Disclaimer: This packet is intended ONLY for the use of students enrolled in Leon County Schools.

Complete the assignments below.

Week 2:

- ☐ **Earth Space Science (SC.912.E.5; SC.912.E.6; SC.912.E.7)**
- ☐ **Content Area Reading: Was Einstein a Space Alien? (RI.1.1;SC.912.E.6)**
- ☐ **Skill Activity: Scientific vocabulary and textual support (RI.1.2; RI.4.10)**

COMMONLIT

Name: _____ Class: _____

Was Einstein a Space Alien?

By NASA Science News
2005

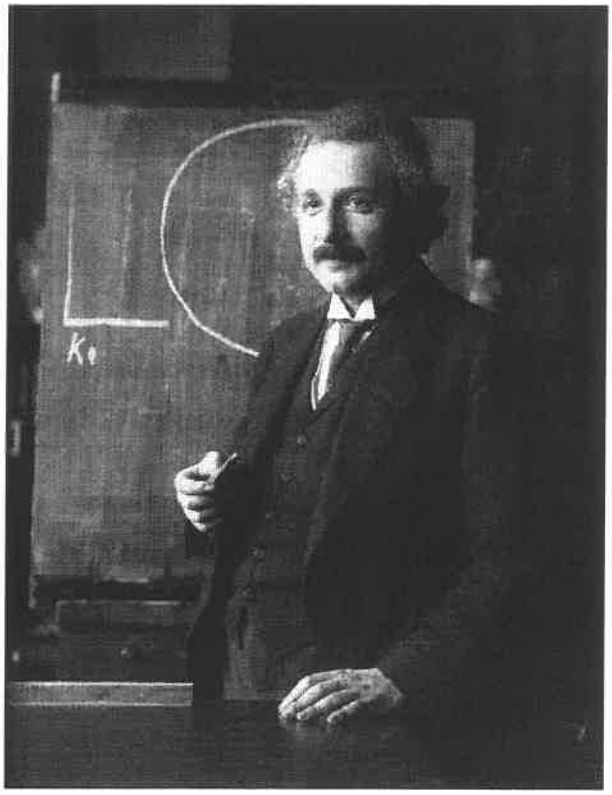
Albert Einstein (1879-1955) was a German-born physicist whose work has had a strong influence on the philosophy of science. He is also often considered the greatest physicist of the 20th century. This informational text discusses Einstein's contributions to science, specifically his discovery regarding the composition of light. As you read, take notes on how Einstein differed from other scientists of his time.

[1] Modern pop culture paints Einstein as a bushy-haired superthinker. His ideas, we're told, were improbably far ahead of other scientists. He must have come from some other planet — maybe the same one Newton grew up on.

"Einstein was no space alien," laughs Harvard University physicist and science historian Peter Galison. "He was a man of his time." All of his 1905 papers unraveled problems being worked on, with mixed success, by other scientists. "If Einstein hadn't been born, [those papers] would have been written in some form, eventually, by others," Galison believes.

What's remarkable about 1905 is that a single person authored all five papers, plus the original, irreverent way Einstein came to his conclusions.

For example: the photoelectric effect. This was a puzzle in the early 1900s. When light hits a metal, like zinc, electrons[1] fly off. This can happen only if light comes in little packets concentrated enough to knock an electron loose. A spread-out wave wouldn't do the photoelectric trick.



"Einstein 1921 by F Schmutzer" by Ferdinand Schmutzer is in the public domain.

[5] The solution seems — light is particulate.[2] Indeed, this is the solution Einstein proposed in 1905 and won the Nobel Prize for in 1921. Other physicists like Max Planck (working on a related problem: blackbody[3] radiation), more senior and experienced than Einstein, were closing in on the answer, but Einstein got there first. Why?

It's a question of authority.

