Reinout Quispel was born on 8 October 1953 in Bilthoven, a small town near Utrecht in the Netherlands. He studied both chemistry and physics, gaining bachelor’s degrees at the University of Utrecht in 1973 and 1976 respectively, and then specialized in theoretical physics, with a Master’s degree in 1979 (on solitons in the Heisenberg spin chain, supervised by Theodorus Ruijgrok) and a PhD, *Linear Integral Equations and Soliton Systems* [22], in 1983, supervised by Hans Capel.

This thesis, which begins with a study of integrable PDEs, arrives in Chapter 4 (later published in [24]) with the discovery of a method for obtaining fully discrete integrable systems on square lattices, that have as continuum limits the Korteweg–de Vries, nonlinear Schrödinger, and complex sine–Gordon equations, and the Heisenberg spin chain. Thus several of Reinout’s lifelong research interests – continuous and discrete integrability, and the relationship between the continuous and the discrete – were present right from the start.

The next stop was a postdoc at Twente University, working with Robert Helleman, the founder of the ‘Dynamics Days’ conference series, before a long-distance move to the Australian National University, working with Rodney Baxter. Reinout and Nel expected this southern sojourn to last for three years; thirty-three years later they are still happily resident in Australia. In 1990 Reinout moved to La Trobe University, Melbourne, where he became a Professor in 2004.

Reinout’s three main research areas are discrete integrable systems, dynamical systems, and geometric numerical integration, along with interactions between these topics.

In discrete integrable systems, having introduced a major new direction in his PhD thesis – his novel reductions to Painlevé equations led to the Clarkson–Kruskal non-classical reduction method – he continued by codiscovering the QRT map [25, 26], an 18-parameter family of completely integrable maps of the plane. These turned out to have far-reaching implications in dynamical systems theory, geometry, and integrability. For example, the modern construction of nonautonomous dynamical systems known as discrete Painlevé equations rely on them. Their geometry is explored at length in the 2010 book *QRT and Elliptic Surfaces* by Hans Duistermaat and is still being investigated today.

In dynamical systems, his work has centred on systems with discrete and/or continuous symmetries. His review [28] marked the emergence of reversible dynamical
systems as a distinct class that exhibits both of conservative and dissipative features. He studied continuous and discrete \( k \)-\((reversing) symmetries (symmetries of the \( k \)th iterate of a map) \[11, 14\]. In \[16\], he introduced “linear–gradient” systems as a unification of Hamiltonian, Poisson, and gradient systems and systems with Lyapunov functions and/or first integrals.

A similar flavour runs through his work on geometric integration, where he has been a proponent of the structural point of view, in which each natural class of dynamical systems (that may form a group, semigroup, or symmetric space) is studied in its own right, with a goal of finding natural structure-preserving integrators for each class \[18\]. Clearly his background in physics and dynamical systems contributed here; the perspective he brought broadened the entire field. For example, he has introduced integral-preserving integrators; volume-preserving integrators; and (reversing) symmetry-preserving integrators \[17, 27\]. He presented the Average Vector Field method as an energy-preserving B-series method, which opened the door to connections with Runge–Kutta theory \[23\]. This has triggered a revival of interest in integral-preserving integration which continues to this day. He conjectured and proved that no B-series method is volume-preserving for all divergence-free vector fields, one of few known ‘no-go’ results in this area \[12\]. He realized that Kahan’s ‘unconventional’ method is also a B-series method \[5\], while in addition preserving integrability in many cases. This last work combined his interests in numerical integration and discrete integrability in a highly satisfying way.

An inveterate traveller, Reinout has been a key participant at numerous research programs around the world, of which we would like to mention the Semester on Foundations of Computational Mathematics, MSRI (1998); the Special Year on Geometric Integration, Centre for Advanced Study, Oslo (2002/03); the Semester on Highly Oscillatory Problems, Isaac Newton Institute (2007), the Semester on Geometry, Compatibility, and Structure Preservation, Isaac Newton Institute (2019), and his co-organization of the Semester on Discrete Integrable Systems, Isaac Newton Institute (2009).

