



NEWSLETTER

INTERNATIONAL HUMIC SUBSTANCES SOCIETY

Number 19

December, 1997

EDITORIAL

Dear Member,

the third issue of the IHSS Newsletter for 1997 is ready to go and this year too. This number 19 is almost completely devoted to the election procedure of new officers of the IHSS Board of Directors. Distinguished colleagues and friends are running as candidates for the positions of Vice President / President Elect, Board Member and Treasurer.

Many problems, difficult changes and new activities have characterized the life of the Society in the last year. Many many darts have been thrown and some of them have hit the targets. New chapters, now up to almost 40, have been founded and some are on their way; the Standard and Reference Collection is in a very good health, it is expanding and it is going to be partially replenished; in addition, a complete set of chemical, functional and structural data is provided by the Society together with the purchasing of each IHSS sample; the IHSS Bylaws is undergoing a thoroughly critical review; and, finally, after few years, a World Membership List of IHSS is ready. I will mail it to all National Coordinators in the next weeks asking them to forward it in their country.

The Board of Director feels confident in continuing such performances as well as improving considerably the "aiming" for the new year. An increase of collaborative work is mostly welcome, in particular by the new Board members, the National Coordinators, and also the rest of the membership.



At last, I would like to send all of you my best wishes for this holiday season and for a really great and happy new year and I look forward to hearing from or to meeting most of you in 1998.

Yours friendly,

*Teodoro M. (Ted) Miano
Secretary*

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International Humic Substances Society on the World Wide Web

Visit our home page at:

<http://www.gatech.edu/ihss/ihss.html>

Prof. E.M. Perdue and Ms. Jian Li are coordinating the development of the IHSS WEB page. Progresses toward this goal may be followed at the above WEB site which resides on a server located at the Georgia Institute of Technology, Atlanta, USA.

Main items on the WEB page are:

Suggestions and comments regarding the content and organization of the WEB pages are actively requested from all IHSS members.

E-mail Dr. E.M. Perdue at **michael.perdue@eas.gatech.edu** for more information.

IHSS VOLUMES (and related publications)

HUMIC SUBSTANCES, PEATS AND SLUDGES: Health and Environmental Aspects
M.H.B. Hayes & W.S. Wilson, Eds. The Royal Society of Chemistry, Cambridge, 1997. Special Discount Price £38.68 (\$72.80)

The interest that is focused on soil organic matter as a carbon pool provided one of the stimuli for this Volume. The others arose from the renewed interest in the utilisation on (or the disposal to) land of sewage sludges and composts from municipal and industrial organic refuse. These matters were 'aired' at a special symposium sponsored by the Royal Society of Chemistry and the British and Irish Chapter of the International Humic Substances Society at the Spring meeting of the British Soil Science Society which celebrated the launch of the European Journal of Soil Science in 1994, and at a symposium supported by the same sponsors convened in University College, Dublin in September, 1995. Some who presented papers at these conferences were invited to contribute to this Volume. Others were invited to do so because their work was relevant to the theme.

Much is written and said about the contributions of fossil fuels to increased emissions of carbon dioxide, and about the depletion of a valuable carbon sink as tropical forests are felled, and yet it is recognised only by those close to the field that the input of carbon to the atmosphere from fossil fuels is only 8 - 9% of that from soil respiration. Each soil type has an organic carbon balance with a steady state related to the management applied. Pressures for increased soil productivity arise from an expanding population, and from market forces in the more affluent societies which seek inexpensive supplies of food. The practices needed to respond to the demands lead to the depletion of soil organic carbon, and thus to a decline in the innate fertility of soils. Civilisations have vanished in antiquity when over-use of soil led to the depletion of fertility, and the practises of modern agriculture would suggest that essential lessons have not been learned from history. A major objective should be to maintain soil organic matter levels close to those for the steady state characteristic of a soil under its natural climax vegetation. Such aims cannot realistically be met where soils are in long term cultivation, but consideration should be given to returning to soil all of the organic waste products that came from its use. The directives which prevent disposal of sludges at sea after 1998, and the landfill taxes in Britain are re-awakening interest in composting and in the utilisation of sewage sludges on land. Because modern agriculture is based on the extensive uses of inorganic fertilizers, and on 'efficient' industrial type practices which often have little consideration for the future, there will need to be incentives or legislation to convince producers of the benefits of supplying some of the needs of crops with organic manures.

