

Science-Day 4 - Cherry

# Bot Man

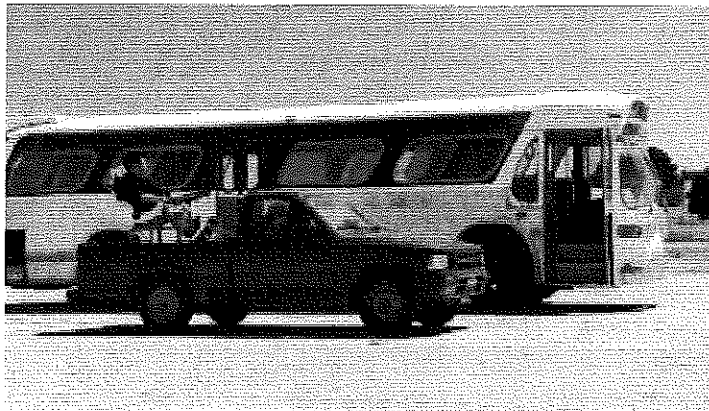
Day 4 - cherry

By Bobby Oerzen

## Robotics expert Grant Imahara uses his knowledge of physics to bust myths.

Have you ever compared a clumsy friend to “a bull in a china shop?” Then you haven’t been watching *MythBusters*. “We put two, three, four, five bulls in the china shop, and they only knocked over one plate!” says Grant Imahara. “Amazing!”

Imahara is one of the co-hosts of the popular Discovery Channel TV show that tests the validity of old sayings, rumors, movie stunts, and Web videos. An electrical engineer by training, Imahara uses his knowledge of applied science to predict the outcome of the tests before the myths are busted—or, more likely, blown up.



*MythBusters*

Grant Imahara steered a bus via remote control from the back of a pickup truck.

Imahara has also predicted how long the Energizer Bunny will keep going and going. That’s no myth. That’s robotics, his other job. Imahara is also a robot builder and an *animatronics engineer*, someone who designs lifelike robots for movies and television.

## Born an Engineer

Imahara’s love of engineering began early in life. “I’ve always been fascinated with how things work,” he says. Instead of crashing his toy cars

when he was a young boy, Imahara removed the wheels. "I took apart anything I could get my hands on."

Later, at age 10, he got his first computer, which sparked an interest in electronics. "But it wasn't until high school that I realized you could get paid to make things work and that's called an engineer," says Imahara.

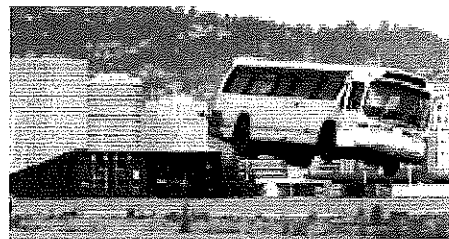
After getting a degree at the University of Southern California, Los Angeles, he headed across town to the movie industry. "Although it may look like all fun and games, it's really hard work," he says.

Imahara has worked as an animatronics expert on movies such as *The Lost World: Jurassic Park* and *Star Wars: Episode I The Phantom Menace*. "It's like I've given these robots a life and personality of their own," he says.

### Remote Controller

One of Imahara's early assignments was devising a remote control system for the Energizer Bunny. "We had to be very tricky and clever with how everything was arranged so the robot could beat the drum, move, and look like a bunny on the outside but still have a huge amount of go on the inside," he says.

Imahara later found himself in another tricky situation after joining the cast of *MythBusters*. One episode duplicated a stunt from *Speed*. In the 1994 action movie, Sandra Bullock pilots a runaway 10,885-kilogram (24,000-pound) bus over a 15-meter (50-foot) gap on an L.A. freeway.



*MythBusters*

The bus lacked the velocity to fly 15 meters through the air. It crashed instead, revealing that a similar stunt in the movie *Speed* was a special effect.

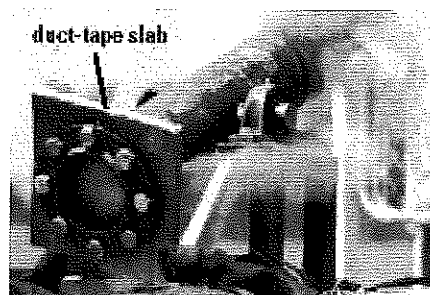
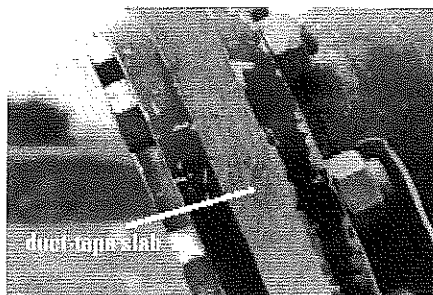
Because the stunt is extremely dangerous, Imahara had to guide the bus by remote control from the back of a pickup truck. The scene turned out to be a myth; the remote-controlled bus nose-dived off the test ramp into the asphalt below. Viewers may have been shocked, but Imahara wasn't. He knew the bus wouldn't clear the gap. "We use physics all the time to predict

how things will work," says Imahara. "Everything we test adheres to the laws of physics."

