

A vibrant cosmic background image featuring a nebula with swirling clouds of gas in shades of blue, purple, and orange, punctuated by numerous bright stars of varying colors.

**CERCA
&
Institute for the Science of Origins?**

Glenn Starkman, Director



**CASE WESTERN RESERVE
UNIVERSITY**

INSTITUTE FOR THE SCIENCE OF ORIGINS



Center for Education and Outreach in Cosmology and Astrophysics

Collaboration of CWRU Physics and astronomy
since the mid 1990s.

CERCA Conferences and Workshops, include:

- Kavli-CERCA conference on the Future of Cosmology (2003)
- Low- l / Large Angle Cosmology (2004, 2011)
- Confronting Gravity (2006), Testing Gravity (2009), Gravity (2011)
- Baryon and Lepton Violation (2017)
- Regional workshops: Great Lakes Cosmology, Buffalo-Syracuse-Cornell, NYU-Penn-CWRU

Internal activities: weekly internal seminar



Institute for the Science of Origins

History

ISO grew out of CERCA in 2008


Is a CWRU University-wide initiative that also includes participants from:

- Cleveland Museum of Natural History
- Cleveland Clinic Foundation, University Hospitals, Cleveland VA
- Cleveland Metroparks Zoo
- University of Akron

Partners:

Ideastream

Great Lakes Science Center, Cuyahoga County Library, other area libraries



What is the Institute for the Science of Origins?

Mission:

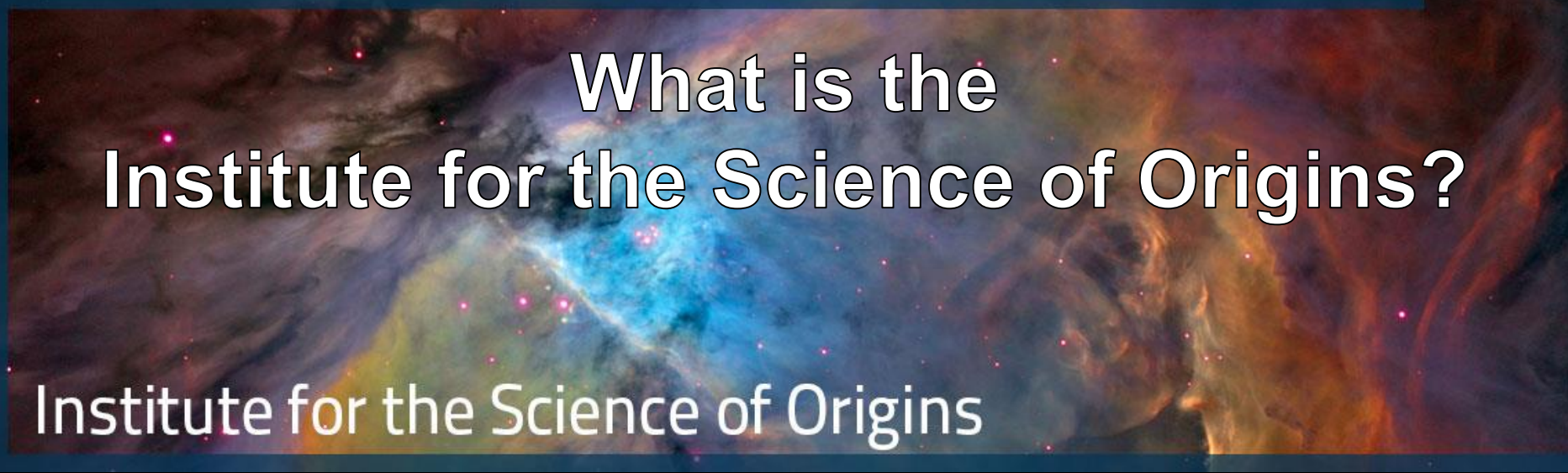
initiate and conduct scientific research on, educate students about and increase public understanding of the origin and evolution of systems, simple and complex, natural and human, and the applications of that knowledge.

A vibrant cosmic nebula with swirling clouds of blue, purple, and red, punctuated by bright stars, serving as a background for the title.

What is the Institute for the Science of Origins?

