

# Resources for Advances in Science

## Lecture 1

January 14

## Professor Fred Adams

*Cosmology: The History of the Universe*

### Books

***The First Three Minutes: A Modern View of the Origin of the Universe.*** (Steven Weinberg; 1977, 2<sup>nd</sup> ed. 1993; Basic Books) --> a classic!

***Before the Beginning: Our Universe and Others.*** (Martin Rees; 1998; Basic Books) --> a newer classic

***A Brief History of Time: From the Big Bang to Black Holes.*** (Stephen Hawkin; 1988; 1996; Bantam Books)

***The Fabric of the Cosmos: Space, Time, and the Texture of Reality.*** (Brian Greene; 2004; Vintage Books)

and, of course, if you can find it\*:

***Origins of Existence: How Life Emerged in the Universe.*** (Fred C. Adams; 2002; The Free Press)

\*You can find it new at Amazon or used at Abe Books.

## Lecture 2

January 21

## Professor Keith Riles

*Gravitational Wave Astronomy – Listening to the Universe*

**Books** [*Gravitational waves were first reported on February 11, 2016.*]

***Is Einstein Still Right?: Black Holes, Gravitational Waves, and the Quest to Verify Einstein's Greatest Creation.*** (Clifford Will & Nicolas Yunes; Oxford, 2020)

***Neutron Stars, Black Holes, and Gravitational Waves.*** (James Kolata, IOP, 2019)

***Ripples in Spacetime: Einstein, Gravitational Waves, and the Future of Astronomy.*** (Govert Schilling; Belknap, 2019)

***Einstein's Unfinished Symphony: The Story of a Gamble, Two Black Holes, and a New Age of Astronomy.*** (Marcia Bartusiak; Yale University Press, 2017). This updated version of Bartusiak's *Einstein's Unfinished Symphony: Listening to the Sounds of Space-Time* recounts the long hunt for Einstein's predicted gravitational waves—and celebrates their recent discovery.

***Black Hole Blues and Other Songs from Outer Space.*** (Janna Levin; Anchor, 2017)

***Gravity's Kiss.*** (Harry Collins; MIT Press, 2017). This book continues the work on gravitational waves that Harry Collins began with *Gravity's Ghost and Gravity's Shadow*. It is written at a very accessible level and serves as an insider account of the discovery of gravitational waves, from the very first email to the first published paper and the response of the public.

***Black Holes and Time Warps: Einstein's Outrageous Legacy.*** (Kip Thorne; W. W. Norton & Company, Commonwealth Fund Book Program, 1994). Beautifully and accessibly written by LIGO's Kip Thorne. [*This comment and others above about books are from the LIGO website.*]

***The Science of Interstellar.*** (Kip Thorne; W. W. Norton & Company, 2014) A description of the making and concepts behind the 2014 movie, *Interstellar*, by the physicist who was the technical consultant.

## Videos

### **Gravitational Waves: Einstein's Audacious Prediction**

Professor Keith Riles, University of Michigan | Saturday Morning Physics | 13 Feb 2016 (1 hr)

<https://www.youtube.com/watch?v=cxgO2gbPPfw&list=PLkCzlk8e8aNfPZoSgvp6m-aRmY4IsUbD6&index=64&t=2733s>

### **The Hunt for Gravitational Waves: Was Einstein Right?**

Professor Keith Riles, University of Michigan | Saturday Morning Physics | 20 Feb 2016 (1 hr)

<https://www.youtube.com/watch?v=21Ong-aqwzY&list=PLkCzlk8e8aNfPZoSgvp6m-aRmY4IsUbD6&index=63&t=0s>

### **How to Catch a Gravitational Wave**

Professor Keith Riles, University of Michigan | Saturday Morning Physics | 14 May 2005 (1 hr)

[https://www.youtube.com/watch?v=kDrdH\\_O9sK8&list=PLkCzlk8e8aNfPZoSgvp6m-aRmY4IsUbD6&index=175](https://www.youtube.com/watch?v=kDrdH_O9sK8&list=PLkCzlk8e8aNfPZoSgvp6m-aRmY4IsUbD6&index=175)

### **LIGO: A Passion for Understanding**

Kai Staats | vimeo | 2014 (20 min)

<https://vimeo.com/88437726>

### **LIGO Generations**

Kai Staats | vimeo | 2015 (25 min)

<https://vimeo.com/115282354>

## Miscellaneous

**LIGO Magazine** is published twice a year by the LIGO Scientific Collaboration and details the latest research, news and personalities across the diverse group of members. It is available in pdf format as a free download from this website. New issues are typically released in March and September.

<https://www.ligo.org/magazine/>

## Lecture 3

January 28

## Professor Aaron Pierce

*Answered and Unanswered Questions in Particle Physics*

### Books

***Seven Brief Lessons on Physics.*** (Carlo Rovelli: Riverhead Books; 2014) This is a very readable book with simple discussions of complex ideas for a wide audience.

