

ENI AWARD 2009

New Frontiers of Hydrocarbons Prize

Winner (ex aequo)

Alan G. Marshall

Petroleomics: Correlation and Prediction of the properties and behaviour of Petroleum Crude Oil and Its Products from Detailed Chemical Composition Determined by Ultrahigh-Resolution Fourier Transform Ion Cyclotron Resonance Ion Cyclotron Resonance Mass Spectrometry (FT-ICR-MS)

Biography

Professor Marshall has been directing the ICR Program since 1993 within the National High Magnetic Field Laboratory. The research centre, with headquarters in Tallahassee, at the Florida State University, was built in 1994 thanks to a National Science Foundation loan and is part of a consortium led by the university itself which has among its members the University of Florida and the Los Alamos National Laboratory.

The Laboratory hosts numerous visiting scientists from different fields so that they may have access to the extremely powerful magnetic fields that are generated there. It is the largest and highest powered magnet laboratory in the world. With these powerful high output magnets Alan G. Marshall, co-inventor of the technique known as Fourier Transform Ion Cyclotron Resonance (FT-ICR), a high resolution method for the accurate determination of mass. Thanks to the high resolution techniques created by the group to identify the molecular components of complex chemical compounds such as blood or oil, they have been able to obtain an extremely detailed picture which enables scientists to understand and predict with great accuracy the reactions and properties of these complex compounds.

Prof. Marshall graduated in chemistry in 1965 from Northwestern University and achieved his PhD in Physic Chemistry in 1970; he began his academic career at British Columbia University and Ohio State University and then moved to Florida State University in 1993.

Alan Marshall has written 469 extremely valuable scientific publications, he holds numerous patents as a result of his researches and received many recognitions from universities and important institutes such as the American Institute of Chemists and the American Chemical Society. He is a member of several scientific commissions and has also been on the board of many specialized magazines.

Reasons for the choice

Dr. Alan G. Marshall has extended the mass spectroscopy method usually applied to the polar molecules to neutral molecules, by developing an efficient electrospray ionization technique, combined with the high resolution ion cyclotron resonance mass spectrometry (FT-ICR MS). This approach offers the mean for resolving the composition of any complex mixture including crude oil and blood, with the possibility of identifying simultaneously up to 50.000 chemical distinct components in a single mass spectrum.

For petroleum technology this represents a significant achievement since it offers for the first time the possibility of obtaining a complete chemical identification of crude oil and its products, providing a new and powerful tool for the prediction of fossil fuel properties and behaviour .