Preface

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This special issue of the *Journal of Indian Council of Philosophical Research* (JICPR) will be the first collection of edited papers on the subject of mathematical pluralism in the world. This is because as a philosophical position it is relatively new. However, we have experienced *pluralisms* in mathematics that are much older. As soon as the mathematical community became aware of non-Euclidean geometries, mathematicians had to come to terms with the plurality of geometrical theories. But much older than this, if we cross cultures and time, we find that there have been very different practices and conceptions of mathematics, and very different mathematical cultures. The traditions of Arabic, Chinese and Indian mathematics were different from the Greek. Both pluralism in mathematics as a philosophical position and *pluralisms* in mathematics as a cultural phenomenon are explored in this volume.

Adopting the *philosophical* position is motivated by causes *internal* to modern mathematical practices. The cultural pluralism is due to *external* reasons. These stem from the *society and culture in which mathematics is born*. Besides, mathematical practices of various ethnic communities are diverse. This volume tracks, through representative articles, both kinds of plurality, *internal* as well as *external* and projects pluralism and *pluralisms*.

‘Mathematical pluralism’ means many things. As a recent philosophical position, it is a *family resemblance concept* that includes *at least*:

1. pluralism in methodology or procedure;

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2. pluralism in theories (individuated by sets of axioms or rules or methods);
3. pluralism in underlying logic;
4. pluralism in truth;
5. pluralism in ontology; and
6. pluralism in foundations.

The essence of ‘pluralism’ resides in an attitude. It means having a principled tolerance towards whatever it is one is pluralist about. The tolerance is *principled*, that is, it is not a kindness or a quietism. It is not a *laissez-faire* attitude that comes from giving up trying to find what is correct, and the tolerance can be *principled* in different ways. But at the very least, a *principled* tolerance means that one *would be* willing to become a monist (believe in only one theory as constituting mathematics) *if there were* sufficient evidence to support the monist claim. Thus, we distinguish already between a *principled* pluralism and a *dogmatic* one. The dogmatic pluralist is a sort of global sceptic, a priori not accepting any evidence against pluralism. In contrast, the *principled* pluralist accepts other mathematical methodologies, theories, underlying forms of reasoning and so on until such time as they are ruled out for convincing reasons. Another way in which a pluralist can be *principled* is in being quite clear as to what is to *prima facie* count as good and bad mathematics, and there are several different criteria to bring to bear. Yet another way would be to recognise, acknowledge and tolerate alternative mathematical cultures and practices. This is more of a political attitude and a very powerful one.

There are several reasons for becoming a pluralist in mathematics. One is that the pluralist might think that he, or she, can learn more, and not be led too far astray, by seriously employing or entertaining several: methodologies, theories, cultures, types of theory, etc. A second reason is that on present evidence there is no good enough reason to be monist about: methodology, theory, culture type of theory, foundations and so on. A third reason is that one observes pluralism in the successful practice of mathematics. How one judges ‘success’ can be conceptual—having deep roots in metaphysical or meta-logical principles or it can be political—adopting or rejecting the mathematical culture of the politically dominant culture. A pluralism in ‘success’ is also welcome, provided it is, again, principled, that is: rigorous, and not simply a tolerance without standards. With a pluralism in success, we can look for standards within a practice or culture.

We should like to mention a little bit of the background history that includes some personal history as well. This volume started with a seminar in Kolkata organised by Mihir Chakraborty, on behalf of Sivatosh Mookerjee Science Centre of Asutosh Mookerjee Memorial Institute, Kolkata, in December 2014. This seminar was supported by the Indian Council of Philosophical Research and the R.K. Mission Institute of Culture. Chakraborty had been engaged with pluralism in mathematics for several decades. Friend had recently come out with a book on the subject. So, it made sense to try to organise a meeting. Chakraborty wrote to Friend inviting her to give a talk. Friend was very excited to receive the invitation but had to think hard about accepting because of the expense in energy, time and money. But she had personal reasons to accept. Her middle name is Indira. Her parents gave her this name because they spent 3 years in India before her birth and she was

conceived in India. But she had never visited India. Overriding the arguments against, Friend accepted the invitation. Chakraborty was delighted to receive a positive reply so quickly, and the preparations for the seminar began.

Philosophers and mathematicians from India, Australia, Europe and the USA exchanged views and ideas over 3 days. Subsequent to the seminar, and encouraged by the quality of the exchanges, we decided to collaborate on edited proceedings of the seminar along with some other invited articles. Chakraborty then approached Amita Chatterjee, the chief editor of the JICPR, who graciously agreed to make a special issue on the subject of pluralism in mathematics. She was also one of the speakers in the seminar. We are honoured to have her paper as the first article of this special issue. Her paper is quite general in nature and touches on several of the issues we encountered in the volume. The articles then flow more or less from the more political/cultural pluralisms end of the spectrum to the more analytic, internal pluralism of existing mathematics and culminating in the philosophical question of retaining objectivity in mathematics in the pluralistic milieu. We are well aware of the inadequacy of this volume in representing many other shades existing within these areas. But this endeavour may be considered to be the beginning of future concerted efforts to probe into the pluralistic contents in and of mathematics.

Working together on the special issue has been symbolic and representative of both types of pluralism. We have crossed cultures and geography and have crossed conceptions and philosophical approaches. In working with the contributions to the special issue, we have witnessed tolerance, but not unprincipled, undiscerning tolerance. The reviewers were efficient and very helpful in their comments. Our sincere thanks to them.