Otto Glatter

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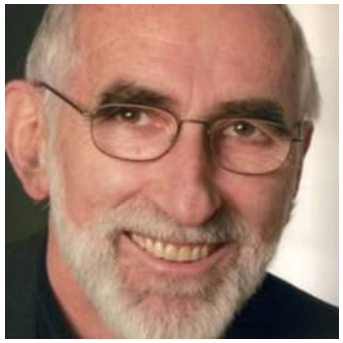

Otto Glatter is a distinguished Professor of Physical Chemistry at the Karl-Franzens-University in Graz, Austria. He finished the undergraduate studies with a diploma thesis in Theoretical Physics at the Technological University of Graz, Austria in 1969. He received his Ph.D. from the Technological University in Graz in 1972.

He dedicated many efforts for the development of new evaluation methods for SAXS and SANS scattering techniques, as well as static and dynamic light scattering. The use of the Indirect Fourier Transform has represented a milestone in the SAXS and SANS modern data analysis.

His interests in the development of new instrumentation has allowed the development of the SAXSess (Anton Paar) SAXS camera. The passion for the dissemination of knowledge related to scattering techniques is testified by his commitment as co-organizer and teacher in all 14 editions of European Summer Schools on Scattering methods applied to soft condensed matter held in Bombannes.

During the last 15 years he focused on the development of new, nano-structured materials with hierarchical organization for food, agricultural, and cosmetic applications.

He published more than 200 papers in international scientific journals and was invited to more than 75 international conferences as plenary lecturer, keynote speaker of invited speaker.

He organized two international conferences and four international workshops. In 2012 he received the Guinier Prize 2012, Sydney, Australia; in 2013 the Overbeek Gold Medal 2013, ECIS, Limassol, Cyprus, and in 2016 the Lectureship Award of the Division of Colloid and Surface Chemistry of the Chemical Society of Japan. He is the editor of the book Small Angle X-ray Scattering (1982, Academic Press) and author of the recent book Scattering Methods and their Application in Colloid and Interface Science (Elsevier 2018).

Self-Assembled Liquid Crystalline Materials Control of Structure by Molecular Interactions

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Glycerolmonolinolein (MLO), Glycerolmonoolein (GMO), Phytantriol (PT) and a few other lipophilic molecules self-assemble in bulk in presence of water to form well defined liquid crystalline phases. Their structure can be tuned by temperature variation and/or by addition of oils or other ingredients. This leads to gel-like or fluid systems with a large internal interface between water and oil domains with different viscosities.

These nanostructured phases can be dispersed in the excess water phase by addition of an external stabilizer and energy input leading to internally self-assembled particles, so-called Isasomes (O/W emulsions) [1-5]. These Isasomes are potential carrier systems for hydrophilic, amphiphilic and lipophilic functional molecules, but similar structures are also formed in the intestine during digestion of fat [6]. Their internal nanostructure can be best characterized by SAXS, supported by polarization spectroscopy, while particle sizes are usually determined by dynamic light scattering (DLS) and Cryo-TEM.

Mixtures of Isasomes with different nanostructures can be used to study lipid transport between Isasomes [7]. The size of the water channels can be controlled by the addition of amino acids [8]. The high viscosity of the liquid crystalline phase can be used to produce stable, nano-structured W/O emulsions without any stabilizer [9].

Finally, we can form reverse hexosomes existing of a hydrophilic liquid crystal dispersed in an oil like alkane [10].

All these systems have a great potential as delivery systems for functional molecules in very different fields like pharmaceutical and cosmetic applications, food science and agro-chemistry.

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[9] Ch.V. Kulkarni, et al., 2010 Soft Matter, **6**, 5615, "Water-in-oil nanostructured emulsions: towards the structural hierarchy of liquid crystalline materials"
[10] F. Pirolt, et al., (2018), Langmuir, **34**, 8379. "Reverse-Hexosome Dispersions in Alkanes – The Challenge of Inverting Structures"

Piero Baglioni

Department of Chemistry & CSGI, University of Florence, Italy.

Piero Baglioni has been a full professor of physical chemistry in the Department of Chemistry at the University of Florence since 1994 and is an MIT affiliate. He was appointed as a visiting scientist/professor by the University of Houston, the Weizmann Institute, the Collège de France, and MIT. He is the Director of CSGI (Center for colloid and surface science, "Consorzio per lo Sviluppo dei sistemi a Grande Interfase"), and he is on the editorial/advisory boards of several international journals and a member of the scientific board of several national and international institutions and societies. He is the author of more than 450 publications and 25 patents in the field of colloids and interfaces and a pioneer in the application of soft matter to the conservation of cultural heritage.

