NEWSLETTER

INTERNATIONAL HUMIC SUBSTANCES SOCIETY

Number 31 Fall, 2004

BOARD OF DIRECTORS 2004

International Humic Substances Society on the World Wide Web

Visit our home page at:

http://www.ihss.gatech.edu

NEW UPDATES!!! The website now contains even more analytical data on the standard and reference samples of the IHSS Collection.

Information on the new IHSS TRAINING BURSARIES is also available on line

Dr. E. M. Perdue coordinates the updating of the IHSS WEB page which is located on the server of the Georgia Institute of Technology, Atlanta, USA.

Contributions, suggestions and comments regarding the content and organization of the WEB pages are welcome from all IHSS members.

E-mail: Dr. E. M. Perdue at **michael.perdue@eas.gatech.edu**.

Maria De Nobili and Ladislau Martin Neto

The twelfth international meeting of the IHSS was hosted in São Pedro (São Paulo, Brazil) from the 25th to the 30th of July, 2004 by the Brazilian chapter. The local organizing committee was chaired by Ladislau Martin-Neto. Participants enjoyed a variety of keynote scene-setting lectures and original presentations, stimulating poster sessions, spontaneous scientific discussions, excellent food, lively social events, and remarkable Brazilian dancing events all of which contributed to make the 12th IHSS conference a memorable experience for scientists of a wide range of ages. The meeting was attended by around 250 delegates from 30 countries and, once again, brought together soil and aquatic humic scientists to share research findings and ideas. The Brazilian group was, of course, the largest group with 86 participants, followed by the USA (33), Germany (18), and Italy (13).

IHSS 12 IN NUMBERS:

Abstracts submitted:	243
Inscriptions (overall including cancelled, etc):	352
Oral presentations:	44
Posters:	186
Invited speakers:	13

(Peter Burael, Carlos Cerri, Yona Chen, Mark Clark, William Cooper, Christian Feller, Fritz Frimmel, Patrick Hatcher, David Hopkins, Bernd Marschner, Alessandro Piccolo (cancelled), Nicola Senesi, Eduardo Sá Mendonça)

Countries represented:	30
Evaluators of abstracts:	35

PARTICIPANTS:	232
Full Members of IHSS	98
Students and retired members IHSS	46
Non Members	34
Students non-members	54

The meeting, spread over six days and consisted of ten sections, covering all main aspects of research on NOM: organic matter and climate change (14 papers), organic matter and aquatic systems (23 papers), ecological functions (28 papers), structural aspects of humic substances (60), organic agriculture and plant growth effects (14), soil amendment and remediation (8), application of humic products (31), interactions with xenobiotics (17), organic matter in tropical soils (34), and finally water treatment and NOM (14). On the first day, an inspiring invited presentation by Christian Feller captivated the audience by revealing unimagined links between the history of mankind and carbon sequestration. A further insight in carbon sequestration estimates was given by Gerd Gleixner et al. who used natural labelling techniques in combination with compound specific ^{13}C, D and ^{14}C measurements to identify stable carbon pools and concluded that soil carbon is more labile than normally believed. A first hand contribution to our knowledge of climate change effects and greenhouse gases emissions was offered by several Brazilian groups who reported about soil carbon reservoirs in the Brazilian Amazon (Cerri et al.) and in sugar cane cultivated soils (Segnini et al.) as well as nitrous oxide (Bayer et al.) and methane emissions (de Souza et al.).

A session was devoted to the agricultural importance and effects on plant growth of humic substances. Humics originating from soils, composts and wastewater were discussed.

Many different aspects of the composition and behavior of NOM in aquatic systems were shown to receive particular attention by water scientists. Prof. Frimmel gave a comprehensive talk in which he related DOC properties in surface waters with those of wastewaters and treated waters pointing out technological pitfalls that should be minimized in order to increase sustainability of water management. Ann McNally, one of the students awarded a travel grant by the IHSS, presented her study of degradation of lignin models by singlet oxygen, whereas photochemical versus microbial oxidation of DOC was discussed by Mopper et al. Interaction of oxides with humic acids and salicylic acid was described by Etelka Tombacz et al. who showed the charge dependence of sorption isotherms as well as the charge reversing effect of humic acids sorption on mineral particles. Humification in aquatic environments and fluorescence properties received the attention of several groups.

The conference included two sections on humic substances structure that allowed us to a first hand insight into the most recent advancements in this field. A new powerful analytical technique, such as ESI FT-ICR MS, is now capable of resolving individual molecules in complex humic mixtures. In his lecture, William Cooper, showed how ultra high resolution mass spectra of HS point out that notwithstanding their complexity, humic molecules exhibit a certain degree of polymeric character. Discussions reflected the close involvement of the delegates with complex, never solved questions related to molecular weights and formation of HS.

