The International Mathematical Knowledge Trust

Ingrid Daubechies[1], Patrick Ion[2], Stephen M. Watt[3]

[1] *Duke University, Durham NC, USA ingrid@duke.edu*
[2] *Mathematical Reviews, Ann Arbor MI, USA pion@umich.edu*
[3] *University of Waterloo Waterloo, Canada smwatt@uwaterloo.ca*

A long-term goal, espoused by the International Mathematical Union (IMU) a decade ago, has been to make available the totality of mathematical knowledge in digital form, with human- and machine-usable tools to build on that knowledge. This talk presents the steps being taken by an IMU working group toward this goal.

It is essential to have an organization so that the attempts the global task of making mathematical knowledge better available. Projects that serve this goal, those already underway and those proposed in the immediate future, can then be brought together as whole, providing a public good for the world. Without such coordination, many useful initiatives have limited lives and the work they have done may be lost or duplicate other projects.

The organization, which we call the International Mathematical Knowledge Trust (IMKT), is being set up to coordinate contributing participants working toward the Global Digital Mathematics Library. The immediate objectives, in the first year, are to create the not-for-profit organization, establish its boards and governance, to set out suitable technical frameworks for cooperative development, and to undertake seed projects.

More than any other field, mathematical knowledge is unique in its precision and its enduring utility. The literature containing this mathematical knowledge is, however, widely dispersed, uses a variety of inconsistent conventions and notations, and for the most part is not in a form that admits automated use. Few except disciplinary experts can combine results from several papers and be sure of the results' correctness and consistency. The correct and reliable application of sequences of mathematical results lies at the heart of our ever-expanding technical infrastructure. Advances here propel our society. Errors can cause disasters.

The long-term plans must address this issue from both the technical and the organizational sides. The technical questions are such as

- "How can the existing literature repositories be united?",
- "What forms of semantic representation are most achievable and useful for mathematical knowledge?",
- "How can mathematical OCR and natural language processing be used in a semi-supervised machine learning bootstrap process?"

The organizational side addresses questions such as

- "How can we build upon existing research projects around the globe?"
- "How can we most effectively engage relevant commercial enterprises including publishers and software companies?"
- "How can these efforts be brought to the public in a coherent and sustainable fashion?"

There are compelling arguments to create a comprehensive knowledge base from the mathematical literature. The present organizational environment of mathematics seems to have been largely hostile to development of significant open data resources in mathematics. This leaves an organizational vacuum which we propose be filled by the IMKT, with moral support from the IMU (International Mathematical Union). The hope is that IMKT may incrementally grow a prospering network of open mathematical knowledge providers, a union of which will provide the long-awaited global digital mathematics library.