Fellows

- More than a hundred fellows
- Labs, research, and intellectual foci cross disciplinary boundaries in their pursuit of Origins Science questions
- ISO takes great pride in the diversity of positions held by ISO fellows, ranging from CWRU faculty members to Cleveland Museum of Natural History curators, and beyond, to other institutions, domestic and international.



What is the Institute for the Science of Origins?

Institute for the Science of Origins

Research



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Research –Incubating Collaborations

ISO Goal 1:

1A: Support the origins disciplines that provide the intellectual underpinnings of the institute, at Case Western Reserve University and other participating and partner institutions.

1B: Incubate new and emerging fields of origins science.

1C: Promote and seed research collaborations among scientists in these disciplines.

1D: Develop resources to support this scientific research.

Research –Incubating Collaborations

Broad Areas:

Integrative Evolutionary Biology

e.g.

Origins of Life

Paleobiology

Paleoanthropology

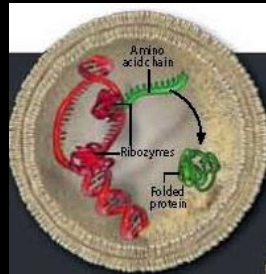
Evolutionary Medicine

Origins of Mind and Language

Recent and Ongoing Human Evolution

Origins & evolution of domestic animals & plants

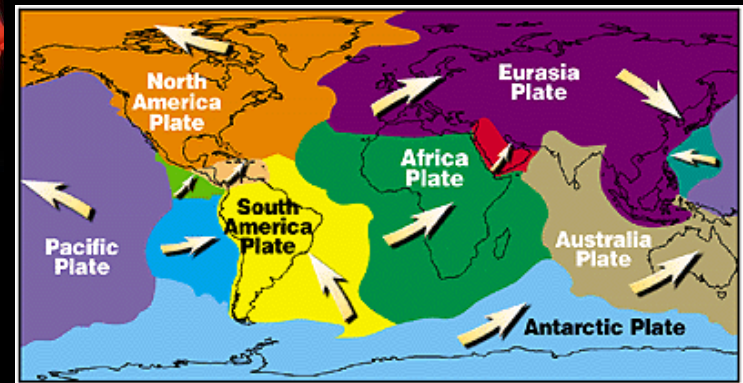
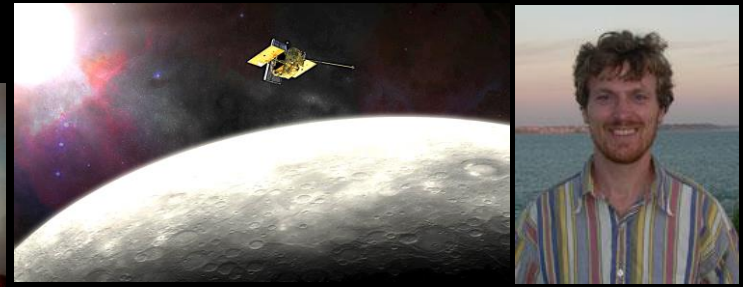
Development & standardization (traditional & engineered) of climate-change resistant food crops



Research –Incubating Collaborations

Broad Areas: Planetary Science

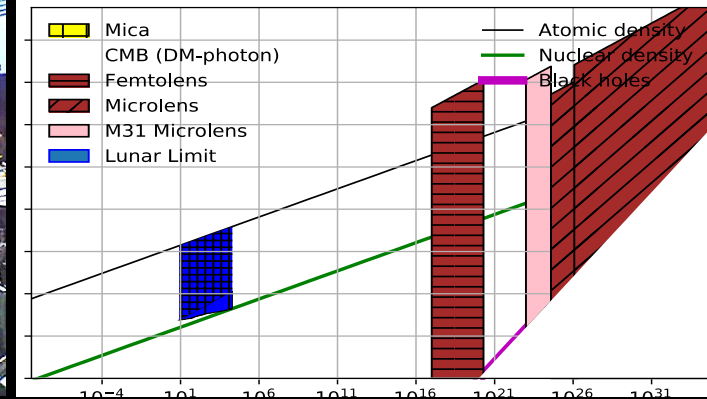
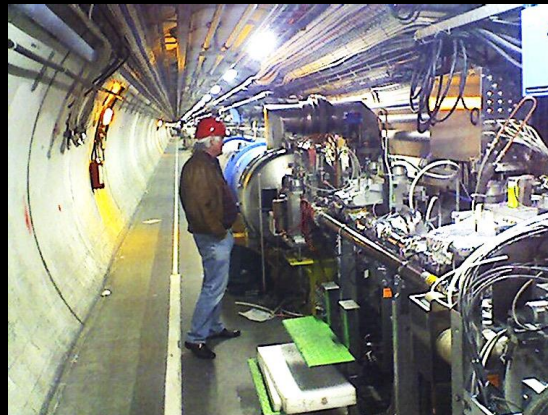
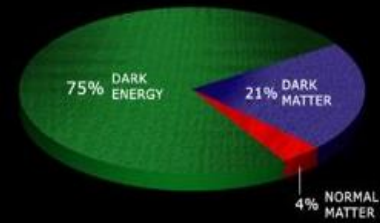
e.g.
Exoplanets
Astrobiology
Air Force
NASA missions
ANSMET
Planetary materials & processes
Earth's Origins & Dynamics