One session was devoted to studies concerning the ecological functions of humic substances in their natural environments and the complication involved in the measurements of estimating their impact in a reliable and informative manner. The scene, was dominated by effects and behaviour of DOM, not only in aquatic environments, but also in the soil. Seasonal changes in DOM concentration and properties, caused by the contribution of different release processes, were discussed by Merchner and Jodermann who studied the biodegradability and $\delta^{13}C$ of DOM. They showed that $\delta^{13}C$-rich fractions are more easily degraded and that soil microrganisms mostly degrade soluble organic matter. The direct interaction of humic substances with biological systems, such as photosynthetic oxygen production (Steinberg et al.), aquatic organisms (Baganz et al.) and their potential to decrease allelopathic effects (Loffredo et al.) or to act as endocrine disruptors (Lutz et al.) were demonstrated to the audience by a large number of oral and poster presentations.

The importance and usefulness of humic substances in many applications, ranging from remediation to organic agriculture and even medicine, were also discussed in a session specifically devoted to the application of humic products.

The field trip offered the occasion to witness the effort of the Brazilians to exploit an alternative and locally abundant energy source aiming to reduce their dependence on mineral oil, by visiting the Ipirang Plant - for sugar and ethanol production. We also had the opportunity to visit an historical patrimony of Brazil, the Conde do Pinhal Farm and its highly impressive gardens.

The highlight of the social gatherings was the conference dinner. Along with the good food, convivial company, live Brazilian music and dancing, there was a traditional presentation of the Malcolm Award and of the certificates to the travel bursary winners and a presentation to Professors Frimmel and Miano in recognition of their contribution to the Society.

The meeting was closed with the traditional small ceremony: the IHSS flag was transferred, with pleasure, by Ladislau Martin Neto and his group to the German Chapter, represented by the national coordinator Dr. Gudrun Abbt Braun and Prof. Fritz Frimmel, who will organize the 13th IHSS meeting. We all look forward to it , being sure it will be another excellent conference.

BOARD ACTIVITIES

The new Board of Directors of IHSS held two meetings during the XII IHSS Conference at Sao Pedro, Brazil. The Board discussed several pending issues and examined new ones. A brief summary of which is given hereafter.

Board of Directors (from left to right). Gudrun Abbt-Braun, Ed Clapp, Ladislau Martin-Neto, Maria De Nobili, Paul Bloom, Claudio Ciavatta, Yona Chen

Maria De Nobili congratulated the Past President, Yona Chen, and thanked him on behalf of the Board for his excellent work, activities and initiative taken in promoting the society issues over the past two years, as President of IHSS. The President also thanked Fritz H. Frimmel, former Past President and Teodoro Miano, former secretary, for their excellent service to the society and the Board. They were honored during the General Assembly and at the Conference Dinner with a gift on behalf of the Board of Directors.

The Board decided that the new president-elected Paul Bloom will maintain his position as chairman of the Sample Collection. He will remain in charge for the next two years, during which he will seek a suitable candidate(s) for his office, possibly in the University of Minnesota as the Board unanimously agreed that it would not be practical to move the site of the Samples Collection. Paul Bloom presented a detailed report concerning annual HS sales for year 2003 and a partial report on year 2004 sales, updated to July 2004. Provisions for the rest of the year were also given.

Gudrun Abbt-Braun presented a suggestion to the Board of sampling and extracting NOM form two places in Germany (bog lake Hohlohsee and Lake Constance). After some discussions, the Board agreed on the following:

- Isolation of NOM from Hohlohsee (bog lake water), is most promising. The proposal for the isolation of Hohlohsee NOM will be revised and submitted it to the Sampling and Collection Committee for further discussions.
- Isolation of NOM from Lake Constance (Bodensee) seems critical, as the OC is low and the inorganic constituents are rather high, however the preparation of a NOM sample from a drinking water source has great scientific interest. The Board suggested to carry out preliminary tests with a few hundred liters. The NOM sample obtained from these tests should be characterized, and the isolation procedure should be evaluated. A new proposal, based on the results of the model experiment will be prepared for further submission to the Samples Collection Committee.

G.Abbt-Braun

The general assembly of IHSS took place on July 25th. Maria De Nobili presented the President's report on societal issues, which was followed by the Secretary's (Gudrun Abbt Brown) and Treasurer's (Ed Clapp) financial report and by the vice president (Paul Bloom) report.
The IHSS membership and Board officially thanked Ladislau Martin-Neto and his group and expressed their gratitude to the whole organizing committee for their effort and sincerity in organizing the 12th IHSS conference. The President announced to the assembly that the German Chapter will host the 13th IHSS conference in Karlsrhue in 2004
Other announcements made during the assembly were:

Training Bursaries:
Starting from 2005 the IHSS will support a limited number of training bursaries. For further details see guidelines on the IHSS web page.

