"A reflection on Steve Jobs and Henrietta Lacks, two people who changed our world"

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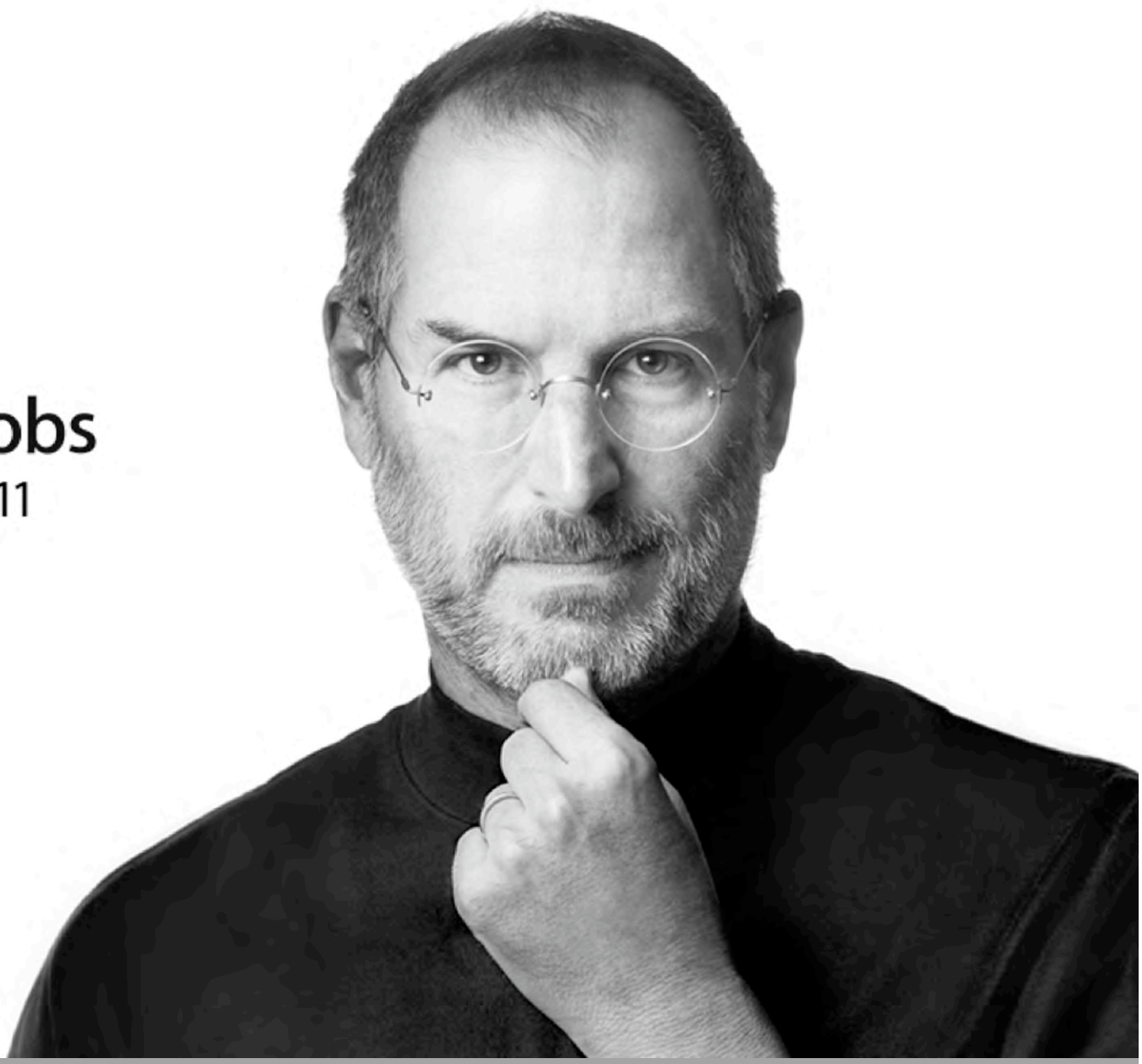
Presented at Lehigh Faculty Forum, October 10, 2011

Steve Jobs, the founder of Apple and Henrietta Lacks, the donor of HeLa cells had a lot in common:

-- Both dyed on cancer
-- Both dyed way to young
-- Henrietta Lacks died October 4th, 1951,
Steve Jobs died on October 5th, 2011
-- Both in their own way changed our world!