SAXS Application in Cultural Heritage Conservation

European Cultural Heritage (CH) is bold, inspirational, and with a wide societal relevance. Tangible and intangible Heritage are European common goods and narrate our past and shared future. As a matter of fact, the European Cultural Heritage is the connective tissue between the artistic and creative production, culture, ethics and values, business and technology. Works of art and artifacts are subject to deterioration. Their surfaces interacting with the environment are the most prone to aging and decay; accordingly, soiling is a prime factor in the degradation of surfaces, chemical and mechanical degradation are often associated to soiling and lead to the disfigurement of a piece of art. The effects of these processes are usually strongly amplified in the presence of protective coatings, mainly acrylic and vinyl polymers. We pioneered the synthesis and the application of several advanced systems for the consolidation and the cleaning of works of art, as hydroxides nanoparticles, microemulsions and chemical/physical gels. All these systems constitute a new platform for Conservation of Cultural Heritage and are characterized by scale lengths below 100 nm in one or more dimensions, making neutrons and x-rays the primary tool for the investigation and the tailoring of these systems to the final application. Scattering techniques played a major role in the development of new palette of materials for the conservation, as microemulsions, physical and chemical gels, magnetic gels and microemulsion confined in responsive gels. In this talk examples from self assembled systems for the cleaning or the removal of coatings from pictorial surfaces will be highlighted. Micellar solutions and microemulsions constitute very efficient systems for the removal of acrylic, vinyl and alkyd polymers or grime/soil. They (as well as neat solvents used in "traditional" conservation) can be confined into chemical and physical gels having proper nano-domains for the upload or the delivery of compounds from/to the work of art. These systems have been used on artifacts of the most diverse origins, from Renaissance frescoes to Picasso and Pollock, Lichtenstein, etc. I will show how chemical and colloidal design can be implemented to meet the requirements of the end-users and how precise knowledge of structure, dynamics and interfacial interactions can contribute to overcome the traditional serendipitous approach used by conservators.

Cinzia Giannini

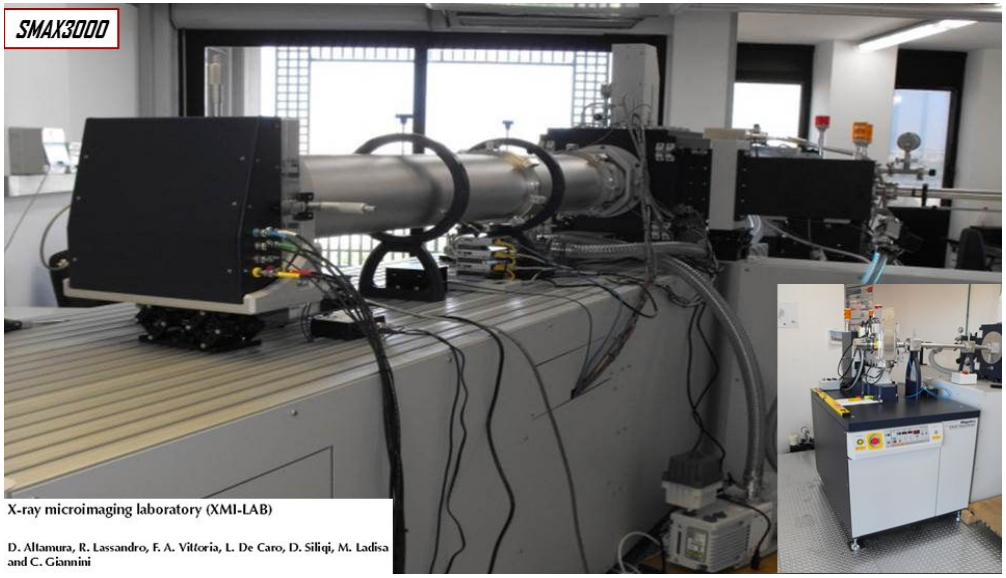
Istituto di Cristallografia, Consiglio Nazionale delle Ricerche, Italy

Cinzia Giannini Ph.D. in Physics at the Physics Dep. of the University of Bari, Italy. Senior Researcher of the National Research Council, Institute of Crystallography Bari (Italy) where she leads the X-ray MicroImaging Laboratory (XMI-L@b).

More than 25 years' experience in the structural characterization of (nano)materials, biomaterials, natural and bio-engineered tissues, interfaces and surfaces with X-ray based scattering techniques.