Support to National Chapter meetings:
Each national meeting organizer will receive financial support by the IHSS (about US $ 800), to invite a renowned scientist to participate in the national event. At least 25 participants from the local country should be present and the Society should also have the option of discussing the scientific program of the event. For further details see guidelines on the IHSS web page

Financial report:
The Treasurer presented to the Assembly his report along with a detailed description of actual balances, income, etc from the year 2002, 2003, and 2004 (up to now). IHSS is in good standing as far as membership, finances and collection activities are concerned.

Abstract from the Secretary's report
The newly elected IHSS secretary, Gudrun Abbt Braun gave her report about the membership situation in the last 4 years and its distribution around the world:

	2001	2002	2003	2004
Members, total	928	873	883	898
Members in National Chapters	899	831	832	855
Members in RoW-Chapter	29	42	51	43
Countries, total		53	53	56
Countries with National Chapters		31	31	35
Countries in RoW Chapter		22	22	21

There is a slow but steady increase in membership: the apparent decrease in 2002 is due to the fact that since that year members that had not pay membership fees for more than three consecutive years were cancelled from the membership list.

G. Abbt-Braun

MALCOLM AWARD AND TRAVEL BURSARIES 2004

Margit Muller received the Malcolm award during a small ceremony held at the conference dinner.

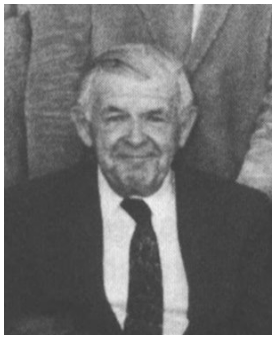
Eight other students were presented with a certificate and a cheque: (left to right)
Marta Fuentes Ramirez, *Spain,* Ingo Schöning, *Germany,* Margit B. Müller, *Germany,* Magnus Christiansen, *Norway,* Guo Jingheng, *China,* Fernando L. Rosario-Ortiz, *USA,* Daniel Said Pullicino, *Malta,* Ann McNally, *USA,* Natalia Sultimova, *Russia (not shown)*

All of them gave an oral presentation of their work in a specially dedicated session during the IHSS 12th meeting.
To our regret Bassam El Eswed, from Amman University, *Jordan*, who was also a winner of a travel bursary, could not attend the conference for health reasons; he was sent a copy of the proceedings together with his certificate.

Awards are based primarily on the quality and originality of the scientific content of the manuscript and the applicant's record of scientific achievement. The IHSS awarded only eight travel awards in 2002, incuding the Malcolm Award. The increased number of awardees is due to an increase both in the number and quality of applications received this year. This is very encouraging, our wish is that these awards may help students to pursue a career in a field in which NOM science is important.

IN MEMORIAM

Wolfgang Flaig (1912 - 2004)



On May 20, 2004, our colleague and honorary member **Prof. Wolfgang Flaig**, passed away. His death is a great loss for the humic substances community. We will always treasure his memory.

Wolfgang Flaig became director of an institute for humus investigations at the newly established Research Centre for Agriculture in Braunschweig in 1948, which soon became world renowned for its modern approach to the biochemistry of soil. He published more than 250 papers on the formation, structure and function of humic and fulvic acids, including their physiological effects on plants. In 1961 he was appointed Professor at the Technische Universität Braunschweig. Several Soil Science Societies awarded him the honorary membership, which he also obtained from the IHSS at the Birmingham Conference in 1984.
Wolfgang Flaig was an honest, open minded scientist who always enjoyed company and his outstanding qualities will be remembered by his many friends and co-workers.

See the life history of Wolfgang Flaig, given in NEWSLETTER 2002 on the occasion of his 90 th birthday

IHSS STANDARD AND REFERENCE COLLECTION

Characterization of IHSS standard and reference samples

Jim Alberts has published fluorescence data of almost all standard and reference samples (see, *J. J. Alberts, M. Takacs (2004): Total luminescence spectra of IHSS standard and reference fulvic acids, humic acids and natural organic matter: Comparison of aquatic and terrestrial source terms. Organic Geochemistry, 35, 243-256*).

Replenishment of the Standard Suwannee River Humic Acid

A report by Mike Perdue

In the time period of October, 2002 – June, 2004, a scientific team, working under the auspices of the IHSS, collected standard humic acid and fulvic acid samples from the Suwannee River in southeastern Georgia, U.S.A. The samples were collected at the southernmost dam on the Suwannee River sill, which is the sampling location from which the original IHSS standard Suwannee River humic and fulvic acids were collected in 1982-83 by a scientific team from the U.S. Geological Survey.
To the maximum extent possible, the experimental protocol that was used in 1982-83 was followed in this work. The only known differences are the significantly higher average TOC concentration in 2003 (5990 vs. 3330 μmol/L) and the use of a commercial freeze-dryer to prepare the dry product.