1. a small particle of matter that travels around the nucleus of an atom
2. in the form of very small, separate particles
3. an object or system that absorbs all light that hits it

"In Einstein's day, if you tried to say that light was made of particles, you found yourself disagreeing with physicist James Clerk Maxwell. Nobody wanted to do that," say Galison. Maxwell's equations were enormously successful, unifying the physics of electricity, magnetism and optics.[4] Maxwell had proved beyond any doubt that light was an electromagnetic wave. Maxwell was an Authority Figure.

Einstein didn't give a fig for authority. He didn't resist being told what to do, not so much, but he hated being told what was true. Even as a child he was constantly doubting and questioning. "Your mere presence here undermines the class's respect for me," spat his 7th grade teacher, Dr. Joseph Degenhart. (Degenhart also predicted that Einstein "would never get anywhere in life.") This character flaw was to be a key ingredient in Einstein's discoveries.

"In 1905," notes Galison, "Einstein had just received his Ph.D. He wasn't beholden to a thesis advisor or any other authority figure." His mind was free to roam accordingly.

[10] In retrospect, Maxwell was right. Light is a wave. But Einstein was right, too. Light is a particle. This bizarre duality[5] baffles Physics 101 students today just as it baffled Einstein in 1905. How can light be both? Einstein had no idea.

That didn't slow him down. Disdaining caution, Einstein adopted the intuitive leap as a basic tool. "I believe in intuition and inspiration," he wrote in 1931. "At times I feel certain I am right while not knowing the reason."

Although Einstein's five papers were published in a single year, he had been thinking about physics, deeply, since childhood. "Science was dinner-table conversation in the Einstein household," explains Galison. Albert's father Hermann and uncle Jakob ran a German company making such things as dynamos,[6] arc lamps,[7] light bulbs and telephones. This was high-tech at the turn of the century, "like a Silicon Valley company would be today," notes Galison. "Albert's interest in science and technology came naturally."

Einstein's parents sometimes took Albert to parties. No babysitter was required: Albert sat on the couch, totally absorbed, quietly doing math problems while others danced around him. Pencil and paper were Albert's GameBoy!

He had impressive powers of concentration. Einstein's sister, Maja, recalled "even when there was a lot of noise, he could lie down on the sofa, pick up a pen and paper, precariously[8] balance an inkwell on the backrest and engross himself in a problem so much that the background noise stimulated rather than disturbed him."

[15] Einstein was clearly intelligent, but not outlandishly[9] more so than his peers. "I have no special talents," he claimed, "I am only passionately curious." And again: "The contrast between the popular assessment of my powers... and the reality is simply grotesque."[10] Einstein credited his discoveries to imagination and pesky questioning more so than orthodox[11] intelligence.

4. the scientific study of sight and the behavior of light
5. the quality or state of having two parts
6. a machine that produces electricity
7. a lamp that produces light through an electric arc
8. **Precarious** *(adjective):* dangerously likely to fall
9. **Outlandish** *(adjective):* strikingly out of the ordinary
10. **Grotesque** *(adjective):* extremely different from what is expected

Later in life, it should be remembered, he struggled mightily to produce a unified field theory, combining gravity with other forces of nature. He failed. Einstein's brainpower was not limitless.

Neither was Einstein's brain. It was removed without permission by Dr. Thomas Harvey in 1955 when Einstein's mother Pauline had famously worried that baby Einstein's head was lopsided. (Einstein's grandmother had a different concern: "Much too fat!") But Einstein's brain looked much like any other, gray, crinkly, and, if anything, a trifle smaller than average.

Detailed studies of Einstein's brain are few and recent. In 1985, for instance, Prof. Marian Diamond of UC Berkeley reported an above-average number of glial cells (which nourish neurons)[12] in areas of the left hemisphere thought to control math skills. In 1999, neuroscientist Sandra Witelson reported that Einstein's inferior parietal lobe, and area related to mathematical reasoning, was 15% wider than normal. Furthermore, she found, the Sylvian fissure, a groove that normally extends from the brain to the back, did not go all the way in Einstein's case. Might this have allowed greater connectivity among different parts of Einstein's brain?

