

Microscale Experiments in Chemistry – The Need of the New Millennium

1. Newer Ways of Teaching Laboratory Courses with New Apparatus

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Jonathan Swift was in a fantasy world when he wrote the old classic *Gulliver's Travels*. Perhaps, he knew that sometime in future, chemists would use the 'Liliput' scale for performing laboratory experiments. The Kaurava prince Duryodhana, denying any claims of territory to the Pandavas, categorically declared that he would not yield to them even that grain of dust, settled at the tip of a vibrating needle. Probably he realised that even that little particle could be used for doing many experiments! "Small is beautiful", it is said. "Green is more beautiful" – would be agreed upon more easily. While combining these two ideas in chemistry laboratories of teaching institutes, we recently realised that time has come to replace the regularly conducted chemistry experiments in our educational institutions, strictly to the smallest possible scales.

Chemistry has always been an experimental science. Even from the days of alchemists, it was anticipated that every statement of each scientist should be validated through experiments. In the schools, it is desired that teaching of every chapter of theory in chemistry must involve simultaneous confirmation by commensurate experiments in the laboratories. This was always found wanting in our present education system. The main reason for this lapse is large-scale operation of the experiments. Whenever students work in the laboratories they perform the tests on a large scale involving cumbersome assemblies of apparatus and huge amounts of chemicals. Besides, disposal of the products, excess reagents and solvents, without harming the environment, presents considerable difficulties. Even today, the chemistry laboratories in academic institutions are always stocked