The scientific team for the current work included:

Name	Affiliation
Mike Perdue	Georgia Tech
Jason Ritchie	Georgia Tech
Jean-François Koprivnjak	Georgia Tech
Norbert Hertkorn	GSF – Munich
Jim Alberts	University of Georgia
Monika Takacs	University of Georgia
Paul Bloom	University of Minnesota

The project was made possible by the generous support of:

- **IHSS**, which provided $47,050 to cover many materials, supplies, operating expenses, and partial salaries for two graduate students (Jason Ritchie and Jean-François Koprivnjak)
- **U. S. Geological Survey – Denver, CO, U.S.A**, which loaned the scientific team a large volume of XAD-8 resin, as well as the large columns and other apparatus needed to purify and use the XAD-8 resin
- Okefenokee National Wildlife Refuge – Folkston, GA U.S.A, which allowed the scientific team to access the sampling site (the *field site*) on the Suwannee River sill in southeastern Georgia, U.S.A. and which allowed the scientific team full use of a house near the field site, both as a residence and as a *field lab*.
- IHSS Volunteers (Mike Perdue, Norbert Hertkorn, Jim Alberts, Monika Takacs, and Paul Bloom), who contributed their time and labor to this effort.
- Georgia Tech which allowed the project to be exempted from the standard overhead rate of 49.2%.

Some summary statistics for this project are tabulated here:

Description	Value(s)
Range of TOC Concentration	4876 – 6549 μmol/L
Range of pH	3.80 – 4.88
Range of Conductivity	55.8 – 95.8 μS/cm
Range of Water Temperature	21.6 – 31.5 ºC
Average TOC Concentration	5990 μmol/L
Average pH	4.14
Average Conductivity	86.1 μS/cm
Average Water Temperature	25.7 ºC
Volume of Water Processed by XAD-8 Resin	16,896 L
Mass of Organic Carbon Processed by XAD-8 Resin	1216 g C
Mass of Organic Carbon in Concentrated Humic Acid	262.3 g C
Mass of Organic Carbon in Freeze-Dried Humic Acid	167.8 g C
Mass of Organic Carbon in Humic Acid Given to IHSS	**147.2 g C**
Mass of Organic Carbon in Concentrated Fulvic Acid	499.5 g C
Mass of Organic Carbon in Freeze-Dried Fulvic Acid	457.8 g C
Mass of Organic Carbon in Fulvic Acid Given to IHSS	**400.6 g C**

In the preceding table, masses of organic carbon are used, rather than masses of humic or fulvic acid. This choice was made because the mass of a sample of humic or fulvic acid is considerably increased by adsorption of water from ambient air. The organic carbon in humic acid and fulvic acid *before freeze-drying* the samples accounted for 21.6% and 41.1% of the total organic carbon

that was processed by XAD-8 resin (i.e., a total recovery of 62.7%). The 37.3% of organic carbon that was not recovered includes 19% that was not adsorbed by XAD-8 resin (hydrophilic acids, hydrophilic neutrals, hydrophilic bases, and hydrophobic bases) and a similar amount of organic carbon that adsorbed to the XAD-8 resin initially, was desorbed at alkaline pH, but which could not be re-adsorbed at acidic pH during a secondary processing step.

During the first attempt to freeze-dry the samples at Van Drunen Farms, serious problems led to the loss of significant quantities of both the humic and fulvic acids (65.6 and 20.9 g C, respectively) and required that the samples be returned to Georgia Tech, re-dissolved, and then brought back to the freeze-drying facility for a second attempt. Smaller losses of humic and fulvic acids were incurred during the second freeze-drying (26.1 and 15.4 g C, respectively). Even with the rather large losses during freeze-drying, the total quantity of freeze-dried product still accounts for 51.4% of the organic carbon that was processed by XAD-8 resin. This yield is comparable to the average recovery (56%) of TOC that is recovered from fresh waters by the XAD-8 method, but it is lower than the recovery of 75% that was reported by the U. S. Geological Survey for isolation of the first IHSS standard Suwannee River humic and fulvic acids in 1982-83.
Although the original contract with IHSS called for isolation of 100 g of humic acid, IHSS actually received 875 g of air-equilibrated fulvic acid and 356 g of air-equilibrated humic acid, both of which contained a significant amount (13% – 20%) of adsorbed water. Mike Perdue retained 50 g of humic acid and 125 g of fulvic acid for use in further ancillary studies in which these products will be compared and contrasted with a concurrently collected sample of unfractionated NOM and a sample of the organic matter that was not adsorbed by XAD-8 resin.
Finally, it is surprising and provocative to compare the elemental compositions of several IHSS samples that have been collected from the Suwannee River in the past 20 years.

