Mathematical Research Institute MATRIX
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MATRIX, Australia's first international and residential mathematical research institute, opened its doors earlier this year. The institute was established as a joint partnership between Monash University and The University of Melbourne, with seed funding from the ARC Centre of Excellence for Mathematical and Statistical Frontiers (ACEMS). MATRIX facilitates and encourages new collaborations and advances through intensive residential research programs.

Four successful programs have already been run since opening this year:

- *Higher structures in geometry and physics*
- *Winter of disconnectedness*
- *Approximation and optimisation*
- *Refining C^*-algebraic invariants for dynamics using KK-theory*

These programs involved organisers from a variety of Australian universities, including Melbourne, Newcastle, RMIT, Sydney and Wollongong, along with a large number of international participants. One more program on *Interactions between topological recursion, modularity, quantum invariants and low-dimensional topology* is scheduled for December this year and several exciting programs are already scheduled for 2017 and 2018, see http://www.matrix-inst.org.au/.

Overseas examples

The creation of a research institute in Australia is one of the key recommendations of the Decadal Plan in the mathematical sciences, and until recently Australia was one of very few developed nations not to have established one. MATRIX is modelled on a number of successful existing institutes around the world, such as the Mathematisches Forschungsinstitut in Oberwolfach, the Mathematical Sciences Research Institute (MSRI) in Berkeley, the Banff International Research Station in Canada and the Newton Institute in Cambridge.

As occurs in other countries, a dedicated residential research institute provides the necessary infrastructure to increase Australia's international impact in mathematical and statistical research. It also provides a supportive setting where academics can engage with researchers in industry.

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While MATRIX has had a very successful start it is not yet in the same league as the well established examples mentioned above. It will take several years with sustained funding to establish the reputation of MATRIX. We are very confident that we can achieve this, building on the increasing international reputation of Australian research in the mathematical sciences.

MATRIX already collaborates closely with MSRI in Berkeley, one of the most prestigious and successful mathematical research institutes in the world. Besides research, this collaboration offers opportunities for postgraduate-level courses taught by leading experts from the US to be hosted on Australian soil.

Format

MATRIX hosts advanced level, residential research programs where world leading researchers in the mathematical sciences, as well as experts from business and industry, come together to collaborate in an intellectually stimulating and supportive environment. As the mathematical sciences are inherently international, MATRIX programs usually include at least one overseas organiser. Programs are selected by an independent Scientific Committee based on scientific excellence as well as on the participation rate of high profile international participants, among other selection criteria.

MATRIX programs tend to have ample unstructured time to encourage collaborative research rather than having a traditional conference format. Longer term programs, lasting three weeks or more, could have an embedded conference or lecture series. Due to the highly interactive nature of residential research programs, new collaborations are more easily formed, be they between senior and junior researchers, Australian and overseas investigators, or between academic and industry based participants.

Shorter workshops focusing on a special theme are also welcome. MATRIX is open to all high-quality research proposals that fit within the constraints of its infrastructure.

MATRIX book series

Each year Springer will publish a book on behalf of MATRIX dedicated to articles related to its activities. The book series has a permanent Editorial Board headed by Deputy Director David Wood and which includes Jan de Gier, Cheryl Praeger and Terence Tao.

The organisers of each MATRIX program appoint a guest-editor, who will organise appropriate peer-review and will ensure the scientific quality of articles. Articles can be peer-reviewed, containing original results or reviews on a topic related to the MATRIX program, or non-peer-reviewed expository lecture notes based on talks or activities at MATRIX.

Location and facilities

MATRIX is currently located in Creswick which is an historic town nestled in the Macedon Ranges, 130km west of Melbourne. Creswick is a former gold-mining town and was the site of the original Melbourne University School of Forestry established in 1910. These days this is a wine producing region, featuring some beautiful walking and riding tracks in the nearby forests, including the Goldfields Track.

The MATRIX House is a double fronted Edwardian with newly renovated rooms that accommodate twenty individual desks as well as collaborative discussion rooms. It has a large kitchen with free Nespresso coffee and abundant white- and black-boards. MATRIX provides daily breakfast, lunch and dinner for up to twenty participants. Our caterer Adam has, in a very short time, established an outstanding reputation. Basic but very adequate college style on-site accommodation with seven private shower cabins shared over twenty individual rooms is also provided by MATRIX.

The site can accommodate larger groups, handling up to forty people in overflow student/post-doc accommodation. Off-campus accommodation is available in a nearby motel, as well as at an RACV hotel, or in the attractive nearby towns of Ballarat and Daylesford. The latter options would be particularly attractive for longer term stays and for families. MATRIX will be offering additional support to families via the MATRIX Family Fund.

Standard catering and accommodation support at MATRIX is for up to twenty people per day at any time. Travel is generally not supported by MATRIX but discretionary funds will be made available which may be used by program organisers to, for example, fly in high profile researchers from overseas or to support additional participants. The lecture theatre can easily sit eighty people and events with significantly more than twenty participants can be accommodated with additional external funding using the overflow and off-campus accommodation.

Applications to MATRIX

Throughout the year MATRIX accepts expressions of interest (EoI) to organise a MATRIX program. An EoI identifies program organisers and their affiliations, usually about four people, including at least one international and one Australian based researcher in the mathematical sciences. An EoI may be up to one page in length and should indicate key research areas, possible participants and potential external fundings sources. EoIs may be emailed directly to MATRIX at any time. If accepted, MATRIX will invite a more developed formal program proposal. Guidelines for a program proposal submission are available on our website.

In the coming years, MATRIX hopes to provide Australian early career mathematicians with overseas employment opportunities as a result of increased networking opportunities, facilitate more intensive research collaborations between researchers in universities and industry, increase the international impact of Australian research in mathematical sciences, and bolster the prospects for the next Australian Fields Medal.

Professor de Gier's research interests are in mathematical physics and statistical mechanics, in particular in the theory and application of solvable lattice models and special functions to stochastic processes as well as combinatorics. Jan is a former Editor of the Gazette, organised an AMSI summer school and was inaugural Chair of the Australia and New Zealand Association of Mathematical Physics (ANZAMP). He currently is Deputy Director of the ARC Centre of Excellence for Mathematical and Statistical Frontiers (ACEMS) and Director of MATRIX.