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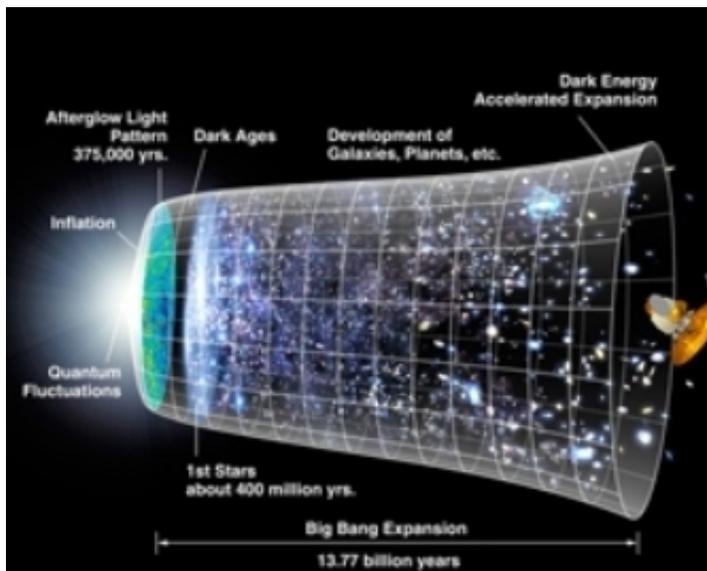
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A representation of the evolution of the universe over 13.77 billion years. (Image courtesy of NASA / WMAP Science Team.)

The Very, Very Early Universe

The Big Bang Theory “says nothing about what banged, why it banged, or what happened before it banged,” declares Professor Alan Guth in the opening lecture of [8.286 The Early Universe](#), a course that was published this month on OCW with full video lectures and lecture slides.

But what could possibly explain what happened before the Big Bang?

Enter Inflation Theory, Professor Guth’s brainchild. Inflation Theory describes the “prequel” to the Big Bang, how what happened in the earliest trillionth of a trillionth of a second created the universe in which we live. Inflation Theory explains why the universe is so uniform, that is, why galaxies are distributed so evenly across



space-time, and why the temperature of the cosmic background radiation (CMB) given off by the Big Bang is so uniform everywhere physicists look.

For the theory of cosmic inflation, Guth was awarded the Fundamental Physics Prize in 2012. In May of 2014, he shared the Kavli Prize in Astrophysics for pioneering this theory.

Recent findings by scientists looking at the CMB through telescopes at the South Pole seem to corroborate Inflation Theory, which also predicts (or maybe “antedicts” is the right term) that “repulsive gravity material” causes the universe to expand exponentially, even while this very material decays.

And if that weren’t enough, from the decay of this material are born an infinite number of “pocket universes.” In other words, Inflation Theory tells us, the “multiverse” is here!

Professor Guth admits it all sounds fantastic. If only the mathematics weren’t so precise!

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OCW Educator



Digital tools are regularly used to enhance learning in science and engineering classrooms. Interactive problem sets, visualizations, and simulations are fixtures on the MIT campus and in MOOCs created by MITx. While these seem like a natural fit for technical subjects, teaching in the humanities is also being transformed by new approaches that allow students to approach and challenge texts in new ways.

Dr. Wyn Kelley, Senior Lecturer in the Literature Department at MIT,

is a leading innovator in the field. On the Instructor Insights pages of the [This Course at MIT](#) section for her course, [21L.501 The American Novel: Stranger and Stranger](#), Dr. Kelley explains how she has incorporated two open-source digital tools into her classroom, allowing students to collaborate and think together in new ways about classic and contemporary works, from Herman Melville's *Moby-Dick* to Octavia Butler's *Kindred*.

The first tool is [Annotation Studio](#), which allows students to comment on passages they highlight as a way to record thoughts, mark observations, and develop ideas for papers. The students liked the Studio so much they found new uses for it, such as taking class notes and returning to their initial insights as they revised and rewrote their work.

The second tool, [Locast](#), integrates customizable geographical maps with text, images, video, and other media tied to specific locations. Dr. Kelley pre-populated the map with places mentioned in *Moby-Dick*. Each student was asked to give presentations on one of these places and explain its significance in the novel. Even Dr. Kelley was surprised by what the students found.

“There is one reference in the text to a Manxman, an inhabitant of the Isle of Man,” she [writes](#). “The student found out that it's where a lot of fishermen come from. The student gave a beautiful demonstration with pictures of the place that turned out to have tremendous relevance to the novel.”

>[Visit This Course at MIT pages](#) for other OCW classes.

Highlights for High School



View from the top of Verrückt, the world's tallest waterslide. (Image courtesy of Schlitterbahn Waterparks & Resorts. Used with permission.)

You've climbed 246 stairs, and now you're strapped to a raft 168 feet above the ground. You are about to begin your ride on the tallest, steepest, and fastest waterslide in the world. Verrückt—which means “insane” in German—opened to the public July 2014 at Schlitterbahn Waterpark in Kansas City. The initial descent is essentially a free-fall—almost a straight drop from 15 stories, in which the raft then accelerates to 65 mph.

The course takes advantage of the relationship between gravity and friction to ensure the rafts remain on the slide. By conducting extensive tests with both sandbags and humans, the ride's engineers were able to ensure that Verrückt would be safe for all, though they do impose a weight limit of 550 pounds per raft.

To learn more about gravity, friction, velocity and acceleration, please visit OCW's introductory physics course, 8.01SC Classical Mechanics. The unit called “One-Dimensional Kinematics and Free Fall” explains the concepts of position, velocity, and acceleration.

> [Find out more at Highlights for High School](#)

MITx News



(Image courtesy of the Shiseido cosmetic company archives.)

For the first time, MITx has partnered with HarvardX to deliver a MOOC on the edX platform. The course is VJx Visualizing Japan (1850s–1930s): Westernization, Protest, Modernity. It starts on September 3 and runs for five weeks.

The course is taught in modules based on the MIT "Visualizing Cultures" website, which is devoted to image-driven research on Japan and China since the 19th century (visualizingcultures.mit.edu). The introductory module considers methodologies historians use to "visualize" the past. Three subsequent modules explore the themes of Westernization (in Commodore Perry's 1853-54 expedition to Japan), social protest (in Tokyo's 1905 Hibiya Riot), and modernity (in the archives of the major Japanese cosmetics company, Shiseido).

There are four instructors: Professors John Dower and Shigeru Miyagawa (of MIT) founded the Visualizing Cultures website in 2002; Professor Andre Gordon (of Harvard) and Professor Gennifer Weisenfeld (of Duke) have authored learning units for the site.

Professor Miyagawa and Professor Dower have taught MIT courses based on the materials appearing on the Visualizing Cultures website. In fact, the course they taught in Spring 2012, [21F.027 Asia in the Modern World: Images and Representations](#), is published on OCW and can serve prospective students as a kind of sneak preview of VJx.

[Professor Miyagawa](#) is a long-time champion of OCW and the open sharing of educational resources. He has served on OCW's Faculty Advisory Committee since OCW's inception in 2000 and was chair of the committee from 2010–2013.

Visualizing Japan is part of a planned series of courses to run on edX. The second course, which is to be created by the University of Tokyo, will be called "Visualizing Postwar Tokyo."

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