Sample	**C**	**H**	**O**	**N**	**S**	**P**
Suwannee River HA I *	52.55	4.40	42.53	1.19	0.58	<0.01
Suwannee River HA II	52.63	4.28	42.04	1.17	0.54	0.013
Suwannee River FA I	52.44	4.31	42.20	0.72	0.44	<0.01
Suwannee River FA II	52.34	4.36	42.98	0.67	0.46	0.004
Suwannee River NOM	52.47	4.19	42.69	1.10	0.65	0.02

* No longer available from IHSS

All samples were collected from the same field site. The “I” samples and the “II” samples were collected using the XAD-8 method in 1982-83 and 2003, respectively, by two entirely different scientific teams. The “NOM” sample was collected in 1999 by a team that included three members of the current scientific team, using only reverse osmosis, cation exchange, and freeze-drying.

The gradual collapse of the dam at the field site over the past 20+ years has caused the soils of the catchment to now be flooded only occasionally, rather than continuously. Such hydrologic changes have likely been accompanied by corresponding changes in redox biogeochemistry and ecology. Nevertheless, the bulk average elemental composition of organic matter from this field site is *remarkably* constant!

My Career in Research and Teaching at the University of Illinois (1953-1990)

Frank J. Stevenson

Early Years

I was born on August 2, 1922 at Logan, Utah, and received my early education in public schools near Salt Lake City, Utah. I attended the University of Utah for a brief period (1940-41), where I took courses in biology and geology, and became interested in the natural sciences. With war looming on the horizon (i.e., WW-II), I withdrew from the university and completed a course for machinists under a federal program designed to develop a pool of trained technicians for the mobilization effort. I subsequently worked as a machinist at Hill Air Force Base, near Ogden, Utah.

In the fall of 1942, I enlisted in the US Navy as an aviation cadet, and, in due course, obtained my "wings" at the air training center in Pensacola, Florida. This was followed by a tour of duty in the Pacific during the war with Japan, as a fighter pilot aboard an aircraft carrier. I was shot down by antiaircraft fire during the Iwo Jima campaign, survived a crash landing at sea, was rescued by the Navy, and returned to my carrier to fly another day.

Upon discharge from the Navy in the summer of 1946, I enrolled in the Brigham Young University and obtained my B.S. degree in Secondary Education (science option) in 1949. I continued my studies as a graduate student, first as a teaching assistant in chemistry at Brigham Young University and then as a research assistant in soil chemistry at the Ohio State University.

I was awarded the Ph.D. degree in December, 1952, and subsequently accepted the position of *Instructor of Soil Chemistry* at the University of Illinois. Over the years, I advanced through the various academic ranks: *Assistant Professor*, 1954; *Associate Professor*, 1958; *Professor*, 1962. I retired in 1990, and, as of this date, I am still listed on the faculty as *Professor Emeritus*.

In addition to research, I taught a course on the *Organic Chemistry of Soils*, and, for a time, taught a course entitled *Biochemical Processes in Soil and Water Environments*. During the school year 1962-63, I was on sabbatical to Australia, where I carried out joint research with soil scientists of the CSIRO, located at the Waite Institute in Adelaide.

Narrative of Research Activities

My research at the University of Illinois covered a wide range of subjects and spanned several scientific disciplines. A particularly rewarding aspect of my work was the opportunity to interact with graduate students, postdoctorate fellows, and visiting scientists – many of whom came from undeveloped countries to work with me under training grants from agencies of the United Nations. Throughout the years, I maintained a hands-on approach to research and worked actively in the laboratory, often using undergraduate students as laboratory helpers – many were inspired to pursue science careers on their own.

My Ph.D. thesis at the Ohio State University dealt with the physical and chemical properties of humic substances (the yellow- to black colored organic substances in soil) and I continued my interest on these important and mysterious substances throughout my career.

Together with my co-workers, I carried out research on the reactive functional groups in humic substances, including infrared studies of humic and fulvic acids and their methylated/acetylated derivatives – this work showed that the acidity of the different reactive groups overlapped, and that methods for determining functional groups based on acidity were not specific and could not be used as an absolute measure for functional group content. I also carried out research on the reactions of humic substances with micronutrient cations (e.g., copper and zinc) and toxic heavy metals (i.e., lead and cadmium). My initial calculations for stability constants of metal-humate complexes were made using unwieldy hand calculators and prototypes of modern-day computers, using "punch cards". With development of the personal computer (PC), I became familiar with spread-sheets (i.e., Lotus 123) for analyzing experimental data. With the PC, I had the same computer capability in my office that previously required an entire room (and a large one at that).