Research –Incubating Collaborations

Broad Areas: Cosmology & Astrophysics

e.g.
CMB collaborations
CERN collaborations
Cosmic Rays
Dark Matter
CERCA



Research –Incubating Collaborations

Examples of ISO Fellows' interdisciplinary research: Evolutionary Medicine

Question:

Can the therapeutic properties of insulin be enhanced by exploiting an evolutionary analysis of its structure and function?



ISO Fellow Michael Weiss

Research –Incubating Collaborations

In vertebrates, insulin acts as a peripheral hormone.

But in round worms, homologous proteins & messenger RNA function in neurons to regulate lifespan.

In fruit flies they function in axon guidance.



ISO Fellow Michael Weiss



Research –Incubating Collaborations

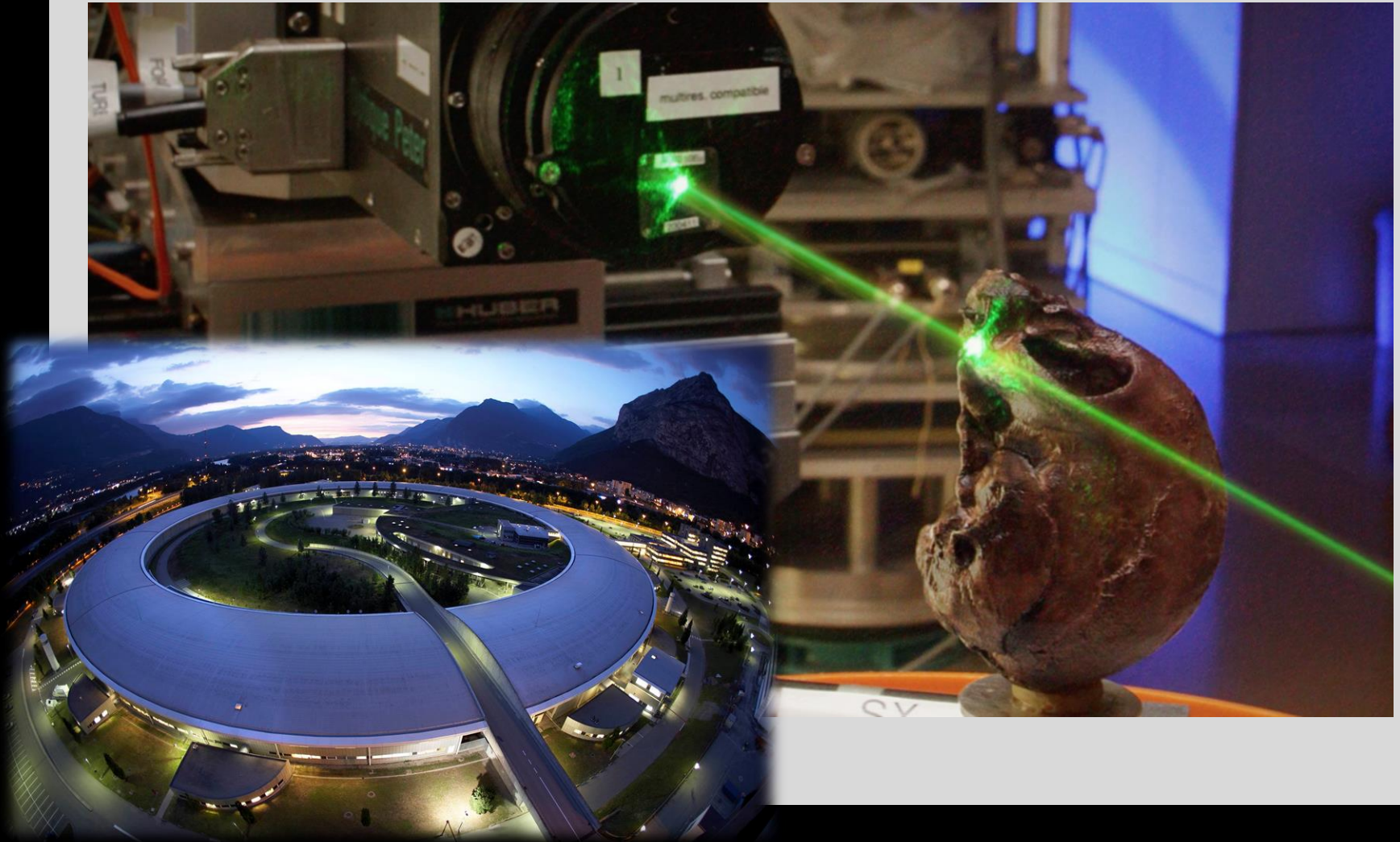
Examples of multi- and trans-disciplinary research: Turkana Basin Institute