He is a true scientific leader, having transformed each of the areas he has touched into major fields of study, due in part to his style: he is an ideas person. He does not stick to the established path; he sees things differently and has consistently come up with new ideas and directions that have inspired others. His intuition, experience, optimism, persistence, and scientific style lead him to repeatedly make original and high-impact discoveries. We are extremely grateful for the opportunity to know and to work with Reinout. We wish him all the best for the years ahead, and look forward keenly to what new surprises await.

The papers in this special issue span a wide range of topics closely related to Reinout’s research interests. There are three papers on continuous dynamical systems, all related to predator–prey equations. Tuwankotta and Harjanto \[32\] consider a family of classical planar predator–prey systems, finding that a small periodic perturbation induces strange attractors in a neighbourhood of an invariant torus of the unperturbed system. Christodoulidou, Hone, and Kouloukas \[6\] find new, high-dimensional integrable and superintegrable cases of Lotka–Volterra systems, and numerical evidence for chaos in other cases. Evripidou, Kassotakis, Vanhaecke \[9\] study integrable reductions of the dressing chain in Lotka–Volterra form, again finding new superintegrable cases. They find that the Kahan map of these systems is
superintegrable, arising in fact from the compatibility conditions of a linear system, thus linking Kahan maps to isospectrality.

There are three papers on discrete integrable systems. The QRT map mentioned above is a product of involutions. Joshi and Kassotakis [13] find conditions on the parameters that ensures that these involutions factorise further, providing links to other parts of the study of discrete integrability. Petrera and Suris [21] study particular Kahan mappings, providing a converse to a recent result of Reinout’s that certain Kahan mappings are Manin transformations: they show that any such Manin transformation is a Kahan map. The degree growth of a rational map has been used as a test of integrability, with linear growth associated with particularly simple dynamics. Tran and Roberts [31] establish linear degree growth for several families of mappings, and also find new quad graph mappings with linear growth.

The remaining papers concern geometric numerical integration and its applications. New geometric integration algorithms are presented for the Gross–Pitaevskii equations with rotation term by Bader, Blanes, Casas, and Thalhammer [1]; for the wave equation with multifrequency oscillations by Condon, Iserles, Kropielnicka, and Singh [7]; for the modified KdV equation by Frasca-Caccia and Hydon [10]; for the space-fractional nonlinear Schrödinger equation by Miyatake, Nakagawa, Sogabe and Zhang [19]; for chains of rigid bodies by Šafran and Zanna [29]; for charged particle dynamics by Shi, Sun, Wang, and Liu [30]; and for variational PDEs with symmetry by Zadra and Mansfield [33]. McLachlan and Murua [15] determine the Lie algebra generated by an arbitrary potential and an arbitrary kinetic energy; this algebra underlies many popular symplectic integrators based on splitting.

As mentioned above, Reinout proved that no B-series can be volume-preserving. However, it is known that a generalisation, the aromatic B-series, can be volume-preserving. The composition and substitution rules for these series are developed by Bogfjellmo [3]. Benning, Celledoni, Ehrhardt, Owren, and Schönlieb [2] apply partitioned symplectic Runge–Kutta methods to an ODE formulation of deep learning: the time steps are regarded as parameters to be learned. Likewise, Pathiraja and Reich [20] apply discrete gradient methods to a gradient ODE formulation of Bayesian inference. Here we are moving into the realm of data analysis via geometric numerical techniques. Curry, Marsland, and McLachlan [8] also moves in this direction: data on a symmetric space (such as a sphere or torus) is approximated by lower-dimensional totally geodesic subspaces. If geometric numerical integration, as defined by Budd and Iserles [4], is the numerical solution of differential equations on manifolds, then perhaps we can anticipate the merging and cross-fertilisation of different techniques all concerned with numerical analysis on manifolds.

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