My studies on metal-humate complexes led me to conclude that heavy metals introduced into agricultural soils as contaminants (and sediments as well) are complexed by humic substances, and that both soluble and insoluble complexes are formed. At low degrees of metal ion saturation, the complexes are soluble and humic substances act as transporting agents. On the other hand, when saturated with metal ions, these same complexes become insoluble and thus immobile, suggesting that humic substances can also function as a "sink" for heavy metals.

I maintained a long-time interest in chemical forms of nitrogen in humic substances and of the role of these constituents in nitrogen cycle processes. I cooperated with other members of our soil science staff on research on the mineralization-immobilization turnover of biologically and chemically fixed nitrogen, using the stable isotope nitrogen-15 as a tracer. This research was of importance in that as much as one-third of the nitrogen applied to soils as fertilizer is retained in stable organic forms after the growing season – to a large extent by incorporation into newly-formed substances. Calculations were made for mean-residence-times (MRT) of this immobilized nitrogen, information which was needed in models for predicting the soil's ability to provide nitrogen for plant growth. Visiting scientists from Pakistan and China participated in this research.

Soon after my arrival at the University of Illinois, I initiated research on nitrogenous organic constituents in soils, which are of importance to soil fertility in that they serve as sources of nitrogen for plant growth. In my Ph.D. studies, I had become acquainted with chromatographic procedures for isolating and identifying biochemical compounds and I applied these techniques to studies on amino acids in soil. An interesting aspect of this research was that I found that soils contained far more amino acids than are normally found in plant and animal proteins (i.e., proteins contain about 26 amino acids whereas I found over 35 similar types of compounds in soil). I identified many of these unusual amino acids, which I believed to be remnants of microbial tissues (i.e., soils contain high numbers of bacteria, actinomyces, and fungi that are involved in the decay of plant and animal residues – my review of the literature showed that bacteria, in particular, synthesized exotic amino compounds of various types). I also detected several nitrogen-containing sugars (i.e., amino sugars), which occur in microorganisms but not in higher plants. I expanded this work to an examination of amino sugars in species of the *Rhizobium* (bacteria responsible for the fixation of atmospheric nitrogen in legumes). I believe that I was the first to detect and identify amio sugars in the rhizobia. I found that there were considerable differences in the kinds and amounts of amino sugars associated with the different *Rhizobium* species, from which I postulated that chromatography patterns for amino sugars might serve as a "finger-print" technique for classification purposes. I wanted to pursue this research further but never had the time to do so.

In my studies, I observed that some of the soil nitrogen (particularly in the subsoil) existed in forms that could not be regarded as "organic", but that existed as ammonium held within the lattice structures of clay minerals (i.e., as "fixed ammonium"). Several other soil scientists, notably J.M. Bremner of the Rothamsted Experimental Station in England, had reached a similar conclusion. It had long been known that the C/N ratio narrows with increasing depth in the soil profile, and I was able to demonstrate that this decrease was due to clay-bound ammonium, rather than to an increase in N-rich organic compounds with depth, as had commonly been thought.

My attention at this time was directed to nitrogenous constituents in sedimentary rocks and marine sediments. From my research with soil, I was able to demonstrate that much of the nitrogen in these samples also occurred as fixed ammonium. Included in my studies were depth samples from the Experimental Mohole [a project of the National Science Foundation (NSF) to drill a hole through the earth's crust and into the mantle]. With these sediments, which I was able to obtain by virtue of a research project supported by NSF, I found that the disappearance of amino acids during diagenesis was due in part to abiotic (i.e., chemical) processes. On still another NSF project, I worked with deep-sea sediments from the Argentine Basin. I found that amino acid levels were correlated with climatic changes during Quaternary times, which I attributed to reduced microbial activity during the colder periods, with enhanced preservation of organic substances in the sedimentary material. From this work, I postulated that the levels of amino acids and other organics in sediments might provide a tool for stratigraphic correlations.

Ammonium is bound to certain clay minerals (e.g., illite) in much the same way as potassium (both have molecular dimensions that allow them to fit snugly within hexagonal voids of the minerals). From this, I concluded that those rocks and minerals that contained potassium-bearing primary minerals (e.g., feldspars and micas) would also contain ammonium, albeit in small amounts. My examination of a wide variety of primary rocks and silicate minerals showed this to be the case. From this work, I concluded that previous estimates for the amounts of nitrogen contained in primary rocks of the earth's crust and mantle were much too high (earlier estimates were based on an average value of 50 µg/g for the nitrogen in rocks; my results suggested a value closer to 30 µg/g). My recalculated estimate for the geochemical distribution of nitrogen in the earth was, I believe, generally accepted by geochemists.