ISO Fellow Isaiah Nengo

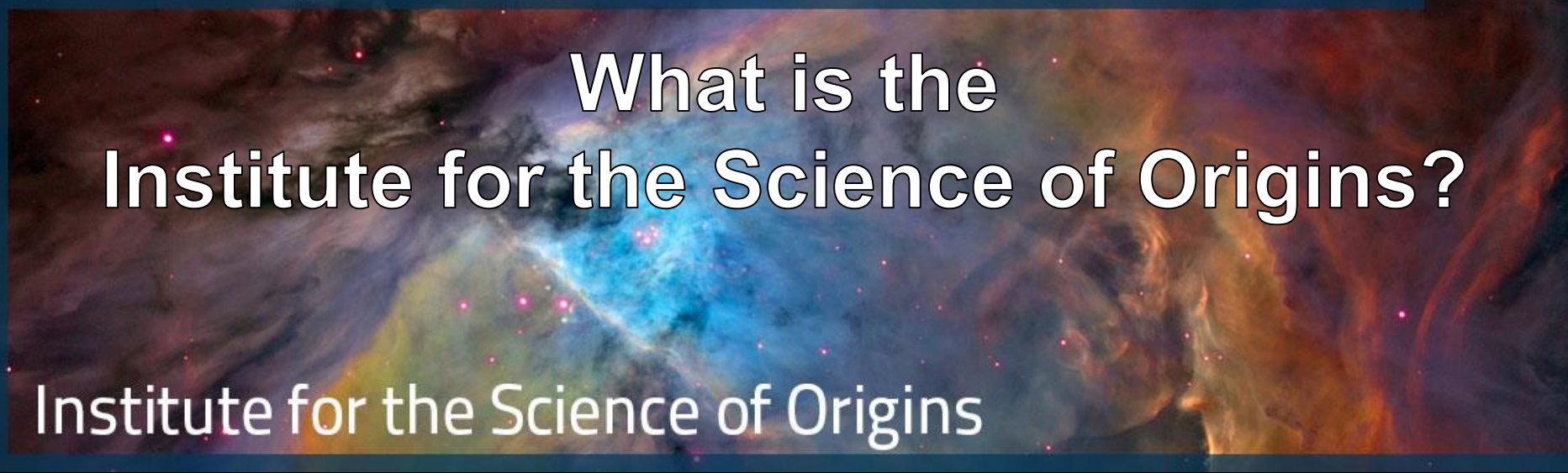


Grenoble Synchrotron scanning of hominoid fossils



Paul Tafforeau / ESRF





What is the Institute for the Science of Origins?

