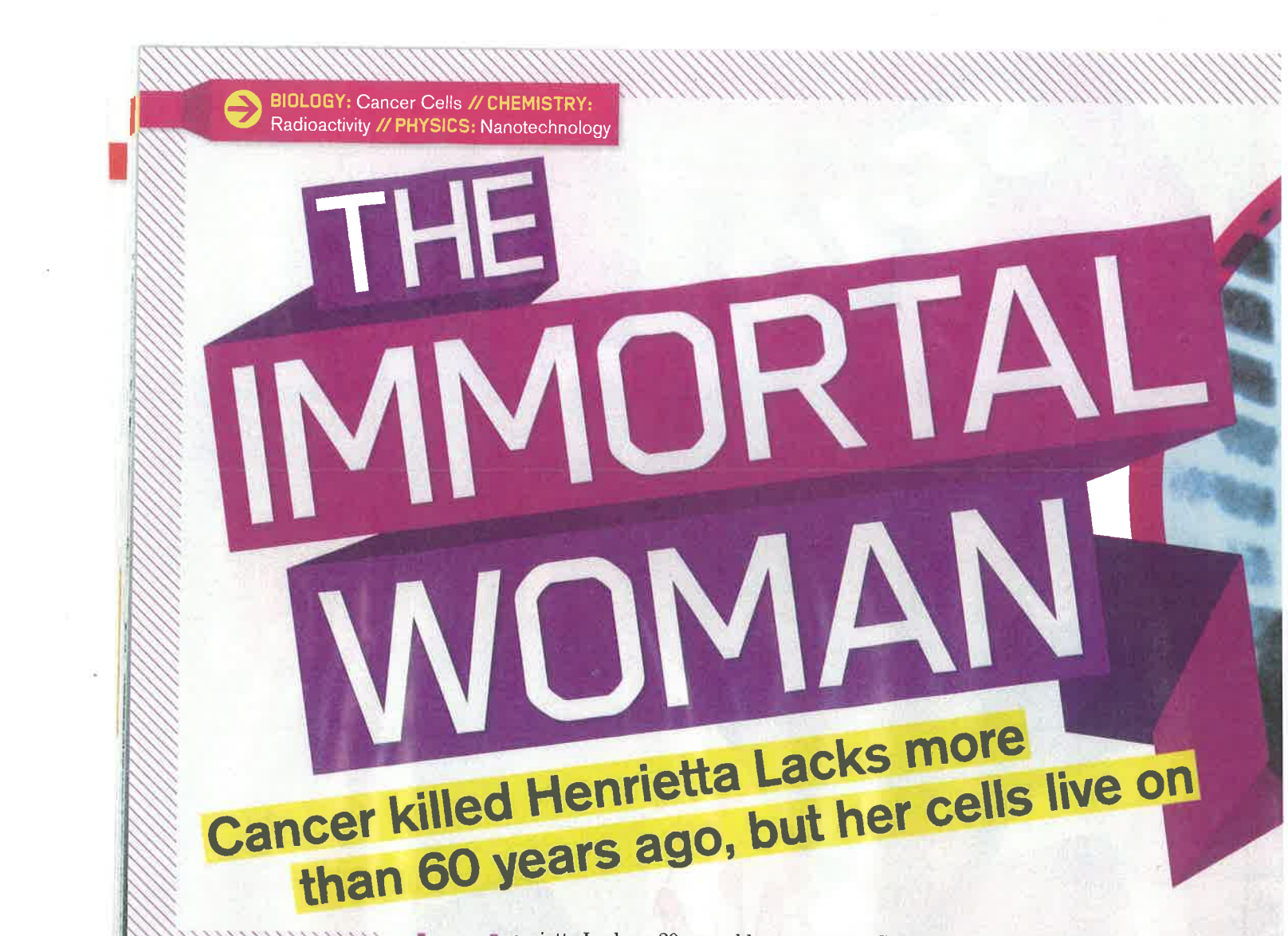
THE IMMORTAL WOMAN

Cancer killed Henrietta Lacks more than 60 years ago, but her cells live on



Henrietta Lacks, a 30-year-old African-American woman, went to Johns Hopkins Hospital in Baltimore, Maryland, in 1951. For months, she had felt pain in her *cervix*, the lower part of the uterus. A doctor examined her and found an abnormal lump of tissue, called a *tumor*, growing there. Lab tests showed that the tumor was cancerous.

Cancer develops when cells divide and grow uncontrollably. Doctors at the hospital gave Lacks the standard treatment of the day: They sewed small packets of radium, a *radioactive* element, onto the tumor. Radiation can damage *DNA*—the genetic material in cells—so that the cells can't divide anymore.

But the doctors did something else too: They took tissue from Lacks's cervix without telling her, which was typical back then. The tissue was placed in test tubes and kept warm in an incubator. Doctors hoped the cells would survive outside of Lacks's body so they could be used for medical research.

