



# TEACHER'S GUIDE

# FALCONIUM

## OVERVIEW OF TOPICS DISCUSSED

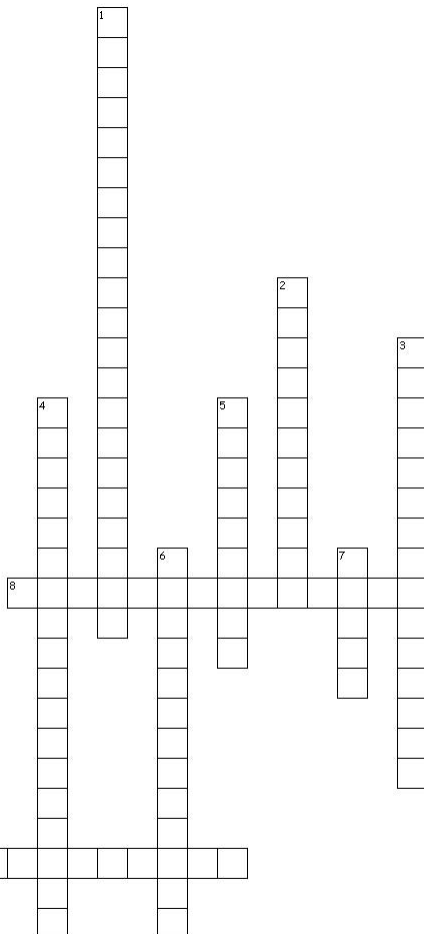
The Two Sides of Modern Technology	Genetic Engineering	A Peek into the Future/ More current research	Student Voices	Student Research: Applications of Life Science
10-12: "Genetic Testing: Blessing or Curse"	13: "The Purple Tomato"	20: "Printing of the Future" (no supplement available)	21-22: "Stem Cell Research"	14-16: "Alteration of Corepressor SMRT in Mice"
18-19: "Why Kids with ADHD have all the Brains"	17: "The Woolly Mammoth Returns"	23-24: "The New Crash Course in Physics"		

### "Genetic Testing: Blessing or Curse" (p. 11-12)

By Ling Jing

#### Critical Thinking

1. Based on the flaws in current legislation, suggest specific and detailed laws or measures that could be implemented to prevent genetic discrimination.
2. What are the possible effects of genetic testing? In your opinion, is genetic testing ultimately a beneficial or harmful scientific development? Explain.
3. Analyze the impact of genetic discrimination. Do you think genetic discrimination has the potential to affect enough people to be considered a significant issue?



#### Further Research and Projects

1. Research the process of genetic testing. Create a brochure explaining the process. Optional: Focus on a company and include their specific procedures.
2. Write testimonies from both supporters and opponents of genetic testing who have undergone the process. Include their reasons for getting tested and how their lives have changed due to testing.
3. What are other applications of the human genome? Write a short essay detailing these applications.

#### Crossword Puzzle

##### Down

1. a general detrimental result of genetic testing
2. 2003 law addressing genetic privacy issues
3. possibly denied due to genetic testing
4. launched in 1990 to uncover the base pair sequence of human DNA
5. another company that offers genetic testing
6. a human example
7. 1996 law on medical data uses

##### Across

8. a company that offers gene tests
9. allows individuals to choose disclosed medical information

## “The Purple Tomato” (p.13)

By Amanda Yuan; Supplement by Alice Fang

True/ False

1. \_\_\_\_ Anthocyanins are pigments found in plants.
2. \_\_\_\_ Red tomatoes, along with commonly eaten fruits, have high enough levels of anthocyanins to be beneficial in terms of antioxidants.
3. \_\_\_\_ After the tomatoes are genetically engineered (by expression of two transgenes), anthocyanin *and* antioxidant levels increase.

Comprehension and Application

1. Why are antioxidants necessary for good health?
2. Why is the tomato purple (as opposed to green or yellow)?
3. What are some food products that are high in antioxidants currently?
4. What are some arguments against genetically engineered foods? Do you agree with these opinions?

## “Alteration of Corepressor SMRT in Mice” (p. 14-16)

By Caroline Yu; Supplement by Alice Fang

Vocabulary: Before Reading

- **Transcription**: when a DNA template is used to produce RNA, which is used to transfer genetic information
- **Chromatin**: an organelle in the cell nucleus that condenses to form chromosomes during cell division
- **Genetic Repressor**: A protein that prevents gene transcription and inhibits protein synthesis.
- **Corepressor**: an activator of a genetic repressor. (e.g. SMRT)
- **Nuclear Hormone Receptors**: proteins that regulate transcription
- **Thyroid**: an endocrine gland in the neck
- **Retinoid Acid**: A vitamin-A derivative; a regulator substance in differentiation of tissues and organs and functions of bone growth
- **Gene Knockout (KO)**: technique in which organisms are engineered to carry inoperative genes

Comprehension

1. What is the function of SMRT (**S**ilencing **M**ediator of **R**etinoid Acid and **T**hyroid Hormone Receptor)?
2. Describe the conclusion of this study. What results lead to this conclusion? Are they credible? Why or why not?

Critical thinking

1. Why is transcription necessary? What are some consequences of repressing transcription?
2. Suggest some reasons why SMRT is such a prevalent subject in research.
3. Besides the ideas listed in this article, what are some questions that can be asked in future research on SMRT?

## “The Woolly Mammoth Returns” (p.17)

By Sara Shu

Reading Comprehension

1. How is genome sequencing useful in bringing the woolly mammoth back to life?
2. What is an advantage of genetic mutation?