***Deep Down Things: The Breathtaking Beauty of Particle Physics.*** (Bruce A. Schumm; The Johns Hopkins University Press; 2004) This is an excellent description of what lies behind particle physics for those with a technical background and for the non-professional. Although it is meant for a somewhat wider audience, it does demand careful reading.

### Videos

#### Revealing the Building Blocks of Our Universe

Professor Aaron Pierce, University of Michigan | Saturday Morning Physics | 4 Oct 2008

<https://www.youtube.com/watch?v=OYipBVw8XQI> (1 hour)

#### Dark Matters

Professor Aaron Pierce, University of Michigan | Saturday Morning Physics | 29 Sep 2018

<https://www.youtube.com/watch?v=YlPrWTVjr-U> (1hour)

## Lecture 4

February 4

## Professor Ted Bergin

*Formation of Habitable Worlds and the Search for Life*

### Articles

**The origins of water** (*Science*, 28 August 2020)

<https://science.sciencemag.org/content/369/6507/1058>

**Hubble Discovers a Strange Exoplanet That Resembles the Long-Sought “Planet Nine”**

(ESA/HUBBLE, 11 December 2020)

<https://scitechdaily.com/hubble-discovers-a-strange-exoplanet-that-resembles-the-long-sought-planet-nine/>

### Videos

**Constructing an Earth: Just Add Water**

Professor Ted Bergin, University of Michigan | Saturday Morning Physics | 9 Feb 2019

<https://www.youtube.com/watch?v=ajOYxRWcoR8&t=634s>

**How Did Earth Get Its Water?**

Professor Ted Bergin, University of Michigan | Saturday Morning Physics | 14 Feb 2009

<https://www.youtube.com/watch?v=Uwl-pWDdaFs&t=266s>

## Lecture 5

February 11

## Professor John Kingston

*Human Dispersal(s) from Africa*

### Books

**Evolution: The Human Story.** (Alice Roberts; DK Publishing; 2018)

### Articles

**Homo sapiens: The global 'general specialist'** (30 July 2018)

<https://news.umich.edu/homo-sapiens-the-global-general-specialist/>

**The Far-Reaching Realms of Denisovan Ancestry Stretch to Iceland** (25 April, 2020)

<https://www.ancient-origins.net/news-evolution-human-origins/denisovan-ancestry-0013617>

**Oldest Homo sapiens in Europe—and a cave bear pendant—suggest cultural link to Neanderthals**

(Science, 11 May 2020)

<https://www.sciencemag.org/news/2020/05/oldest-homo-sapiens-europe-and-cave-bear-pendant-suggest-cultural-link-neanderthals>

**Mystery ancestor mated with ancient humans. And its 'nested' DNA was just found.** (Live Science, 6 August 2020)

<https://www.livescience.com/mystery-ancestor-mated-with-humans.html>

**Defining Moment in Human Evolution: Turbulent Era Sparked Leap in Human Behavior, Technology 320,000 Years Ago** (Smithsonian, 21 October 2020)

<https://scitechdaily.com/defining-moment-in-human-evolution-turbulent-era-sparked-leap-in-human-behavior-technology-320000-years-ago/>

### Videos

**Who Were the Denisovan Humans?**

Ben G Thomas | 12 April 2020

[https://www.youtube.com/watch?v=EWaREXA8\\_fE](https://www.youtube.com/watch?v=EWaREXA8_fE)

**Lecture 6**  
February 18

**Professor Ben van der Pluijm**  
*Welcome to the Anthropocene*

## Books

***Anthropocene: A Very Short Introduction.*** (Erle C. Ellis; Oxford University Press; 2018)

***Adventures in the Anthropocene: A Journey to the Heart of the Planet We Made.*** (Gaia Vince; Milkweed Editions; 2014)

[Website with 5 other recommended books: <https://fivebooks.com/best-books/gaia-vince-anthropocene/>]

## Articles

**Humans have altered North America's ecosystems more than melting glaciers** (*Science*, 5 August 2020)

[https://www.sciencemag.org/news/2020/08/humans-have-altered-north-america-s-ecosystems-more-meltingglaciers?utm\\_campaign=news\\_daily\\_2020-08-07](https://www.sciencemag.org/news/2020/08/humans-have-altered-north-america-s-ecosystems-more-meltingglaciers?utm_campaign=news_daily_2020-08-07)

**Human 'stuff' now outweighs all life on Earth** (*Science*, 9 December 2020)

[https://www.sciencemag.org/news/2020/12/human-stuff-now-outweighs-all-life-earth?utm\\_campaign=news\\_daily\\_2020-12-09](https://www.sciencemag.org/news/2020/12/human-stuff-now-outweighs-all-life-earth?utm_campaign=news_daily_2020-12-09)

## Videos

**Living in the Anthropocene: Toward a Resilient Human Society**

Professor Ben van der Pluijm, University of Michigan | Saturday Morning Physics | 27 Oct 2018

<https://www.youtube.com/watch?v=-z4XIIXddMM&t=1268s>