



DRAFT

CONCLUSIONS

the 14th Meeting of IHSS

**“From molecular understanding –
to innovative application of humic
substances”**

Presented by **Irina V. Perminova**

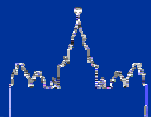
Co-Chair of the Scientific Committee

14th International Meeting of IHSS

September 14 – 19, 2008, Moscow – Saint Petersburg, Russia

PREAMBLE

Due to its diffuse nature, Humic Substances face an identity crisis: the materials are seen by one part of the HS community as a key component of many environmental issues, such as carbon sequestration, global warming, and nature's carbon cycle, while by others they are viewed more as a potential source of carbon feedstocks for chemical industries.



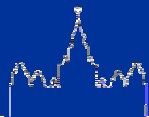
MAJOR GOAL OF IHSS-14

Expand the existing attitude towards humic substances as components of organic matter in soil and water to understanding their potential as alternative sustainable feedstocks for the chemical industry.



To achieve this, the following gaps in knowledge transfer between fundamental science and applications were identified.

These gaps could be also seen as *strategic research priorities* needed for developing a humic-based industrial sector.



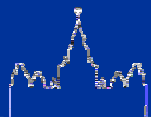
GAPS IN THE KNOWLEDGE -1

- SOURCES OF HUMIC SUBSTANCES ARE VERY DIFFUSE: APPROPRIATE INVENTORY STUDIES ARE NEEDED

Humic substances exhibit many similarities to lignin, which comprises one third of the plant-derived biomass.

The major stock of humic substances is preserved in the fossilized organic materials such as lignites, peat, and sapropel. Young humified biomass such as composts and sewage sludge present a link between lignin and fossilized humic materials. In addition, large amounts of HS are present in soil, water and air comprising the most dynamic part of humic matter.

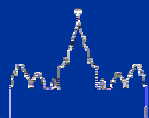
Hence, the sources of HS are very diffuse and extensive inventory studies are needed.



GAPS IN THE KNOWLEDGE -2

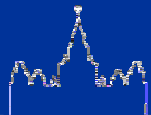
- IDENTITY CRISIS OF HUMIC SUBSTANCES: CLASSIFICATION OF HS AS CARBON FEEDSTOCK FOR DIFFERENT INDUSTRIAL NEEDS IS NEEDED

To apply humic substances, we will need to classify them. Classification should be based on a series of standardized assays establishing links between molecular structure and specific properties. The classification scheme should allow construction of a relationship matrix that can be viewed in a suitable dendrogram. Such information could be used to identify characteristics either individually or in combinations that endow favorable functionality for different applications. With such information it would be possible to quickly relate a source material with a process or desired function in a predictable manner.



GAPS IN THE KNOWLEDGE - 3

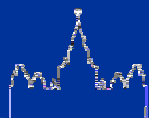
- STANDARDIZATION PROTOCOLS ARE LACKING =>
DEVELOPING PROTOCOLS AND QUALITY CRITERIA FOR APPROPRIATE INDUSTRIAL NEEDS IS NEEDED



GAPS IN THE KNOWLEDGE -4

- DIVERSE FUNCTIONALITY OF HUMIC SUBSTANCES: SYSTEMATIC REACTIVITY MAPPING STUDIES ARE NEEDED

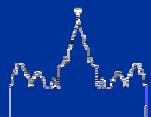
Humic substances are chemically reactive, and they possess a wide range of functionalities that could change when structural modifications are made to acquire desired properties. Humic substances are not well understood with regards to exact structure, appropriate methodology for conversion to other materials, and fundamental knowledge regarding their chemistry and properties.



GAPS IN THE KNOWLEDGE -5

- HS POSSESS BIOLOGICAL ACTIVITY, WHICH IS BENEFICIAL BOTH FOR PLANTS AND HUMAN BEING

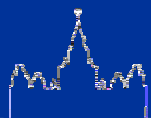
The biological activity of HS is not very well proven and, hence, not generally appreciated => VIGOROUS MECHANISTIC STUDIES ON BIOLOGICAL ACTIVITY OF HS ARE NEEDED



GAPS IN THE KNOWLEDGE - 6

- PRACTICAL APPLICATIONS OF HS ARE LIMITED TO AGRICULTURE.

MARKETING STUDIES ARE NEEDED =>
THE INPUT FROM INDUSTRY IS HIGHLY
DESIRABLE IN THE FORM OF PRACTICAL
NEEDS OF OTHER INDUSTRIES

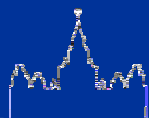


GAPS IN THE KNOWLEDGE - 7

- GENERAL KNOWLEDGE ON HUMIC SUBSTANCES IS VERY LIMITED

NEW CURRICULA FOR TEACHING HUMIC CHEMISTRY AS A PART OF ORGANIC CHEMISTRY COURSE ARE NEEDED

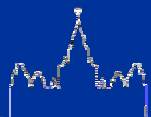
UNIFIED DEFINITIONS (VOCABULARY) ON HUMIC SUBSTANCES SHOULD BE DEVELOPED AND PUBLISHED ON PUBLIC DOMAIN (Wikipedia)



GAPS IN THE KNOWLEDGE - 8

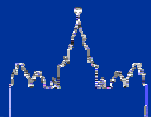
- VISIBLE KNOWLEDGE GAP EXISTS BETWEEN INDUSTRY AND ACADEMICS

Society might consider developing an external advisory board to bring the needs of industry to the forefront



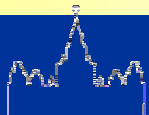
GAPS IN THE KNOWLEDGE - 9

- There is a need for a large scale interdisciplinary and policy oriented research programme enabling the establishment of a road map identifying major knowledge gaps and monetizing the importance of NOM and HS.



RECOMMENDATIONS

- Greater definition of the role and potential impact of HS would result from workshops with leading experts in HS, combined with experts in allied fields, in order to establish the “grand challenges” in fundamental science of HS.
- Parallel workshops with potential industry stakeholders in HS applications would provide the link for eventual transition of fundamental discoveries to real world utility.
- Finally, the HS community would benefit from preparing a comprehensive summary of challenges and opportunities (such as a special issue of an appropriate journal?) with reviews on HS structure, biosynthesis, utility, research needs, economics, impact, etc



THANK YOU ALL!

SEE YOU IN RUSSIA AGAIN!



БОЛЬШОЕ СПАСИБО ВСЕМ!

ДО НОВЫХ ВСТРЕЧ В РОССИИ!