gec.amu.edu.pl/

Landelijk Informatiecentrum voor Kranswieren (**LIK**): http://www.kranswieren.nl (in dutch)

The International Fossil Algae Association (**IFAA**): http://www.ku.edu/~ifaa/

The Charophycean Green Algae Home Page: http://www.life.umd.edu/labs/delwiche/Charophyte.html

Homepage of the German Working Group on Characeans (**AGCD**): http://www.biologie.uni-rostock.de/oekologie/agcd

Homepage of the electronic journal *Charophytes*: http://www.charophytes.com

International Phycological Society **(IPC)**: http://www.intphycsoc.org/links.lasso

MEMBERSHIP FEES

Please **do not forget** to send your membership fee payment for 2016. Multiple-year payments are encouraged!

20 Euros (c. US$25) per year

Please find on **page 19** the membership payment form or download it from the IRGC-webpage at:

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Any questions about membership fees should be addressed to:

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E-MAIL ADDRESSES OF IRGC MEMBERS

Please check the e-mail list and address directory carefully. **We particularly urge members to send any address changes (both surface mail and e-mail)** to the IRGC-Secretary, **Adriana García:** adriana@uow.edu.au to ensure you receive forthcoming information. **Updated March 2016**

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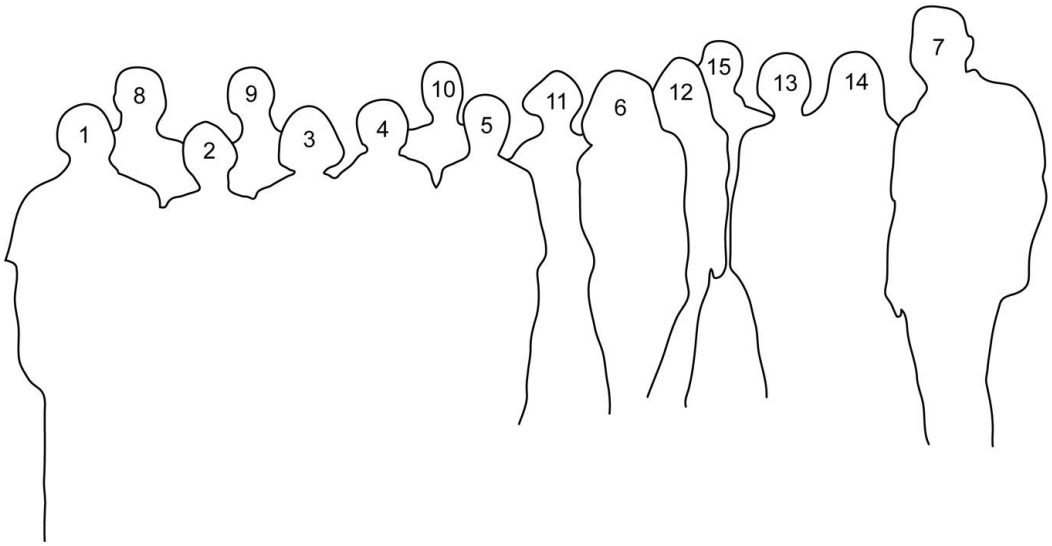

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