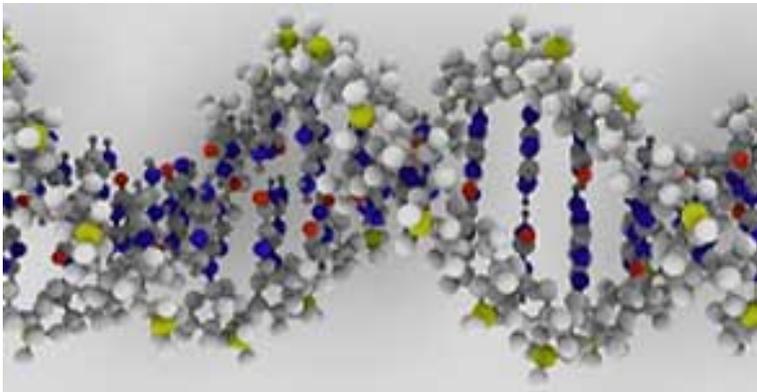


September 2012 Newsletter

[Current Events in Context](#) | [New Courses](#) | [Updated Courses](#)  
[Highlights for High School](#) | [Views from Supporters](#)

**Current Events in Context: Junk DNA debunked**



DNA rendering by [ynse](#).

More than a decade ago, scientists from the Human Genome Project successfully sequenced the entire human genome. The achievement was viewed as a major breakthrough, with one disappointing outcome: Scientists found far fewer genes than they had originally hoped. The human genome appeared to be a long string of gibberish, marked by rare "words" or genes—from the three billion nucleotides they sequenced, only two percent were protein-encoding genes that actually built the cells that compose our bodies. The rest of these nucleotide sequences were disparagingly—and prematurely—called "junk DNA."

But this month, an international team of researchers laid to rest the misnomer and myth of junk DNA. The ENCODE project, which stands for the Encyclopedia of DNA Elements, picked up where the Human Genome Project left off. This enormous collaborative effort, involving 400 scientists from 32 institutions, has presented definitive evidence that almost 80% of those long stretches of DNA, once considered useless, are actually quite important. They may not produce proteins like genes, but many of these sequences function like regulatory switches, determining how active or inactive a gene becomes.

So junk DNA is actually the "control panel" for genetic expression. Each switch is part of a larger, interconnected

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hierarchy that controls not only the type and nature of a cell—whether it becomes a brain cell or kidney cell—but also speed and timing of its growth. This discovery opens up an entirely new world of research, with profound implications for the study of disease. The ability to biochemically control these switches might allow scientists to regulate and correct the sorts of malfunctioning genes that cause cancer, psoriasis, Crohn's disease, and any number of maladies. It could also open up an entirely new frontier of personalized medicines that are designed to act upon a particular individual's unique genetic makeup.

OCW offers an excellent range of courses that cover many of the topics and disciplines raised by this important discovery:

- [7.01SC Fundamentals of Biology](#) is an OCW Scholar course that presents a rich array of material covering biochemistry, molecular biology, and genetics.
- [7.03 Genetics](#) reviews the core principles of genetics, including the structure and function of genes, and the use of genetic methods to analyze protein function, gene regulation and inherited disease.
- [7.91JK Foundations of Computational and Systems Biology](#) emphasizes the fundamentals of DNA sequence analysis, covering many of the principles and methods used in the Human Genome Project and the ENCODE project.



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## New Courses

- [17.447 Cyberpolitics in International Relations: Theory, Methods, Policy](#)
- [17.S914 Conversations You Can't Have on Campus: Race, Ethnicity, Gender and Identity](#)

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## Updated Courses

- [5.301 Chemistry Laboratory Techniques](#)
- [21M.220 Early Music](#)
- [22.033 Nuclear Systems Design Project](#)
- [24.09 Minds and Machines](#)

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### Highlights for High School



ChemLab Boot Camp follows 14 MIT freshmen as they face the challenges of learning chemistry the MIT way.

Every January, the MIT Chemistry Department runs a four-week laboratory "boot camp" for freshmen (also known as [5.301 Chemistry Laboratory Techniques](#)), and those who pass are guaranteed a job in an MIT research lab.

Now you can follow along as 14 students learn everything from column chromatography to protein assays.

Watch as teams compete to grow the biggest crystal. Smell the stench as students synthesize their very own antibiotics, and hold your breath as they give presentations to the whole class.

Cringe as horror stories are told and made, and discover whether MIT students have love lives.

> [See the newest ChemLab Boot Camp episodes](#)

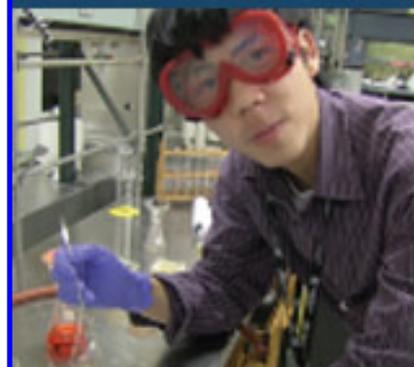
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### Views from Supporters



"I am a simple construction worker. I was not a good student



## 5.301 ChemLab Boot Camp

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in school. But now that I am getting older I understand how important education and, of course, knowledge is.

With OCW I started watching 8.02 lectures by Professor Lewin. With his amazing teaching style I was launched into a fascinating world that changed my life.

I am now obsessed with the electromagnetic force. I have learned so much about it. Even though my math is not good I find myself addicted to learning.

I must bow down to the mighty leaders and teachers of history who discovered these fundamental and beautiful equations that today's engineers use. I remember when I was taught that the electromagnetic force is  $10^{40}$  times more powerful than gravity! I remember discovering Ohm's law and Maxwell equations and Faraday and that cool cage of his!

Now I am dedicated to teaching myself with OCW. I may not ever get a degree, but I will never be denied access to the teachings of these truly remarkable people either."

- Moses, Independent Learner, Canada

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