A comprehensive treatise on the subject matter in the title is outside the scope of this Volume, and so aspects of review have been blended with accounts of ongoing research. The editors have felt that considerations of the uses and the behaviour of organic matter in soil and water environments should, in so far as possible, be based on an awareness of the compositions and structures of the components.

IHSS TRAVEL BURSARIES

A number of Travel Bursaries with the aim of providing a partial support to young researchers and students for attendance at the 9th Meeting of the IHSS, to be held on September 21-25, 1998 in Adelaide, Australia, will be assigned by an "ad hoc" Committee of the IHSS in the 1998.

Applications should be sent to the address of the forthcoming IHSS President: **Dr. James J. Alberts, Univ. Georgia, Marine Institute, Sapelo Island, GA 31327 USA. Fax: +1.912.485.2133.**

Applications should include three (3) copies of the applicant C.V., three (3) copies of the full paper intended to be presented in Adelaide and a breakdown of the expenses the applicant will incur in order to participate at the Meeting. The absolute deadline for receipt of this material by the IHSS President will be April, 15, 1998. The President will then send the material to the other committee members and they will make decisions on successful candidates and the amount of awards to be notified by early June.

NATIONAL CHAPTERS NEWS

Brazilian Chapter

The 2nd National Meeting of the Brazilian Chapter of IHSS was held in Sao Carlos, SP, on November 18-20, 1997. The venue of the meeting was at EMBRAPA *Instrumentacao Agropecuaria*, and the Chairman of the Organizing Committee was Dr. Ladislau Martin Neto, the National Coordinator of the Brazilian Chapter of IHSS. Invited lectures were presented by international speakers, including Prof. Nicola Senesi, President of the IHSS, Italy, Dr. Caroline Preston, Canada, Dr. Peter Burba, Germany, and Dr. Andreas Wais, Switzerland, and national speakers, including Dr. Carlos C. Cerri, Dr. Samia Tauk-Tornisielo, Dr. Ladislau Martin Neto and Dr. Antonio Mangrich. About 120 attended and 14 oral papers and more than 70 poster papers were presented during the meeting, which focused both on thematics of general interest to the science of humic substances and on topics specifically related to tropical ecosystems, sustainable soil management and reclamation of degraded areas. The meeting was very actively attended with ample discussions and confrontation. The hospitality was great and social activities run excellent. The General Assembly of the Brazilian Chapter of the IHSS, which counts now about 80 members and is growing, was also held at the end of the meeting.

Italian Chapter

The 3rd National Meeting of the Italian Chapter of the IHSS was held in Bologna on December 17 and 18, 1997. The Meeting was organized by **Prof. Carlo GESSA**, Professor of Soil Chemistry and Director at the Institute of Agricultural Chemistry of the University of Bologna, together with Dr. Claudio Ciavatta, Assistant Professor at the same Institute. The theme of the Meeting was: **"Humic Substances in Biogeochemical Cycles: their Role in Anthropic and Natural Systems"**. The President of the IHSS; Prof. Nicola Senesi, was invited to present a plenary lecture titled: *"Perspectives on humic substances research at the beginning of the third millennium"*. About 70 attended and more than 30 oral and poster papers were presented during the meeting which was animated by very intense and active discussion sessions. The Annual General Assembly of the Italian Chapter of the IHSS, which counts now 117 members, was also held during the Meeting.

MISCELLANEOUS

WANTED USED ANALYTICAL LABORATORY INSTRUMENTS FOR UKRAINIAN ENVIRONMENTAL SCIENTISTS

Ukraine is easily one of the most polluted countries on Earth. The analytical instrumentation is so antiquated that all kinds of modern analytical instruments are desperately needed.

*"modern
analytical instruments
are desperately
needed"*

If you have any items to donate, please simply call or write.

Dr. William Shotyk, Geological Institute, Univ. Berne, Baltzerstrasse 1, 3012 Berne - Switzerland. tel. +41.31.631.8761 / direct +41.31.631.8770, fax. **+41.31.631.4843**.
email: shotyk@geo.unibe.ch

THANK YOU VERY MUCH FOR YOUR CONSIDERATION

HUMIC SUBSTANCES in TRANSPORT PROCESSES

A Workshop/Symposium held under the Auspices of the IHSS, the SSSA, and the ASA at Anaheim, California, October 26-28, 1997.