Imahara identified all the *variables* in the test. A variable is a factor in an experiment that can change and affect the result. The variables included the bus's *velocity* (the rate at which it moved in a specific direction), the angle of the ramp, and the length of the gap. Gravity was also a factor, of course, but not a variable. Gravity is a *constant*—a factor that does not vary in specified circumstances. Gravity accelerates objects toward Earth at 9.8 meters (32 feet) per second, every second. With all the variables in mind, Imahara calculated that a bus reenacting the *Speed* stunt would miss clearing the gap by more than 9 meters. Which it did!

## The Third Law

Imahara also used scientific reasoning during *MythBusters's* duct tape show. In that episode, he and his co-hosts tested the legendary strength of duct tape. They wondered whether it is strong enough to withstand a cannon blast. The team fastened a block of duct tape to the back of a cannon and fired an 8-kilogram cannonball from it.



*MythBusters*

The *MythBusters* crew screwed duct-tape slabs of varying thickness to the back of a cannon and tested each one's ability to withstand the force of a cannon shot.

The variables in this experiment included the explosive force of the cannon—enough to launch the cannonball hundreds of feet at 257 kilometers (160 miles) per hour—as well as the duct tape. Each myth buster guessed how many blocks of inch-thick duct tape it would take to withstand a cannon blast.

Imahara made his guess using Isaac Newton's *third law of motion*: To every action there is an equal and opposite reaction. In other words, the force propelling the cannonball forward is matched by a force of the same size pushing the cannon backward against the block of duct tape.

Imahara calculated that it would take 3 solid inches of duct tape to withstand the cannon's mighty blast. His calculation was a little off; it took only 1 inch!

Regardless, Imahara remains confident of the predictive power of physics. "Pop singers come and go, but the laws of physics never change," he jokes. "Gravity—you can always count on gravity."

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. According to the passage, which of the following laws of physics helped Imahara test the strength of duct tape?

- A first law of physics
- B Newton's third law of gravity
- C law of velocity
- D Newton's third law of motion

2. In the description of Imahara's re-creation of the *Speed* bus scene, which of the following was a constant?

- A gravity
- B velocity
- C angle
- D length

3. Based on the passage, it is likely that

- A Imahara did not like engineering when he was young
- B many myths are not actually true when tested with science
- C it is easy to be an engineer for movies
- D Imahara does not like his job

4. Read the following sentence: "Imahara identified all the *variables* in the test."

As used in the passage, **variables** are

- A things that can go wrong
- B things that never change
- C things that can change
- D things that can go right

5. What is this passage mostly about?

- A how movie makers design robots
- B how Grant Imahara tests myths for a show
- C how to use duct tape for experiments
- D how Grant Imahara built an Energizer Bunny

6. What is gravity?

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7. Why does Imahara make the joke: "Pop singers come and go, but the laws of physics never change"?

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8. The question below is an incomplete sentence. Choose the word that best completes the sentence.

\_\_\_\_\_ he was a child, Imahara has been interested in how things work, and eventually he became an engineer.

- A Though
- B Because
- C Since
- D After

9. Answer the questions based on the sentence below.

Imahara guessed how much duct tape it would take to withstand a cannonball by using Newton's third law of motion.

Who? Imahara

(did) What? \_\_\_\_\_

How? \_\_\_\_\_

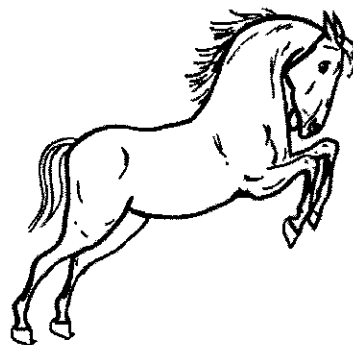
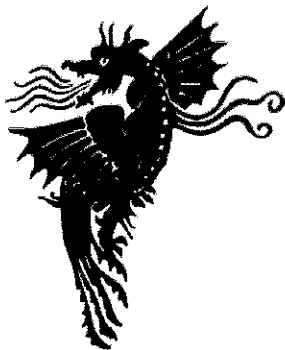
**10.** Read the vocabulary word and definition below and complete questions 10a, 10b, and 11.

**Vocabulary Word:** myth (myth): a made-up story about a hero or an event, though many people believe it to be true.

**10a.** Read the five sentences below and underline the word **myth** in each sentence.

1. Many people believe in myths without having facts to support these ideas.
2. Many stories about magical creatures are myths that aren't completely true.
3. Science experiments can help people prove whether myths are true or not.
4. He read about a giant who could fly in a book of myths in the library.
5. It is a myth that a bus, like the one in the movie *Speed*, can jump over a large gap in the road.

**10b.** Which image shows something that is a myth?



**11.** Would you find a story about fairies and magic in a newspaper or a book of myths? Why?

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