I published my work on nitrogen in rocks and minerals in Science 130, 221-222 (1959), and this work was widely quoted, including newspapers (both locally and elsewhere). Some sources credited me with discovering nitrogen in rocks, but this was not the case. Rocks had been known to contain nitrogen since the work of Raleigh in1910. My work dealt with the *chemical form* of this nitrogen. I also postulated that the nitrogen in *stony* meteorites existed as ammonium held within the structures of silicate minerals, which I found to be the case (work unpublished).

By virtue of my research with organics in sediments, I became affiliated with the relatively new scientific discipline of organic geochemistry. I became personally acquainted with world-renowned scientists in this field, many of whom worked on organics in extraterrestrial samples (e.g., carbonaceous meteorites) and in developing methods for detecting life (i.e., microorganisms) on other planets. I assisted in these endeavors in that I evaluated some of the approaches that were being considered to determine if life existed (or ever existed) on Mars (i.e., initial landings were to be unmanned). For a brief time, I was a consultant to a commercial company that was developing hardware for this purpose.

I was indirectly involved in allied disciplines in which humic substances were of interest. For example, numerous studies had shown that organic matter was a key component on the retention of pesticides and various xenobiotics in soil. I was often asked to participate in symposia on this subject and to offer expert advice on the nature of the binding, etc. Based on my other research, I predicted that pesticide residues can become stabilized, and thereby inactivated, by conjugation with components of soil humic substances, and this hypothesis was subsequently confirmed.

During my career, I gave over 50 symposium, workshop and seminar presentations in 10 countries throughout the world: Australia (1962, 1984); Canada (1963, 1965, 1978); England (1966, 1984); France (1973); India (1982); Pakistan (1984); Germany (1987); Israel (1985); Italy (1973), and the USA (over 20).

In addition to my research, I published 4 books, edited 2 books of major importance, and published about 150 research articles and book chapters. I served on many university and scientific society committees and received a number of awards, including Fellows of the American Association of Science, the American Society of Agronomy (ASA), and the Soil Science Society of America (SSSA). I was a recipient of the Agronomic Research Award (ASA), Soil Science

Research Award (SSSA), Bouyoucos Soil Science Distinguished Service Award (SSSA), Paul A. Funk Recognition Award (University of Illinois), and the prestigious Wolf Prize in Agriculture, awarded jointly with Dr. Morris Schnitzer for our "outstanding contributions to our understanding of the chemistry of soil organic matter, and its application to agriculture".

Memberships included: Phi Lambda Upsilon, Phi Kappa Phi (honorary member), Gamma Sigma Delta, Sigma Xi, American Association for the Advancement of Science, American Society of Agronomy, International Humic Substances Society (honorary, life-time member), Soil Science Society of America, International Soil Science Society.

I retired from the University of Illinois in1990 after 37 years of service and continued to be active professionally (as professor emeritus) for several years thereafter. Along with my wife and companion of over 50 years (Leda), I now reside in a retirement community in Arizona, where I relax in the sunshine, enjoy the fantastic scenery of the American southwest, frolic with four grandchildren living nearby, and, as health permits, engage in such worthwhile activities as the game of golf.

For a time following retirement, I continued to attend national and international conferences, usually to give an invitational paper. My last paper was presented at annual meetings of the *Soil Science Society of America* in St. Paul, Minnesota, in November 1994, at which time I decided that it was time to step down and let younger scientists take over.
To paraphrase the words of one of our famous generals (General Douglas MacArthur) -
Old scientists never die, they just fade away.

PhD Thesis

Linn Persson:
Methods for the study of dissolved organic matter as an environmental actor
Stockholm 2003

Akademisk avhandling som för avläggande av filosofie doktorsexamen vid Stockholms Universitet offentligen försvaras fredagen den 5:e december 2003, kl 10.00 i Magnélisalen, Arrheniuslaboratorierna, Frescati.
Opponent: Associate Prof. William Cooper, Florida State University, USA.
Department of Environmental Chemistry and Institute of Applied Environmental Research (ITM), Stockholm University
SE-106 91 Stockholm, Sweden

Abstract
Dissolved organic matter (DOM) binds nutrients and pollutants in aquatic systems. The associations between pollutants and DOM may either increase or decrease the pollutant bioavailability in the water body, and may furthermore strongly affect the transport of the pollutants in the water system. The concentration and quality of the DOM therefore carry important ecological implications. The complexity of the material offers an analytical challenge in striving to identify DOM structures and to understand the interactions of DOM in environmental and technological processes. In spite of rapid development of new analytical techniques, we are still unable to predict and fully understand its environmental role.