A note by Andre Simpson, Ian Kenworthy, & Dr. Barbara Watt
The University of Birmingham, School of Chemistry.

In the preface to the Book of Abstracts it is stated: "Concerns with regard to the transport of xenobiotic organic chemicals (XOCs) and of anthropogenic organic chemicals (AOCs) to water supplies are not unfounded. Because there is very careful control of the chemicals which are used in agriculture for the control of the pests and diseases of plants and animals, it is fair to say that the chemical sources which give cause for environmental concern are no longer mainly agricultural. Numerous chemicals, however, have been and still are synthesized that are not readily transformed biologically, and many such chemicals, and intermediates in their manufacture have in the past been deposited in landfill sites. Claims are made that such sites are leak proof, but such claims cannot be substantiated because organic sealants eventually decompose, and chemicals move through aluminosilicate (clay/zeolite) barriers in slow diffusion processes".

The Workshop on October 26 and the Symposium on October 27 focused on the roles of humic substances (HS) in the transport of AOCs and XOCs, and trace metals to surface and to ground waters.

The opening contribution by Dr. M.H.B. Hayes (Birmingham) and Dr. R.L. Malcolm (Denver) focused on considerations of the compositions and structures of HS in soil and water systems. It emphasized the importance of awareness of composition and structure for understanding the processes involved in binding and transport, and outlined the concepts which are emerging with regard to humic structures.

Little attention has been focused on the ways that bulk organic materials placed in landfill sites inevitably transform to HS or to humic-type substances (H-TS). Such transformation products will, of course, interact with some XOCs, AOCs, and with the metals that they contact. Some of the HS and H-TS are, or become water soluble allowing the metals and organic chemicals associated with these to be co-transported. The presentations by Dr. Ned Black (USEPA, San Francisco) and by Dr. Jim Frampton (Department of Toxic Substances Control, Sacramento, CA) left us in no doubt about the roles which landfill generated HS can have in the cycling of chemicals in landfills. The organisers of the Workshop may have felt that those from industry who dismissed such concepts (and did not attend the Workshop) may soon have to change their views under the pressure of scientific fact.

Dr. Geoff Briggs of Agrevo, UK gave an erudite and well appreciated treatise on 'Soil Behaviour and Pesticide Discovery', and IHSS President, Professor Nicola Senesi, gave a comprehensive review of the mechanisms of interactions between organic chemicals and HS. Dr. Uri Mingelgrin is now Chief Scientist in Israel's Ministry of the Environment, but clearly, as judged by his treatise on 'Quantitative and Thermodynamic of Sorbate/Sorbent Complexes', his diverse duties nowadays have not dulled his abilities to think creatively in the field, and to clearly espouse ideas which make concepts of the relevant sorption processes easy.

Dr. Jean-Marc Bollag (Penn State) has done outstanding work on interactions between xenobiotic residues and HS, and his treatise was a magnificent illustration of his excellent techniques of study, and of the vast amounts of vital data that he has accumulated.

Dr. George Bailey (USEPA, Athens, GA) feasted our eyes with a graphical representation of what computer simulation can bring to our awareness of organic chemicals-HS interactions. He rightly pointed out that HS coat the surfaces of mineral phases and control the physical and chemical reactivities of such composite surfaces. He and his colleagues have applied molecular mechanics and molecular dynamics to muscovite interactions with model linear oligomers and with selected AOCs. They have calculated conformational and sorption energies, and their data indicated that flexible linear polymers undergo drastic conformational changes when approaching the mineral surface. Bailey's graphic representations of the interactions were 20th century science at its best, and when there are proven structures and conformations for humic molecules his approach will have universal acclaim.

Dr. Mike Perdue of Georgia Tech is a recognised authority on metal-humic complexes, and his presentation showed just why this is so. New approaches to metal binding by HS were contained in the presentation by Dr. Geoff Davies (Northeastern University, Boston) which dealt with 'Tight Metal Binding by Humic Substances'. A presentation by Dr. Paul Bloom (Minnesota) and Dr. Will Bleam (Wisconsin) reviewed well the applications of spectroscopy and the bonding of metals and of other non-structural elements in HS.

