Dr. Harri Vanhala is a theoretical astrophysicist at the National Center for Space, Earth, and Flight Sciences Education at Universities Space Research Association, where he divides his time between scientific research and public education. His specialty is the origin of the Solar System and investigating how stars elsewhere in the universe may be similar to (or different from) the Sun. The goal of his research is to help us understand whether there are other solar systems out there and whether they might be similar to ours. He does his research through computer simulations and by comparing the results of his calculations with astronomical observations.

Presentation Overviews and AV Requirements:

Classroom Visit presentation

Life on Earth — and elsewhere?
How do you know something is alive? How can you say that a dog walking down the street is alive but a car next to it is not? We discuss what it is that makes something alive and what do you need to survive. Based on these results, we can look for life in surprising places on Earth—and maybe elsewhere!

AV Requirements: LCD projector and projection screen; chalkboard and chalk or flipchart and markers or whiteboard and markers

The Origin of the Solar System (specifically for grades 9-12 science or astronomy classes)
Are we alone? Is there life elsewhere in the universe? Is our solar system unique or might there be planets just like Earth out there somewhere? How did the Sun and the planets come...
to exist? Can pieces of rock falling from the sky help us understand how our planetary system was formed? Did a star have to die to give birth to the solar system? These are some of the questions I will attempt to answer in my discussion of "The Origin of the Solar System."

AV Requirements: LCD projector and projection screen

Family Science Night presentations

Extreme Earth
Earth is our home. It is where we humans live and thrive. It is also the only place in the universe where we know life exists. What makes Earth such a special place? What is it like on the global scale? What are some of the extreme environments on Earth? How can these extreme places help us understand other worlds? Come discover answers to these questions as we explore our home planet!

AV Requirements: LCD projector, lavaliere microphone and projection screen

Fifty of Your Very Own
Look up on a starry night far from city lights. What you're seeing is but a tiny portion of the Milky Way, our home galaxy. The Milky Way is a vast and swirling mass of 400,000,000,000 suns—enough to give 50 to every person on Earth! Come explore the different neighborhoods of the Milky Way, and get an understanding of our home world location among the stars.

AV Requirements: LCD projector, lavaliere microphone and projection screen

A Voyage That Will Forever Change Your Perspective of Home
We live aboard a spaceship called Earth. It’s the big thing under your feet. It carries us through space at fantastic speeds all the while orbiting one special star we call the Sun. But only when you leave Earth and look back can you truly understand the nature of our existence.

How? Get ready to be transformed into a cosmic giant, able to comfortably journey through our solar system - a vast space home to many tiny worlds. Along the way we’ll stop at many of these worlds, put them under the cosmic microscope, and see the majesty of the very small. It is a Voyage that will forever change your perspective of home.

AV Requirements: LCD projector, lavaliere microphone and projection screen

How Big Is Big?
It’s a big, often intimidating universe out there. How do we even begin to fathom objects and distances that dwarf anything we've ever experienced? Earth's place in space is knowable. The secret is placing the universe in a context that is familiar. Take a magical journey from spaceship Earth to points unknown.

AV Requirements: LCD projector, lavaliere microphone and projection screen

Featured Presentations
[Appropriate Venues: educator workshops and conferences, university non-science majors, business and civic groups, museum and science center staff]

"The Origin of the Solar System"
Are we alone? Is there life elsewhere in the universe? Is our solar system unique or might there be planets just like Earth out there somewhere? How did the Sun and the planets come to exist? Can pieces of rock falling from the sky help us understand how our planetary system
was formed? Did a star have to die to give birth to the solar system? These are some of the questions I will attempt to answer in my discussion of "The Origin of the Solar System."

**AV Requirements:** LCD projector, lavaliere microphone and projection screen

**Research Talks**
[Appropriate Venues: colloquia for physics and astronomy departments, presentations to astronomy majors and graduate students]

*The Triggered Origin of the Solar System*
Studies of meteoritic material have revealed the presence of short-lived radioactive isotopes in the early solar system. The short half-lives of the radionuclides—less than a few million years—set strict limits on the time scale of the formation of the solar system. These limits appear to be at odds with the "standard model" of solar system formation, which proposes that solar-type stars form in quiescent conditions without outside interference. Instead, the meteorite data suggests that the formation of the solar system may have been initiated by an external factor, an interstellar shock wave propagating from a nearby supernova explosion. The current state of this proposal, sometimes called the hypothesis of the triggered origin of the solar system, is discussed in this presentation by describing computer simulations investigating the viability of the scenario. Implications on star and planet formation elsewhere in the universe are also discussed.

