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Obituary

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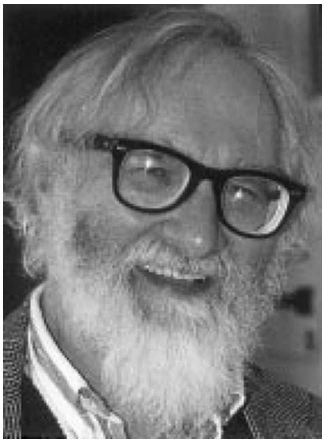

George Stell (1933–2014)

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Born in 1933 in the coastal village of Sea Cliff on Long Islands' North Shore, George Stell played a central role in the development of the statistical mechanics of classical and quantum fluids and strongly influenced the careers of many researchers and academicians who had the good fortune to collaborate with him or have him as a mentor. He is sorely missed.

With a strong mathematical avocation, George obtained his Bachelor of Science degree in 1951 from Antioch College, in Yellow Springs, Ohio, an institution well known for its emphasis on Liberal Arts, its cooperative educational program, and for being a cradle of social activism. After a time at the Chicago division of the University of Illinois as Instructor of Physics, he returned to New York where he joined the Institute of Mathematical Sciences (later known as Courant Institute of Mathematical Sciences) in New York University as a PhD student under the supervision of J B Keller. He presented his dissertation in 1961 with the title 'Solutions of the Hierarchy Equations of Statistical Mechanics for Mixtures', marking the emergence of his long term interest in the fields of fluids and disordered matter. He remained for a few years at the Institute as a staff mathematician, publishing his first key paper on cluster expansions for fluids in equilibrium [1], a paper that lay the foundation for much of the further development in the theory of fluids. Later he moved to the Belfer Graduate School of Science as a postdoctoral fellow under the supervision of J L Lebowitz where, in collaboration with Shalom Baer, he investigated graph expansions in powers of the inverse Kac long range γ-parameter [2]. This work was inspired by previous research of Mark Kac, George Uhlenbeck and a Norwegian postdoctoral research associate at the Rockefeller University, Per Christian Hemmer. In 1965 George moved to the Polytechnic Institute of Brooklyn where he was appointed as an associate professor. During that time he began a long term collaboration with Per Hemmer and other researchers at the Norwegian Institute of Technology in Trondheim. Among other things, Per Hemmer and George Stell showed how a simple fluid with an interaction potential exhibiting various interaction ranges can undergo multiple phase transitions [3]. The Hemmer–Stell potential became the focus of renewed interest after the late nineties due to its ability to explain thermodynamic, structural and dynamic anomalies in simple liquids (including the existence of liquid–liquid equilibria), and especially in connection with the search for the second critical point of water. In 1968, George moved to the State University of New York at Stony Brook, where he would spend his next 46 years, first in the Department of Mechanics (1968–1979) and then in the Department of Chemistry and Engineering (from 1979 onwards), becoming Distinguished Professor in 2001. At Stony Brook he supervised his first PhD student, Carol Hall, and several years later Salvatore Torquato, to name but a few of the many first line scientists who had him as a mentor.

George Stell's work on the inverse long range γ-parameter expansion paved the way for his numerous and essential contributions on the behavior of dipolar fluids, a work in which his collaboration with another Norwegian postdoctoral researcher, J S Høye, led to very relevant contributions [4]. This collaboration had many ramifications, some of them in connection with the development of integral equation approaches, in particular exploring the analytical or semi-analytical solutions of the mean spherical approximation (MSA) for a large variety of systems, ranging from single component dipolar fluids, to ionic and Yukawa fluids, as well as classical and quantum polarizable fluids. Pointing out the thermodynamics inconsistencies intrinsic to the MSA, Stell and Høye formulated the self consistent Ornstein–Zernike approximation [5] (SCOZA), a differential equation approximation that in the last twenty years has been put to test in a wide variety of systems. This approximation has been shown to be able to reproduce the critical behavior of simple fluids with astonishing accuracy.

Ionic fluids were one of George Stell's favorite subjects—ripe for the application of his favorite approaches: integral equation treatments (e.g. the MSA) or cluster expansion analysis. With seminal contributions back in the 1970s [6], the critical behavior of ionic fluids was a topic to which he devoted a great deal of work during his scientific career [7]. The nature of criticality of ionic systems was an issue that was marked by the long controversy between George's views and those of Michel Fisher. Their debate was followed with interest by the scientific community in numerous meetings over more than a decade.