Dr. Diane McKnight's (University of Colorado) presentation dealing with the biogeochemical processes controlling humic-metal complexes in surface waters provided a welcome insight into metals in water systems, and Dr. John McCarthy (Oak Ridge, TN) gave a masterly account of subsurface transport of dissolved HS and associated contaminants.

The Monday (October 27) Symposium was opened by Professor A. Piccolo of the University of Naples who reviewed his exciting results which indicate that when organic acids (but not mineral acids) are

introduced to humic substances and the pH is raised, the HS are seen to be composed of relatively small-sized molecular components. This concept can be central to the theme that HS are (self) associations of smaller molecules. Some voices were raised suggesting that the same study should be carried out using standard polyelectrolytes of known molecular weight in order to eliminate the possibilities that the changes in gel filtration properties are not attributable to influences from organic salts. The Piccolo data are impressive and, when his concepts have undergone further validation through additional model studies, this will contribute enormously to our understanding of humic associations and structures.

The classical lysimeter studies by the Fuehr Group at Juelich, Germany are respected worldwide, and the presentation by Dr. Peter Burauel, which paid especial attention to the bound residue fraction in the eluted humic fraction, made it clear to the previously uninitiated just why this is so.

Dr. Ed Clapp (Minnesota), the principal organiser of the event, may have had little time to prepare his presentation on 'Measurements of Sorption and Desorption', but his comprehensive coverage gave no evidence of that, and his coauthors and former colleagues, Hayes and Mingelgrin, must have felt proud of what he did.

Nearly 30 years ago Dr. Robert Wershaw of USGS, Denver, introduced the concept that humates in solution enhance the solubilities of sparingly soluble AOCs. None will dispute the Wershaw data, but he did work with a sodium humate prepared from a soil humic acid. Others since then have found little or no solubility enhancements when HS isolated from drainage waters, and representative of HS in the soil solution, were used. The Wershaw presentation, which included an input from Dr. Tom Hayes of Birmingham (who has worked with HS from drainage waters) took account of the different results from different systems.

An important component of the Symposium dealt with techniques for analyses. Dr. Bill Koskinen (Minnesota) dealt with modern laboratory procedures for measuring crop protection chemicals, Dr. Billy Kingery (Mississippi State Univ.) outlined the latest techniques for metal analyses, and the account by Dr. Raina Miller (Univ. of Arizona) of 'Ultra sensitive biological techniques for the detection of chemical contaminants' was new for most of us, and hence especially exciting.

There is growing interest in the roles which HS have in health, and the contribution by Dr. Irina Perminova (Moscow State University) took account of the ways that the structures and reactivities of HS can be related to modifications of the toxicities of XOCs. It looks like this topic could be a growth area in the humic sciences.

The Symposium concluded with an intriguing Section on modelling. Not everyone might have totally accepted the models of humic structures by Dr. Hans-Rolf Schulten (Taunusstein, Germany) and Dr. Morris Schnitzer (Ottawa, Canada), but none could quibble with the computational skills that generated these. It is felt that when some additional structural data are available from chemical/spectroscopic procedures the authors will be able to put together structures that might even convince the sceptics. Good models for the transport of XOCs from lysimeter studies were provided from the Juelich Group and presented by Dr. Harry Vereecken. Dr. Carl Enfield (USEPA, Cincinnati, OH) modelled the effects of co-disposed materials on the transport of organic chemicals.

The Workshop/Symposium was supplemented with a Poster Session [involving the Soil Chemistry (S-2) and Soil Biology & Biochemistry (S-3) Divisions of the Soil Science Society of America] on Tuesday, October 28 (PM). The posters addressed methods for the isolation of soil organic matter and AOCs associated with the organic matter using non-aqueous solvents and supercritical fluids, and considered the associations of surfactants with HS, the bioavailabilities of chemicals associated with the non-extractable organic fraction of soils, the influences of organic amendments in the translocations of XOCs, the dissipation of polycyclic aromatic hydrocarbons (PAHs) in contaminated soils, and the production of HS in waste-amended soils, and the importance of these, and of model humic materials in sorption studies.