**AV Requirements:** LCD projector, lavaliere microphone and projection screen
Harri Arto Tapio Vanhala
Formal Bio

Research Interests
Theoretical astrophysics, star and planet formation, the origin of the solar system, computer simulations

Education
1997  Ph. D. in Astronomy, University of Oulu
1993  Ph. Lic. in Astronomy, University of Oulu
1991  M. Sc. in Astronomy, University of Oulu

Research Experience
2005-present  Space Science Researcher, Carl Sagan Center for Earth and Space Science Education/Universities Space Research Association; investigating the origin of the solar system and triggered star formation.
2002-2005  Astrophysicist, Challenger Center for Space Science Education; investigating the origin of the solar system and triggered star formation.
2000-2002  Postdoctoral Research Associate, Department of Physics and Astronomy, Arizona State University; working with Prof. Sumner Starrfield, investigating the growth of convective instabilities in accreting white dwarfs and neutron stars.
1997-2000  Postdoctoral Research Associate, Department of Terrestrial Magnetism, Carnegie Institution of Washington; working with Dr. Alan Boss, investigating triggered star formation and the origin of the solar system.
1993-1997  Smithsonian Astrophysical Observatory Predoctoral Fellow, Harvard-Smithsonian Center for Astrophysics; under the direction of Prof. A.G.W. Cameron, investigating molecular cloud core formation, compression and induced collapse.
1990-1993  Research Assistant, Department of Astronomy, University of Oulu; under the direction of Prof. K.A. Hämeen-Anttila, investigating the properties of circumstellar disks.
1992  Visiting Research Assistant, Louisiana State University; conducting independent research under the supervision of Prof. J. Tohline, investigating the structure and dynamics of circumstellar disks.
1991  Research Intern, Lunar and Planetary Institute; under the direction of Dr. Tomasz Stepinski, investigating the dynamics and magnetic properties of circumstellar disks.

Teaching Experience
2005-present  Space Science Researcher, Carl Sagan Center for Earth and Space Science Education/Universities Space Research Association; giving classroom presentations and talks to the general public; developing education materials for use in teaching space and Earth science; giving educator workshops on K-12 teachers on developed materials.
2002-2005  Astrophysicist, Challenger Center for Space Science Education; giving classroom presentations and talks to the general public; developing education materials for use in teaching space and Earth science.
2001-2002  Guest lecturer, Department of Physics and Astronomy, Arizona State University; giving lectures on undergraduate and graduate astronomy courses.
1990-1993  Lecturer, Department of Astronomy, University of Oulu; teaching undergraduate astronomy courses.
1989-1990  Teaching Assistant, Department of Astronomy, University of Oulu; responsible for overseeing and directing exercises on various undergraduate courses.

Professional Memberships and Service
Member American Astronomical Society
Curriculum materials content reviewer, Carl Sagan Center for Earth and Space Science Education / Universities Space Research Association, 2005-present.

Information Technology Experience
Unix System Administration; maintaining and upgrading Unix workstations and operating systems, including HP*UX, Ultrix, OSF/1 and DEC Unix.
Macintosh and PC System Administration; maintaining and upgrading personal computers and operating systems.

Bibliography


Curriculum Materials Development
11) 2005  “The 2005 Space Science Compendium of Lessons in support of Sixth Grade Earth and Space Science, District of Columbia Public Schools”; co-author
10) 2005  “The Voyage Continues Middle School Component”; co-author
9) 2005  Teachable Moments in the News, Issue 6; co-author
8) 2004  Teachable Moments in the News, Issues 2-5; co-author
7) 2004  “2004 Space Science Supplement to a Compendium of Activities in support of Sixth Grade Earth and Space Science, District of Columbia Public Schools”; co-author
6) 2004  “Voyage: A Journey through Our Solar System – An Education Module for Journey through the Universe”; co-author
5) 2004  “2004 Space Science Supplement to a Compendium of Activities in support of Sixth Grade Earth and Space Science, District of Columbia Public Schools”; one of the authors
4) 2004  “Voyage: A Journey through Our Solar System – An Education Module for Journey through the Universe”; one of the lead authors
3) 2004  “Space Science Supplement to a Compendium of Activities in support of Sixth Grade Earth and Space Science, District of Columbia Public Schools”; one of the lead authors
2) 2003  “Earth Systems Science – An Education Module for Journey through the Universe”; one of the lead authors
1) 2003  MESSENGER Education Module “Framing Pathways to Answers: The Scientific Process in Action, Unit 1: Staying Cool”; one of the lead authors

