

Citation for **Arieh Iserles** for the David Crighton Medal

Arieh Iserles' research has been at the leading edge of numerical analysis for his whole career. His early papers dealt with stability and accuracy which were at the forefront of numerical analysis at the time. In particular, he wrote an important paper with Gilbert Strang (1983) on the accuracy of difference schemes and a first book with Syvert Nørsett (1991) on the theory of order stars.

Arieh's most important mathematical contributions include being one of the leading practitioners of geometric numerical integration and in particular the subdiscipline of Lie group methods, which are numerical integration methods for ordinary differential equations on Lie groups and homogeneous spaces. Geometric integrators preserve structure such as the presence of symmetry, invariant volumes and symplectic geometry. The Lie group integrators preserve not just the Lie group as a manifold, but have built in the presence of a group action and a Lie algebra as the tangent space. Arieh's recent work on highly oscillatory integrals is also deserving of high praise, and is a breath of fresh air in a classically difficult subject. It should be mentioned that the algorithms Arieh studies always exhibit sensitivity to the problems of implementation, so the work covers the whole range from theory to practice.

Two other areas of Arieh's research are worthy of special mention. One is a seminal contribution to approximation theory, by developing the theory of Sobolev Orthogonal Polynomials, with Koch, Nørsett and Sanz-Serna (1991). Another is recent work with Tony Bloch on isospectral flows with Poisson structure, leading to the discovery of a new and fascinating integrable system of Toda type, now known as the Bloch-Iserles system.

Arieh has an outstanding record of service to the research community. There are three main contributions: editorial work, especially that of *Acta Numerica*; to the Society for the Foundations of Computational Mathematics, and finally, a stellar record of teaching and mentoring.

Arieh's editorial work is what editorial work should be but infrequently is. He doesn't just manage; he reads the papers himself and joins in the decision making and advice to authors, rather than relying solely on referees. Arieh founded *Acta Numerica* in 1992. Its pages have included many seminal review articles in a large variety of active and important topics. During 2004-9 it achieved the highest mathematical citation quotient (MCQ) of *any* journal indexed by Mathematical Reviews (*Annals of Mathematics* was in second place). Among many other journals, Arieh also co-managed the *Journal of Foundations of Computational Mathematics* with Peter Olver and then Mike Todd, and it has achieved pre-eminence as the leading journal of the field.

Arieh was one of the founding members of the Society of Foundations of Computational Mathematics, with Steve Smale and Mike Shub among others. This organisation has been a great success, and Arieh has been fully active as Secretary, Chair, Board member and committee worker. In particular, there is a huge triennial conference with nine days of talks, 18 plenary speakers and more than 20 separate workshops in topics ranging from computational number theory to flocking and

swarming. This breadth and diversity with quality is the hallmark of Arie's vision for FoCM.

Last but not least, is Arie's contributions to teaching and mentoring, with award winning former students, a strong contribution to women in mathematics, and a textbook on Numerical Analysis. It is hard to give Arie sufficient credit for the influence he has on others, his energy, enthusiasm, commitment and friendship.