GISAXS/GIWAXS and Scanning SAXS Microscopy Applications at the X-ray MicroImaging Laboratory

The presentation is aimed to describe the X-ray MicroImaging Laboratory (XMI-L@b) equipped with a FR-E+ Rigaku microsource and a SMAX3000 3-pinholes camera [1,2], instrumentation further developed by the XMI-L@b team for X-ray scanning microscopy [3], with respect to its standard SAXS/WAXS, GISAXS/GIWAXS performances. Applications in medicine and material science will be shown.



X-ray MicroImaging Laboratory (XMI-L@b)

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Lise Arleth

Structural Biophysics, X-ray and Neutron Science, Niels Bohr Institute, University of Copenhagen, Denmark

Lise Arleth received her PhD in Physics in 2002 from Risø National Laboratory and The Royal Danish Veterinary and Agricultural University in Denmark under the supervision of Prof Jan Skov Pedersen. She held a Post Doctoral fellowship at Lujan Neutron Scattering Center at Los Alamos National Laboratory, New Mexico, from 2002 to 2003. Since returning to Denmark in 2004 she has held academic positions at first Risø National Laboratory, then the Royal Veterianary and Agricultural University and since 2007 at University of Copenhagen. In 2015 she was appointed professor in Experimental Biophysics at the Niels Bohr Institute of Physics at University of Copenhagen. Throughout her career, Lise Arleth has used solution small-angle scattering (X-rays and neutrons, i.e. SAXS and SANS) as her main technique for investigating various self-assembled and colloidal samples. Presently she and her research group have special focus on developing approaches for investigating membrane proteins under solution conditions. Almost all experiments are carried out at international large scale facilities (X-ray Synchrotrons and Neutron scattering facilities) in highly interdisciplinary and international scientific environments. Lise Arleth has been strongly engaged in the European Spallation Source (ESS) and the Max-IV Synchrotron projects and is looking very much forward to become a user of these facilities.

Using phospholipid nanodiscs for Small-angle X-ray and neutron scattering based structural studies of membrane proteins

Small-Angle Neutron Scattering (SANS) and Small-Angle X-ray Scattering (SAXS) have been combined with different approaches for reconstituting membrane proteins and modeling based data analysis to enable the investigation of the structure of a general membrane protein as well as it's surrounding lipid membrane environment. Results obtained for the structure, localization and orientation of three structurally very different membrane protein types, Bacteriorhodopsin, Aquaporin and Cytochrome P450 will be presented. It is shown that the small-angle scattering based approach holds perspectives for investigating both the flexibility and dynamics of membrane proteins in a native-like lipid environment. Results, limitations and perspectives of the developed approach will be discussed.

Ulf Olsson

Physical Chemistry, Lund University, Sweden

Ulf Olsson is a professor of physical chemistry at Lund University, Sweden. He obtained his PhD in Lund in 1988. After a year as a post-doctoral fellow at Centre Paul Pascal, Pessac (Bordeaux), he returned to Lund at the end of 1989, and has remained there, at the division of Physical Chemistry, where he is currently Head of the Division. His research interests are focused on surfactant self-assembly and microemulsions involving self-assembly structure, phase equilibria and structural transformation kinetics. His research interests also include the self-assembly of peptides and other biomolecules. Experimental methods involve mainly various NMR and scattering methods. He is currently also board member of Lund Institute for Advanced Neutron and X-ray Science (LINXS) and spokesperson for the CoSAXS beamline at the MAX IV Laboratory synchrotron.

Self-Assembly of model peptides A_nK

Small peptides may self-assemble in solution into well defined β-sheet based structures of various shapes like ribbons, rods, plates or tubes. The aqueous self-assembly is typically driven by hydrophobic interactions and colloidal stability can be achieved is the peptides carry a net charge. Peptide self-assembly is still not fully understood. For example, it is often not clear whether the observed self-assembly corresponds to equilibrium "micelles", characterized by an equilibrium size distribution, or to kinetically stable precipitates. In the present talk we will discuss the aqueous self-assembly of short model peptides, A_nK, where A denotes alanine, K is lysine and n is the number of alanine residues in the chain. A_6K form hollow tubes with a strikingly monodisperse cross section diameter of 52 nm. A_8K and $A_{10}K$, on the other hand, form twisted ribbons, having a rectangular cross section of ca. 4 nm by 8 nm, that also are strikingly monodisperse. This and other aspects will be discussed, based upon detailed structural characterizations of the aggregates, using, in particular, small and wide angle X-ray scattering.