Scientists had been trying to *culture* human cells, or grow them in a lab, for a long time. But no matter what they did, the cells died. Lacks's cells thrived. (Scientists now think it's partly because a molecule called *telomerase*, which protects DNA from damage, is unusually active in her cells.)

Lacks's cells have fueled nearly 75,000 studies in genetics, cloning, vaccines, and other areas of biology. Last year, for the first time, her descendants were given a say in research conducted on her cells.

DEATH AND EVERLASTING LIFE

The radiation treatment Lacks received didn't stop her cancer and she died later that year. Remarkably, though, her cultured cancer cells survived and reproduced in test tubes. They grew just as aggressively as they had in her body. Every day, they doubled in number. The cells were immortal.

Scientists who heard about them asked for samples, and soon Lacks's cells arrived in

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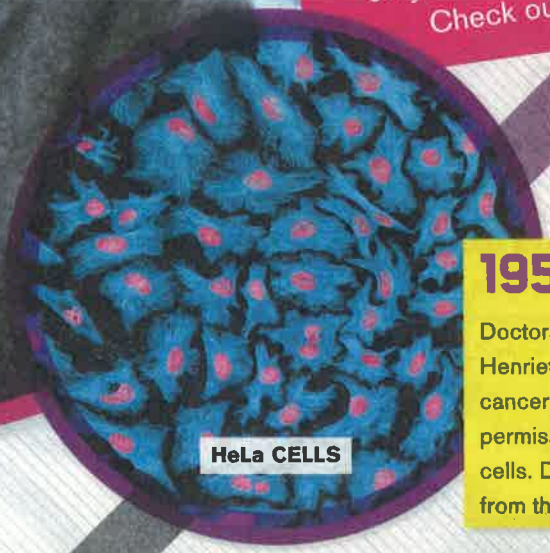
PAGE 15: SCIENCE SOURCE (LACKS); DR. THOMAS DEERINCK/VISUALS UNLIMITED/CORBIS (1951); CRAIG VAN DER

HENRIETTA LACKS

THE IMMORTAL CELLS OF HENRIETTA LACKS

A woman's cells are still going strong more than 60 years after doctors first collected them. Check out some of their major milestones.



HeLa CELLS

1951

Doctors take cancer cells from Henrietta Lacks, who has cervical cancer, without her knowledge or permission. They name them "HeLa" cells. Despite treatment, Lacks dies from the disease later that year.

1952

HeLa cells survive shipment by mail—the first successful transport of live cells. Scientists use them to study viruses and to test the polio vaccine.

1955

HeLa cells are the first to be successfully *cloned*, or copied exactly.

Turn the page for more of HeLa's historic journey

labs around the world. They were given the name "HeLa," combining letters from her first and last names.

HeLa cells allowed researchers to run experiments on human cells that they couldn't ethically do on people—such as infecting them with diseases or administering high doses of drugs. Such experiments helped scientists understand how human cells work and led to the development of vaccines and treatments for diseases (*see time line above*).

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In the past 63 years, several scientists have won Nobel prizes for research on HeLa cells. Winners of national student research competitions have used them too. "It's hard to find a biology lab that doesn't have HeLa cells sitting in the freezer or incubator," says Kathy Hudson, deputy director at the National Institutes of Health (NIH), the agency in charge of U.S. medical research.

A FAMILY'S LEGACY

Last year, scientists in Europe published the *genome* of HeLa cells on the Internet. DNA molecules are made of a string of smaller molecules called *bases*, which are represented by letters. A genome is the list of letters in a DNA sequence. Lacks's genome will help scientists learn more about how human cells work.

Her genome wasn't the first to be published, but in the other cases, the people who provided samples gave scientists permission to use them. "They said, 'I'm OK with my sequence being publicly available,'" says Hudson. "Henrietta wasn't asked."

There was another problem. A genome can reveal personal information, such as which diseases someone might develop. And

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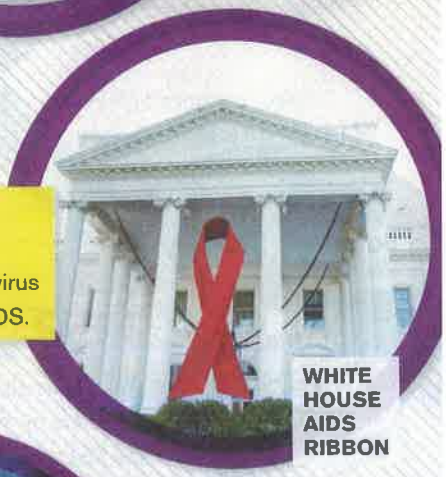
1960

HeLa cells travel into space aboard a Russian satellite. Later, NASA sends more HeLa cells into space, discovering that they reproduce faster in low gravity.