No one knows.

[20] Not knowing. It makes some researchers feel uncomfortable. It exhilarated Einstein: "The fairest thing we can experience is the mysterious," he said. "It is the fundamental emotion that stands at the cradle of true art and true science."

11. ordinary; normal
12. a nerve cell

Text-Dependent Questions

Directions: For the following questions, choose the best answer or respond in complete sentences.

1. PART A: Why does the author quote Peter Galison in paragraph 2 of "Was Einstein a Space Alien?" [RI.5]
   A. to demonstrate that Einstein's luck was to be born at the right time
   B. to explain that Einstein displayed the prejudices of his era
   C. to suggest Einstein's unwillingness to share his ideas
   D. to argue that Einstein was in some ways an average person

2. PART B: Which paragraph provides additional evidence to the answer to Part A? [RI.1]
   A. Paragraph 5
   B. Paragraph 10
   C. Paragraph 12
   D. Paragraph 15

3. PART A: What major claim about Einstein does the author of "Was Einstein a Space Alien?" develop in paragraphs 7-8? [RI.2]
   A. He was a source of frustration for his teachers.
   B. He was an independent and original thinker.
   C. He relished provoking intellectual battles.
   D. He ended up winning the respect of his adversaries.

4. PART B: Which sentence best supports the answer to Part A? [RI.1]
   A. "'In Einstein's day, if you tried to say that light was made of particles, you found yourself disagreeing with physicist James Clerk Maxwell.'" (Paragraph 7)
   B. "Maxwell was an Authority Figure." (Paragraph 7)
   C. "He didn't resist being told what to do, not so much, but he hated being told what was true." (Paragraph 8)
   D. "'Your mere presence here undermines the class's respect for me,' spat his 7th grade teacher, Dr. Joseph Degenhart." (Paragraph 8)

5. PART A: In paragraph 9 of "Was Einstein a Space Alien?" what is the meaning of the word "beholden?" [RI.4]
   A. attached through shared interests
   B. hostile
   C. bound by obligation
   D. grateful

6. PART B: Which word or phrase from paragraphs 8-9 of "Was Einstein a Space Alien?" best clarifies the meaning of "beholden?" [RI.1]
   A. "fig" (Paragraph 8)
   B. "flaw" (Paragraph 8)
   C. "authority figure" (Paragraph 9)
   D. "free to roam" (Paragraph 9)

Discussion Questions

Directions: Brainstorm your answers to the following questions in the space provided. Be prepared to share your original ideas in a class discussion.

1. When is it appropriate to challenge authority? In what ways did Einstein challenge authority? Cite examples from the text, your own experience, and other literature, art, or history in your answer.

2. In the context of the text, why do people succeed? Why was Einstein a successful scientist? What character traits did he possess that contributed to this success? Cite examples from the text, your own experience, and other literature, art, or history in your answer.

3. In the context of the text, how do we understand the world? In what ways did Einstein's understanding of the world differ from other scientists'? How did Einstein's perspective on the world contribute to his success as a scientist? Cite examples from the text, your own experience, and other literature, art, or history in your answer.

This week in class, we're reading "Was Einstein a Space Alien?" by NASA Science News.

The informational text "Was Einstein a Space Alien?" discusses Albert Einstein's numerous and impressive discoveries, specifically his discovery regarding the composition of light.

As we read, we will be discussing the theme of Resilience & Success as it relates to the text. We are trying to answer this big question :

"Why do people succeed?"

Ways to support your child:

- Ask your child about this informational text at home:
  - What was "Was Einstein a Space Alien?" About
  - What did you learn about?
- Watch the following clips with your child at home:
  - 'How Einstein's Brain Is Different Than Yours '
  - 'Albert Einstein: Mini Biography'
  - 'Albert Einstein: Why Light is Quantum'