George's interest in random media dates back to the late 1970s and was first reflected in his work with one of his first PhD students, Salvatore Torquato, where the theory of *N*-point probability functions was extended to 2-phase random media. In close connection with this problem, one decade later, together with a postdoctoral researcher, James A. Given, he opened an entirely new avenue of research in the field of statistical mechanics of partly quenched systems, introducing the Edwards and Jones replica trick into the realm of fluid theory to describe fluids confined in disordered porous media [8]. The Replica Ornstein–Zernike equations became a popular tool to account for the behavior of quenched-annealed mixtures. In particular, its application to simple and complex fluids confined in random porous media has been the topic of hundreds of publications over the last 25 years.

George's collaborative activities took him not only to Norway but also to other European locations, especially Paris. Attracted both by its cultural life, and the flourishing groups working on statistical mechanics of fluids both at Orsay and Jussieu, George first moved to Paris as a visiting Professor in 1968. There he interacted with Loup Verlet, Jean-Jacques Weis and Dominique Levesque at Orsay, sharing their interest in polar and especially ionic fluids. In the 1990s, while visiting Jussieu, George, Gilles Tarjus, and Martin-Luc Rosinberg derived the complete thermodynamic formalism of the Replica Ornstein–Zernike theory [9].

In close connection with his work on ionic fluids, George undertook a series of pioneering studies on chemical reactions, associating fluids, and molecular fluids as a limiting case. This work was initiated with Peter Cummings, a postdoctoral researcher at Stony Brook at the time [10], and saw further expansion in the late 1980s and early 1990s in the PhD work of Yaoqui Zhou also supervised by George Stell [11]. Almost a decade later, these approaches were linked within the general framework of Wertheim's theory for associating fluids [12] and the proper Reference Interaction Site model expansion thanks to the collaboration between George and the group of Myroslav Holovko at the Institute of Condensed Matter Physics in Lviv (Ukraine).

George was a visiting scholar in tens of academic institutions in Europe and US. To name but a few, he was research scientist at the Laboratoire de Physique Théorique et Hautes Energies at Orsay (France), Université Pierre et Marie Curie in Paris, at the Institutt for Teoretisk Fysikk in Trondheim (Norway), the Atomic Energy Research Establishment (Harwell, UK), at the University of California (Lawrence Radiation Lab), at the Rockefeller University in New York, the University of Minnesota, and at the Brookhaven National Lab. His career was marked by numerous awards, which include the Creative Extension Award of the National Science Foundation (1987), the Lars Onsager Professorship Award (1993), and the Joel Henry Hildebrand Award in Theoretical and Experimental Chemistry of Liquids of the American Chemical Society. From 1984 to 1985 he was recipient of the John Simon Guggenheim Fellowship. Since 1975 he was Fellow of the American Physical Society and from 1992 he was a member of the Royal Norwegian Academy of Sciences and Letters.

With more than 330 publications spanning the period from 1962 to 2009, George's scientific contribution constitutes a substantial part of the solid foundations on which current statistical mechanics of disordered matter rests. But in addition to that, his human side was also impressive; a great scientist with a sweet and open personality, a caring husband and father, and kind and supportive to his students. For those of us who had the chance to interact with him in person—most of the contributors to this memorial issue—he left a lasting impression, both for his acute sense of humor and his inspiring comments on both scientific and non-scientific issues. Moreover, it was always a pleasure to enjoy his performances as a jazz musician. In fact, George's love for music paralleled his enthusiasm for science. He was a skilled trombone player, who loved to join in jam sessions both in New York and Long Island, and in Paris or Copenhagen. In fact he kept one trombone in Paris and another one in Trondheim, and so he avoided carrying it along in his frequent visits to Europe. In George's words: "Music has always fascinated me. On the one hand it is devoid of information in a certain sense … of objective information. Yet it carries this powerful message that is quite mysterious". In a sense, this last sentence could also reflect his love and passion for science as well. Even today, the recording of *Carl Halen's Gin Bottle Seven*, featuring George Stell at the trombone during his time at Antioch College in 1954 is still available, or its later contribution to Albert Aylers', *Live at Greenwich Village: The Complete Impulse Recordings*, recorded in 1965. In the same fashion that one could meet George in a jam session in a night club in Paris or Manhattan, it was also possible to encounter him and Joel Lebowitz disentangling cluster expansions for plasmas at the Parisian Café de la Paix.

In summary, in the previous paragraphs we have just attempted to provide a sketch of what in our personal view are some of the lines of research which George pursued along his career that had a lasting impact on the statistical mechanics of fluids and disordered matter. At the same time, we tried to draw a more personal picture of George as the kind person, excellent musician and great scientist he was. A modest homage to his role as scientist, teacher and person follows in the selected contributions that constitute this Special Issue of the *Journal of Physics: Condensed Matter*.

We are grateful to those people who have conveyed to us some of their personal experiences of the time they shared with George, namely J L Lebowitz, P C Hemmer, J S Høye, and F Ranieri.

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