



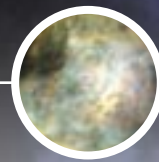
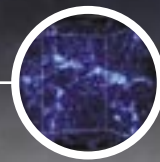
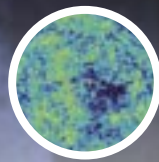
MCMASTER UNIVERSITY • HAMILTON, ONTARIO, CANADA

# Exploring the Origins of Structure and Life in the Cosmos



The **Origins Institute** is a newly created institute at McMaster University. Its scientific focus is to create and foster interdisciplinary research on origins themes across a broad range of fundamental science. It also sponsors a public outreach and lectures program, as well as an undergraduate Origins specialization.

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## The Institute and its Goals

The Origins Institute (OI) is an interdisciplinary research institute at McMaster University whose mission is to pursue fundamental research into the origins of structure and life in the cosmos, and to parlay the excitement of this quest into innovative Origins undergraduate educational and public outreach programs. The OI will position McMaster as an international leader in research that will profoundly affect our understanding of the nature of the universe and the appearance of life within it.

Origins research addresses some of the most interesting and important questions of fundamental science: “How and why did the universe begin?”, “How did stars, galaxies and planets form?”, “What is the origin of matter and of the elements?”, “How did life begin on Earth, and can it also develop on other planets?”, “What was the nature of the Universal Ancestor, and how did life evolve from it?”, and “How did intelligent beings arise and evolve on Earth?”.

These complex processes and progress requires an interdisciplinary approach that involves outstanding scientists from diverse fields such as astronomy, physics, biology and biochemistry, mathematics, geology, chemistry, anthropology, as well as computational and visualization experts.

## The OI Vision

The OI encompasses research across a broad range of interconnected origins themes:

- Space-time (particle physics)
- The elements and matter (nuclear astrophysics)
- Structure in our universe (astronomy)
- Life (evolutionary biology, astrobiology)
- Species (biodiversity)
- Humanity (anthropology, psychology)

The OI will make an international impact by creating a complementary set of research programs within this set of themes.

### Pillars of Activity:

The OI runs a unique combination of research, university education, and public outreach programs.

1. Interdisciplinary research — featuring annual *Origins Scientific Conference/Workshop*, an *Origins Visitors Program*, and a comprehensive *Origins Postdoctoral Program*.
2. Undergraduate education — featuring an *Undergraduate Origins Specialization*.
3. Public Outreach — featuring an annual *Origins Public Lecture Series*.



## Operational Programs and Facilities

OI operations began on July 1, 2004 with Dr. Ralph E. Pudritz, Dept. of Physics and Astronomy as the first Director, and Dr. Jonathon Stone, Dept. of Biology, as the first Associate Director who oversees the undergraduate program. Seed funds provided by McMaster University have enabled us to start several key OI programs, including:

- First OI International Science Workshop: May 24-June 4, 2005. This year's topic is "Astrobiology and the Origins of Life", consisting of a major one week conference coupled with informal one week collaborative workshop.
- OI Colloquia and Visitors Program: started 2004/2005
- Origins Undergraduate Specialization: starting September 2005. Accepts up to 40 outstanding science undergraduates per year, who are enrolled in a "home" undergrad program, into a unique interdisciplinary, 3 year OI specialization.
- OI Public Lecture Series: started in 2003/2004. These outstanding and very popular lectures have filled our largest lecture theatres (see OI series program). The lectures bring some of the world's greatest scientists such as Sir Martin Rees (cosmology), Stuart Kauffman (theoretical biology), and Chris Stringer (human origins) to our campus.
- McMaster 3D Theatre opening fall, 2005. This theatre was created to provide one of the most potent outreach and educational tools for the OI, as well as the university programs at all levels.

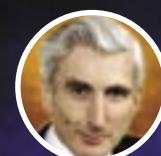
## Members and Partner Institutions

OI members consist of more than 30 faculty members from departments across the Faculty of Science (Physics & Astronomy, Mathematics & Statistics, Biology, Biochemistry, and Geography & Geology, Psychology) and the Department of Anthropology in the Faculty of Social Sciences. It has members at and is developing partnerships with Perimeter Institute, TRIUMF at the University of British Columbia, as well as the Canadian Space Agency.

OI Advisory Council members to date are Sir Martin Rees (Cambridge University), Stuart Kauffman (Santa Fe), and Alan Shoter (Director, TRIUMF).

### Facilities:

OI researchers make use of state-of-the-art High Performance Computing facilities offered by SHARCNET (Shared Hierarchical Academic Research Computing Network), support from the Research and High Performance Computation Support group at McMaster, the groundbreaking genomics research carried out at McMaster's Centre for Environmental Genomics and Biotechnology, and the Centre for Antimicrobial Research.



Sir Martin Rees



Stuart Kauffman



Alan Boss



James Ferris



Norman Pace



Chris Stringer



Marc Garneau



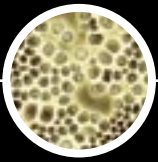
Don Clayton



Lawrence Krauss



Chris McKay



## Proposal for Further Development

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The creation of vibrant OI research programs requires substantial investment in research personnel; imaginatively-designed offices, seminar and interactive spaces and laboratories; and educational/outreach facilities – all housed in the same custom designed building.

### **OI Postdoctoral Program:**

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Interdisciplinary research teams will require that postdocs from a variety of backgrounds be attracted to the OI. We are working with funding agencies and others to create an OI postdoc program ultimately consisting of about 20 postdocs who would work in several different interdisciplinary research programs. The first OI postdoc starts August 2005.

### **OI Endowed Chairs:**

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OI needs to attract international research leaders who work at the interfaces between major Origins fields. This will be accommodated by endowed chairs that would cover at least three areas; eg. astrobiology, origins of space-time, and human origins.

### **OI Research Infrastructure:**

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The OI seeks to raise funds, from both agencies and private sectors, to build and operate the research infrastructure and laboratories needed to make it a world leader. A good example is a lab suite for studying extremeophiles and astrobiology.

### **OI Building:**

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McMaster does not currently have space available to house an interdisciplinary OI program. Researchers are scattered across the campus making daily interaction – so necessary for interdisciplinary research – difficult. Funds are sought to build a specially designed OI building to house our varied programs, people, and facilities.

## For more information contact us:

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