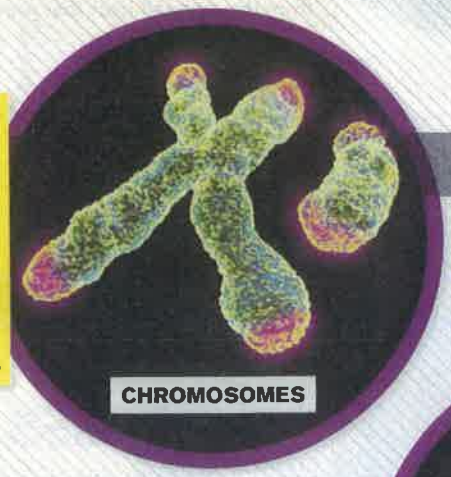
1965

HeLa cells are combined with mouse cells to make the first *hybrid* cells from two different species. Such cells were used in research on genetics and cell division.



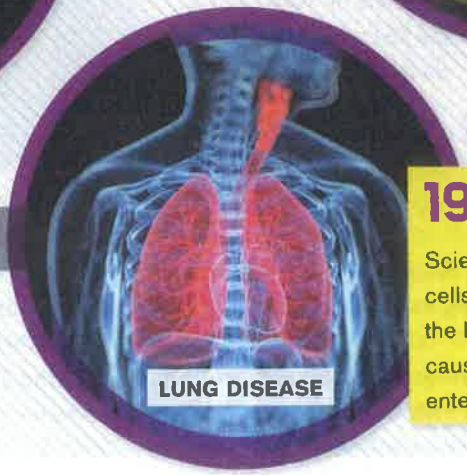
1986

Scientists use HeLa cells to study HIV, the virus that causes AIDS.



1989

Researchers working with HeLa cells discover that a molecule called *telomerase* protects the DNA in human chromosomes from damage due to aging.



1993

Scientists use HeLa cells to learn how the bacteria that cause tuberculosis enter human cells.

since family members share similar DNA, a person's genome holds clues about diseases their relatives might be susceptible to.

Henrietta Lacks left behind five children, ages 16, 12, 4, 2, and 1, when she died. She has many living descendants today. When researchers published the HeLa genome in 2013, they hadn't informed the Lacks family or asked their permission, since they weren't required to. When the family expressed concerns about privacy, the scientists removed the sequence from the Internet.

Hudson and other NIH leaders then met with the Lacks family. Her relatives wanted to find a way to keep Henrietta's DNA sequence somewhat private without cutting off scientific progress. "They are really proud of the contribution Henrietta Lacks's cells have made to biology," says Hudson.

Together, the family and the NIH came to an agreement. Researchers can use the HeLa genome by applying to the NIH for access. A group of scientists and Lacks family members reviews the applications. And from now on, when scientists publish research conducted using HeLa cells, it'll include a note thanking Lacks and her family for their everlasting gifts to science. ❀ —*Jennifer Barone*

CORE QUESTION

How have HeLa cells contributed to biology and medicine? Give three examples.

1971

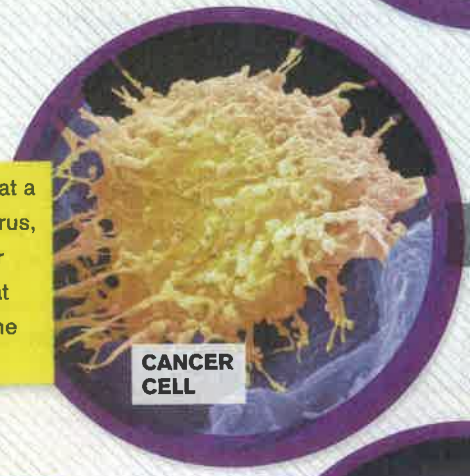
Henrietta Lacks is identified by name for the first time in an article honoring George Gey, the scientist who cultured HeLa cells, following his death in 1970.

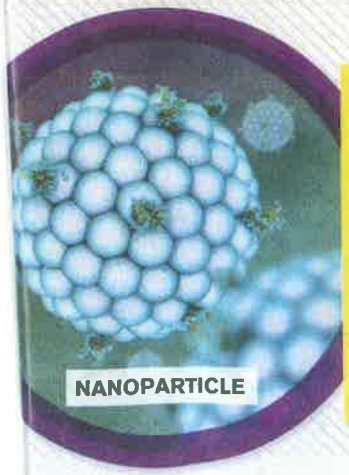
1973

Lacks's children learn that their mother's cells are immortal and are used in research worldwide. The same year, scientists take blood samples from members of the Lacks family for genetic analysis without proper permission.

1984

Research on HeLa cells proves that a virus known as human papillomavirus, or HPV, can cause cervical cancer (which killed Lacks). A vaccine that protects against some strains of the virus became available in 2006.





2005

Researchers test how quickly HeLa cells absorb nanoparticles. The results suggest new methods for delivering drugs to cancer cells.

2013

The HeLa cell genome is published online without permission from the Lacks family. The family and the NIH reach an agreement for future use of the genome in research.