Institute for the Science of Origins

Origins Major



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Origins Major



- First and only in USA
- Broad in scope
- Considerable role for student-driven research and learning
- Great flexibility in courses and topics
- Students design their own educational plans
- Free to explore non-traditional topics

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Director

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Origins Major



- Curriculum emphasizes a broad grounding in the origins sciences
- Fundamentals of physics, biology, chemistry
- Aspects of anthropology, cognitive science, astronomy and earth, environmental and planetary sciences and mathematics

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Origins Major



--B.A. plays well with other majors
-Faculty research provides first-rate instruction & opportunities for undergraduate involvement in cutting-edge research, including lab & museum experience & fieldwork across the globe.

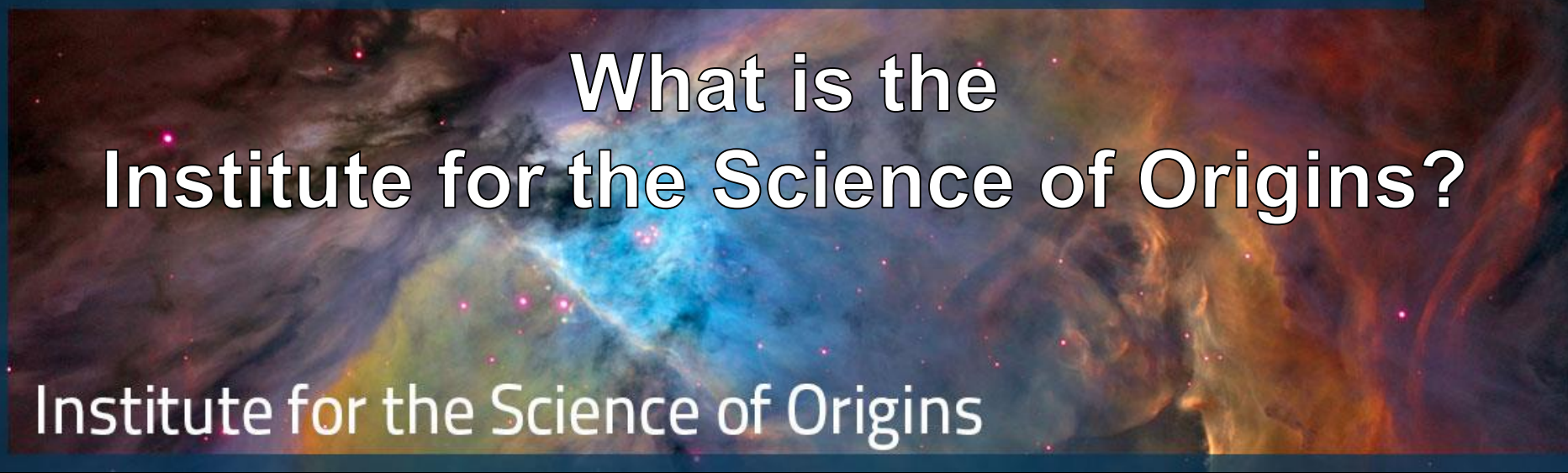
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What is the Institute for the Science of Origins?

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Outreach



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Origins Science Scholars Program & TV Show

Lecture & dinner with
the speaker for ~100
of the public.

Mathematician
Greg Forest
modeling the lung



The Virtual Lung Project

University of North Carolina at Chapel Hill

Greg Forest

Mathematics, Biomedical Engineering, and Applied Physical
Sciences

Institute for the Science of Origins

April 13, 2015



ideastream®



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Origins Science Scholars Program & TV Show

Broadcast weekly by
Cleveland's
PBS/NPR affiliate
ideastream on TV
channel WVIZWorld

Cyrus Taylor on
particle physics



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Origins Science Scholars Program & TV Show

Topics range broadly
across all fields of
origins-related science.