The papers of this thesis contributed to method development in two areas, 1) Characterization of DOM using electrospray ionization mass spectrometry (ESI MS), and 2) Measurements of the interactions between DOM and organic pollutants. The methods were applied to DOM in polluted ground water and surface water, as well as to humic-like substances in aqueous extracts of aerosol. In both areas of method development the focus was on the study of whole samples, rather than isolated organic matter.

Using ESI MS structural information was obtained for DOM in surface water as well as in polluted ground water and aerosol samples. The surface water was analysed without prior isolation or concentration of the DOM. The m/z_{range} calculation proved to be a sensitive method to evaluate ESI spectra of DOM, revealing also minor qualitative differences between samples. Using non-invasive techniques it was possible to measure pollutant binding capacity in natural water without prior isolation of the DOM. The pollutant binding capacity of ground water DOM was found to increase with increasing distance from the investigated landfill. Pollutant binding capacity also varied with the origin of lake water DOM. The structural information obtained using the ESI MS co-varied with the pollutant binding capacity for the surface water DOM, but not for the landfill leachate DOM. It was concluded that ESI MS in conjunction with other techniques may contribute to improved understanding of the key role of dissolved organic matter in ecological processes.

Linn Persson has got the IHSS TRAVEL BURSARIES AWARDEE (IHSS 12) in Toulouse 2000 for her contribution ""On-line size-exclusion chromatography/electrospray ionisation mass spectrometry of aquatic humic and fulvic acids".

New Books

C. E. W. Steinberg, *Ecology of Humic Substances in Freshwaters*, Springer, Heidelberg, 2003, ISBN 3-540-43922-6.

E. A. Ghabbour and G. Davies , Eds., *Humic Substances: Nature's Most Versatile Materials*, Taylor & Francis, New York, 2003, ISBN 1-59169-015-3.

K. H. Tan, *Humic Matter in Soil and the Environment. Principles and Controversies*, Marcel Dekker Inc., 2003, ISBN 0-8247-4272-9.

FUTURE MEETINGS

Humic Science & Technology VIII:

March 16-18, 2005, held at the Northeastern University, Boston, MA, USA
For further information contact Elham A. Ghabbour
Chemistry Department, 406 HT, Northeastern University, 360 Huntington Ave.
Boston MA 02115-5000, USA
Fax (617)373 8795, e.ghabbour@neu.edu
Or the IHSS webpage: http://www.ihss.gatech.edu/ , new conferences

Goldschmidt Conference:

A session chaired by our society will take place during the 15th Annual Goldschmidt Meeting to be held in Moscow, Idaho, U.S.A. on May 20-25, 2005:

"NOM-metal complexation and the mobility of metals " (SS-57)
The mobility of many metals is greatly influenced by natural organic matter (NOM) ligands. Because NOM is a mixture of components and much of NOM is ill defined, NOM-metal interactions are very difficult to study. Recent research utilizing spectroscopic and thermodynamic equilibrium techniques has greatly improved the understanding of the mode of interaction of metals with NOM.

In addition, advances in equilibrium modeling of the behavior of NOM-metal interactions allows for researchers to better predict the behavior of metals in natural waters.

Organizers: Paul Bloom (prb@umn.edu)
Department of Soil, Water, and Climate, University of Minnesota
Yona Chen (yonachen@agri.huji.ac.il)
Dept. Soil & Water, The Hebrew University of Jerusalem

Important Dates

October 15, 2004	Begin acceptance of abstracts
January 15, 2005	Abstract submittal deadline
May 20-25, 2005	Moscow, Idaho Goldschmidt

For more information see: http://www.the-conference.com/2005/gold2005/index.php

Character of Natural Organic Matter and its Role in the Environment -10th Nordic IHSS Symposium:

June 1 - 3, 2005, University of Latvia, Raina blvd. 19, LV-1586, Riga, Latvia
For further information contact Maris Klavins or Janis Sire
Department of Environmental Sciences, University of Latvia
Raina blvd 19, Riga, Latvia,LV-1586
Phone: +371 7331766, Fax: +371 7332704, e-mail: Janis.Sire@lu.lv

The 5th North Central Regional Symposium on Natural Organic Matter

June 14 – 16, 2005, The Ohio State University, Columbus, Ohio.
The symposium, cosponsored by the US chapter of IHSS, will be held in conjunction with the annual meeting of the Environmental Molecular Science Institute at The Ohio State University.
Contact Paul Bloom: prb@umn.edu, 612-625-4711, or see:
http://www.chem.umn.edu/environment/NOM/.

XIII International Meeting of IHSS:

July 30 to August 4, 2006, held at the University of Karlsruhe, Germany.

Ladislau Martin-Neto, head of the organizing committee of the XII IHSS meeting, passed the IHSS banner to the organizers of XIII IHSS meeting Fritz Frimmel and Gudrun Abbt-Braun

Impressum

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Newsletter 31

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