Critical Thinking

1. How is hair a good source of extracting DNA?
2. Do you think it is likely that scientists will succeed in creating a woolly mammoth in the future?

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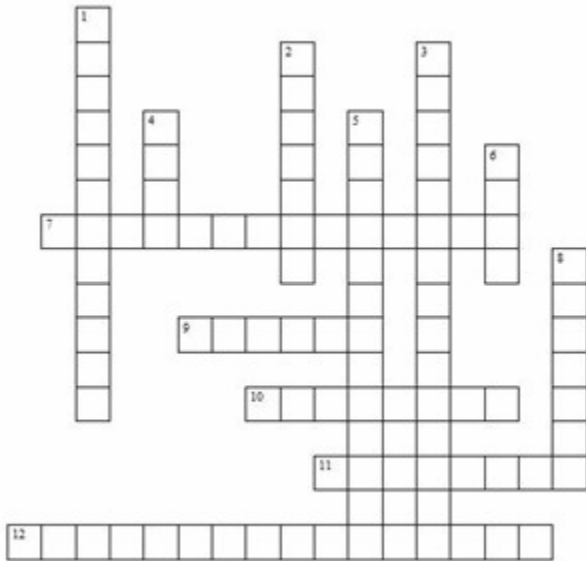
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N M B A G M E A S N M E O T B P  
M A C O O N H R T F W O M T O P

DNA  
genome  
Woolly Mammoth  
base pairs  
permafrost  
gene map  
genome sequencing  
extinction  
Siberia  
Prehistoric

## "Why Kids with ADHD have all the Brains" (p.18)

By Noor Al-Alusi

### Crossword



#### ACROSS

- 7 A long-term side effect that may come as a result of taking ADHD medications is \_\_\_\_\_ complications.
- 9 People who take ADHD medications may lose \_\_\_\_\_.
- 10 The activity of chemicals noradrenaline and \_\_\_\_\_ is increased by medications such as Adderall and Ritalin.
- 11 Used as a comparison to cognitive-enhancers by Profesor Trevor Robbins.
- 12 Taking medications like Adderall or Ritalian repeatedly can lead to \_\_\_\_\_.

#### DOWN

- 1 The prefrontal cortex and \_\_\_\_\_ regions of the frontal cortex of the brain are two areas in which children with ADHD are underactive.
- 2 It is \_\_\_\_\_ to take prescription ADHD medication if you do not have ADHD.
- 3 An active stimulant ingredient in ADHD medications is \_\_\_\_\_ hydrochloride.
- 4 Attention Deficit Hyperactivity Disorder
- 5 ADHD medications allow for better \_\_\_\_\_.
- 6 Functional Magnetic Resonance Imaging
- 8 Pills that have been taken by pilots in the past to stay awake during long flight.

## "Opinion: Stem Cell Research" (p.18)

By Connie Liu and Marci Rosenberg

### Comprehension:

1. The use of what kind of stem cells has sparked such a controversy today?
2. Where else in the body are stem cells found (besides the embryo)?
3. What types of diseases or injuries have the potential to be cured with the use of stem cell regeneration?

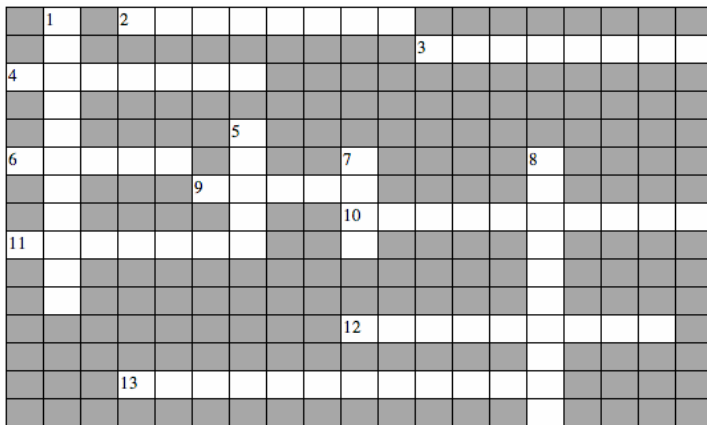
### Short Essay

1. The stem cell controversy has quieted down in the media recently. However, the real question still looms. What arguments do the pro and con authors offer on this issue? With whom do you agree? For what other reasons do you side with the pro/ con?
- \* Send your opinion to Falconium! Write a letter to the editor by emailing us at [info@falconium.org](mailto:info@falconium.org).

## "The New Crash Course in Physics" (p. 23-24)

By Lauren Sweet

### Vocabulary and Concept Crossword



#### ACROSS

2. the liquid form of this element cools the LHC
3. number of LHC like collisions that occur every second in the universe
4. the LHC attempts to recreate this universe phenomenon
6. form of particles when injected into the LHC
9. experiment where scientists collide ions to recreate the Big Bang
10. the LHCb will attempt to learn more about this substance
11. these things guide the particles around the bends in the LHC

#### DOWN

1. the LHC borders France and this country
5. detector used to learn more about the origins of mass
7. this element's ions will be used in the ALICE experiment
8. fear that these microscopic matter suckers will be created

### Try it out- Experiment: How do the LHC's Magnets Work?

LHC's magnets can be compared to "normal" magnets of opposing polarities repelling each other (positive-positive or neg-neg). Play with the different combinations of positive and negative magnets. What do you observe? The LHC's magnets work the same way, but use atomic charges to move the particles through the machine.

### Comprehension: Name the purpose of the following experiment detectors

ALICE-  
LHCb-  
ATLAS-  
CMS-