A special Session (Oral Presentations) involving Divisions S-2 and S-3 was devoted to the Chemistry and Reactivities of Humic Substances during the morning of the same day. This was an exciting session, and it was good to witness the growing interest in the humic sciences by members of the SSSA.

For us, as advanced students and a Post-Doc, the Symposium, Workshop, and the Tuesday morning and afternoon sessions were the finest of the academic experiences we have had. After several years of research in the field, we have grown to appreciate the complexities of the subject, but have come to believe that the complexities can be solved. After our Anaheim experiences we are convinced that solutions will soon be found to the most important aspects of the compositions, structures, and interactions of HS, and when that has happened, one of the great mysteries of nature will have been solved. We, and all who are involved in this field, can hardly wait until the SSSA/IHSS/ASA publication of the presentations at Anaheim are available.

MEETINGS

9th International Meeting of IHSS "Humic Substances Downunder. Understanding and managing organic matter in soils, sediments and waters", Adelaide, Australia, 21-25 September 1998. The conference will be held at the University of Adelaide, Adelaide, Australia. This venue is in the city centre and offers modern conference facilities, surrounded by parklands and is close to all amenities. Adelaide is on the southern coast of Australia, and in September the average temperature is in the range 17-20 °C. The city is serviced by international airlines and has a wide range of interests for both national and international visitors. These include beautiful beaches, wineries, national parks, and cosmopolitan attractions.

The aim of this international conference is to advance the field of humic substance and organic matter research by providing a forum for the sharing of current expertise between researchers in these disciplines and to enhance the communication and collaboration of researchers in Australia with those from other parts of the world. Topics: 1. *Characterisation* - Size, structure and functional group content; 2. *Origin and fate* - Bio-markers, C-cycling, degradation, adsorption; 3. *Aquatic systems* -Transport, pollutants, transformation, sediments; 4. *Soil systems* - Interactions, amelioration, pollutants and transport; 5. *Geochemical systems* - Coal and petroleum industry, mineral processing; 6. *Water treatment* - Removal or transformation, disinfection products

The Conference Organization is being carried under the direction of the National Chapter of the IHSS in Australia. The chairman of this committee is **Dr Roger Swift**, a Past President of the IHSS. If you are interested in receiving further information about the conference, please contact Dr Kaye Spark, IHSS-9 Conference Secretary, CRC for Water Quality and Treatment, PMB 3, Salisbury, SA 5108, AUSTRALIA. Ph: +61 8 8259 0347. Fax: +61 8 82590228.

E-mail: IHSS-9@sawater.sa.gov.au. **internet:** <http://www.clw.csiro.au/conferences/ihss9/>

Others relevant to IHSS activities

Northeastern Seminar on Humic Substances II, Boston, USA, 27-28 March, 1998. The Seminar will be held at the Northeastern University (first-class facilities; 5 miles from Logan Airport (pick-up available); great historical location; hub of Northeast, downtown, museums and many sites nearby). **Focus:** Structures (Theory, Data: **S**), Properties (**P**), Uses (**U**) of Humic Substances. **Program:** Fri.: Invited Plenaries (45 min, nominations welcome), Oral presentations (30 min), Exposition and Banquet; Sat.: Oral presentations (20 min) and Poster Sessions **Contact and mailing address:** Phyllis Mitzman, Barnett Institute, 341 Mugar Hall, Northeastern University, Boston, MA 02115, USA: +1.617.3734818; fax: +1.617.3732855; e-mail: pmitzman@lynx.neu.edu. **See you there!**

ELECTIONS OF IHSS BOARD MEMBERS

Enclosed with this Newsletter is your official ballot paper for the election for vacant positions of the IHSS Board of Directors: Vice President - President Elect, Treasurer, and a Board position. These positions become vacant on January 1, 1998. The Nominating Committee has done an excellent job in selecting able and active members of our Society as candidates for all offices. Information relevant to the candidatures are included in this Newsletter. Please give your choices careful consideration and exercise your privilege to vote.

According to Article III, Section 9, of the IHSS Bylaws .."*All members except student members shall have the right to vote and hold office*".

In order to be counted, your voted ballot must be **sent** in an envelope clearly indicating your name and affiliation on the outside **to the address of the President** of the IHSS, Prof. Nicola Senesi, to be **received before February 28, 1998**. Please do not sign your ballot.