Conference Presentations and Seminar Talks (2001-present)
39) 2005  Protostars and Planets V, Waikoloa, HI; poster presentation Injection of Radioactivities into the Forming Solar System.
36) 2004  Northern Michigan University, Marquette, MI; seminar The Origin of the Solar System.
35) 2004  Communicating Astronomy to the Public conference, Washington, DC; one of the authors of the poster presentation Challenger Center’s Education and Public Outreach Activities for the MESSENGER Spacecraft Mission to Mercury.
34) 2004  Communicating Astronomy to the Public conference, Washington, DC; one of the authors of the poster presentation Voyage – A Journey through Our Solar System.
33) 2004  Northern Michigan University, Marquette, MI; colloquium The Origin of the Solar System.
31) 2002  University of Washington, Department of Astronomy, Seattle, WA; colloquium The Triggered Origin of the Solar System.
29) 2001  Arizona State University, Department of Physics and Astronomy, Tempe, AZ; colloquium The Triggered Origin of the Solar System.
26) 2001  University of Georgia, Department of Physics and Astronomy, Athens, GA; colloquium Numerical Simulations of Triggered Star Formation.

Presentations for the General Public
Family Science Night presentation *Extreme Earth*, Altamont, KS, Journey through the Universe, May 5; 120 attendees

Family Science Night presentation *Fifty of Your Very Own*, National Air and Space Museum, Washington, D.C., February 22; 367 attendees

Family Science Night presentation *Voyage through the Solar System*, Martinsville, VA, Journey through the Universe, November 18; 250 attendees

Family Science Night presentation *Extreme Earth*, Munising, MI, Journey through the Universe, April 22

Family Science Night presentation *Extreme Earth*, Marquette, MI, Journey through the Universe, April 20


Family Science Night presentation *Extreme Earth*, Menominee, MI, Journey through the Universe, November 11

**Classroom Presentations**

- 2005: Labette County, KS, *Journey through the Universe*: total of 23 presentations, 1,026 students.
- 2005: Posion yläaste, Posio, Finland; total of 1 presentation, 50 students.
- 2004: Martinsville, VA, *Journey through the Universe*; total of 18 presentations, 843 students.
- 2004: Washington, DC, *Journey through the Universe*; total of 7 presentations, 220 students.
- 2004: Marquette, MI, *Journey through the Universe*; total of 15 presentations, 974 students.
- 2004: Maret School, Washington, DC; 1 presentation, 75 students.
- 2002: Posion yläaste, Posion lukio, Posio, Finland; total of 2 presentations, 55 students
- 2002: Space Camp, Challenger Center, Alexandria, VA; total of 2 presentations, 50 students.

**Educator Workshop Presentations**

- 2005: MESSENGER Educator Fellowship Program Update Session, Washington, DC; 10 educators
- 2005: Marquette *Journey through the Universe* Physics workshop, conducted via Distance Learning from Alexandria, VA; 20 educators
- 2004: Martinsville *Journey through the Universe* Staying Cool workshop, Martinsville, VA; 2 workshops for a total of 130 educators
- 2004: NASA Earth and Space Science Education Products Workshop, via distance learning from Martinsville, VA, to Johnson Space Center, Houston, TX; 60 educators
- 2004: MESSENGER Educator Fellowship Program Launch Workshop and Update Session, Cocoa Beach, FL; 25 educators
- 2004: Marquette *Journey through the Universe* Earth Systems Science workshop, Marquette, MI; 120 educators
- 2003: MESSENGER Educator Fellowship Program Launch Workshop, Cocoa Beach, FL
- 2003: Marquette *Journey through the Universe* Earth Systems Science workshop, Marquette, MI
- 2003: Challenger Center Annual Conference, MESSENGER workshop, Kansas City, MO
- 2003: MESSENGER Educator Fellowship Program Workshop, Alexandria, VA