Nicole Steinmetz on
nanoscience and
cancer



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Origins Science Scholars Program & TV Show

Paleoanthropologist &
CMNH curator
Yohannes Haile-Selassie
with his reconstruction
of Lucy

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Origins Science Scholars Program & TV Show

Claudia De Rham on
testing general
relativity



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Origins Science Scholars Program & TV Show

Nita Sahai on the Origins of Life



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Evalyn Gates on
gravitational lensing



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Origins Science Scholars Program & TV Show

Serpil Erzurum of
Cleveland Clinic on
Manipulating
Mitochondria



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Origins Science Scholars Program & TV Show



Dinosaur
expert
Michael
Ryan

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Science Talks at the Happy Dog Bar



Glenn Starkman,
Director

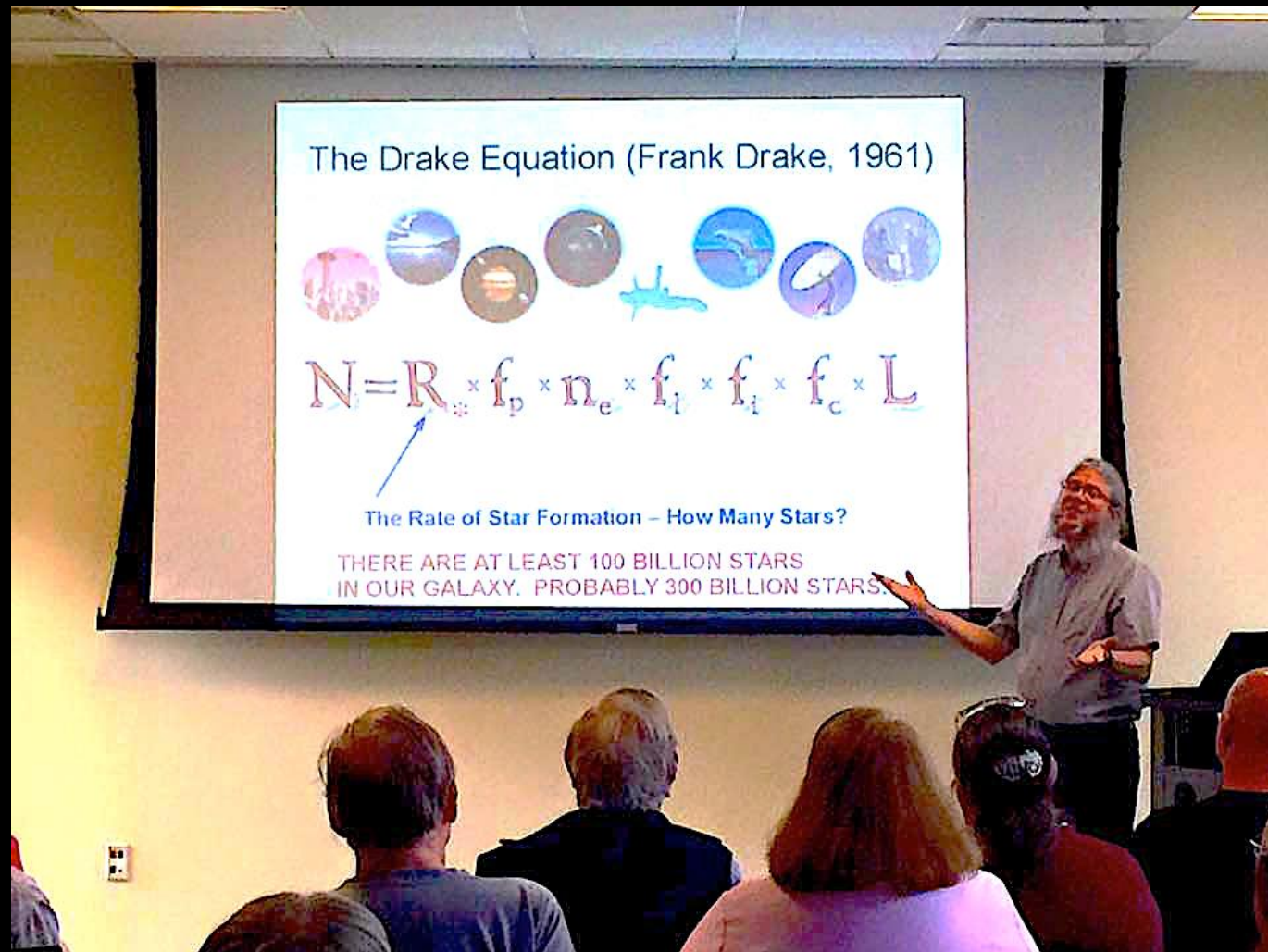
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Science Talks at Urban, Suburban, and Rural Libraries




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What is the Institute for the Science of Origins?

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Science Tourism



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Science Tourism



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