In this issue

Quest for quantum gravity

This issue carries an article by Gary K. Au (**page 499**) on the 'Quest for Quantum Gravity'. It is an extended exposition of some current efforts towards the Holy Grail of theoretical physics. The article makes a real effort to aim at the reader outside the field, and is also unusual in avoiding the impersonal style of the textbook and the research journal, by using detailed extracts from interviews with three of the many people who have spent time on this quest – Chris Isham of Imperial College, London, Abhay Ashtekar of Pennylvania State University, and Edward Witten of the Institute of Advanced Studies, Princeton. We therefore have an interesting contrast in emphases, viewpoints and style. The article does not portray the field as a finished product but is a report from the frontline, so to speak. It will be interesting to see how much of what is described will seem outdated ten or even five years from now, and how much will survive.

R. Nityananda

Fall of liquid drops

The phenomenon of a liquid drop falling under gravity in another immiscible liquid medium is, in fact, a complex one. In general, the drop may deform considerably or even break up, the motion may be unsteady or oscillatory and the wake may even be turbulent. For sufficiently small drops, however, these pathologies are absent and the motion is steady with only slight deformation of the drops. A natural question to ask then is: What is the nature of the drag force on a drop under these circumstances?

In this issue (**page 534**) G. J. Srinivasan and P. Satyanarayana present the results of a detailed experimental study aimed at determining the drag force on a falling drop. They show that although, in general, many more dimensionless groups are involved, for the range of Reynolds numbers, Morton numbers and Eotvos numbers considered, only three are really relevant. Moreover, using data obtained from 21 liquid systems, they show that the relationship between these three yields an explicit expression for the drag force, a quantity of considerable practical interest. One should note that this expression holds even when the drops deform slightly provided the equivalent diameter is used. The authors point out that their results provide a means for measuring the density of liquids available only in microquantities when other conventional methods may fail.

P. N. Shankar

Measuring single-ion activities

Solutions of electrolyte were considered non-ideal, since the change in chemical potential of these solutions was not found to be equal to $RT \ln m$. To account for this, Lewis proposed an empirical correction factor, γ, called the activity coefficient and considered $m\gamma$ to be the effective concentration. The reason for the non-ideal behaviour of electrolyte solution was explained as being due to electrical interaction between ions by the Debye–Huckel limiting law. Thus, the concept of activity coefficient of ions gained a rational basis. However, the activity of a single ionic species remained a theoretical idea since it could not be measured experimentally and the measurable mean ionic activity was used in theoretical calculations.

Activity coefficient is conveniently measured by the EMF of galvanic cells with or without transference. The former involves a junction between two solutions and hence a liquid junction potential (LJP). The latter also includes LJP due to the contact between the reference electrode solution and the electrolyte solution and the electrolyte of the half cell under test. Evaluation of LJP needs a knowledge of single-ion activity (SIA). Thus, one faces a vicious circle when an attempt is made to measure SIA.

In this issue (**page 529**) S. Parthasarathy and K. Ramya propose an interesting solution to overcome this problem. They eliminate liquid junction by using a bridge of solid silver chloride, which is a solid-state ionic conductor. Using this idea, they have measured SIA of Zn^{2+} and Cl^- in $ZnCl_2$ solutions and the results are discussed in this paper. An interesting observation from the results is that the activity is seen to be equal to $Z_i^2 mr_i$ and not mr_i, lending support to the view of Parthasarathy and Srinivasan published in *Current Science* (1994, **66**, 56–59).

S. R. Rajagopalan