Steve Jobs

1955-2011



First-Year Experience Seminar, LU 09-21-'11

HeLa cells: their essential role in research and teaching

(A 'story' based on the recent book by Rebecca Skloot "The Immortal Life of Henrietta Lacks")

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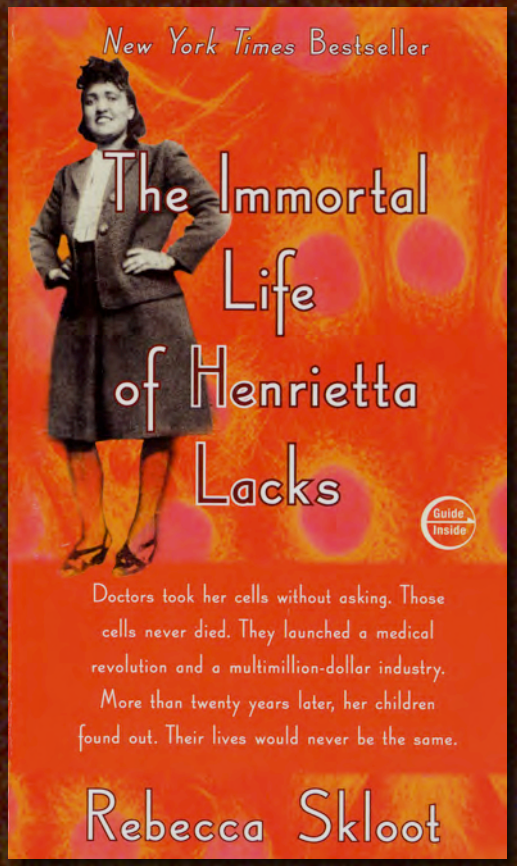
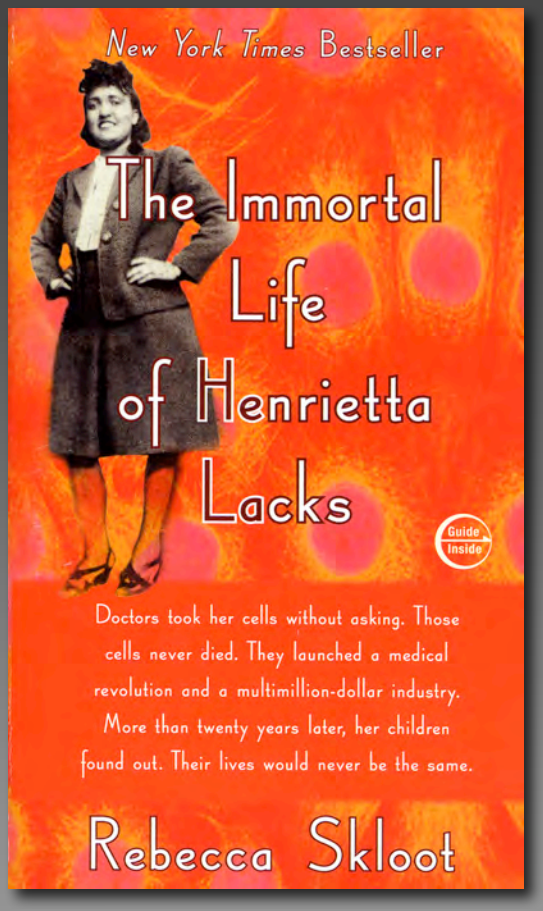




... A thorny and provocative book about cancer, racism, scientific ethics, and crippling poverty ...

For a life-scientist, a biologist, and especially for a cell-biologist,
this is not a story about racism, ethics, and poverty,
but a sad story about a cancer victim, research and learning,

<u>that tells the need for research to understand human health and disease!</u>

The Source of HeLa Cells

January 1951: A young, 31 year old Afro-American woman went to Johns Hopkins Hospital, the only hospital in the area that would treat 'colored people', after she observed a knot in her womb and intermittent bleeding. She was diagnosed with cancer, a 'epidermoid carcinoma of the cervix, Stage I.'

Dr. George Gey

February 1951: The woman started radium treatment after a specimen had been removed from her tumor. She had agreed to the surgical procedure, but not specifically to the removal of a biopsie (which was not mentioned in the consensus form).

This biopsie was given to Dr. George Gey's lab at John's Hopkins which had unsuccessfully tried for more than 20 years to culture human cells *in vitro* to study cancer.

http://farm3.static.flickr.com/2721/4336002895_f28ea6ac43.jpg

Surprisingly, and completely unexpected, these cancer cells, named HeLa, grew in Dr. Gey's lab, and subsequently revolutionized biology and pharmacy.

Unfortunately, and inappropriately, in 1971 the name of the donor was released, so we know today who the patient was:

Henrietta Lacks

Born August 1st 1920 as Loretta Pleasant in Roanoke, Virginia

-- grew up as a tobacco farmer
-- married to David "Day" Lacks
-- moved to Baltimore, MD in 1941 where her husband joined Bethlehem Steel, Sparrows Point

-- Five children (Lawrence, Elsie, David, Deborah and Joseph)

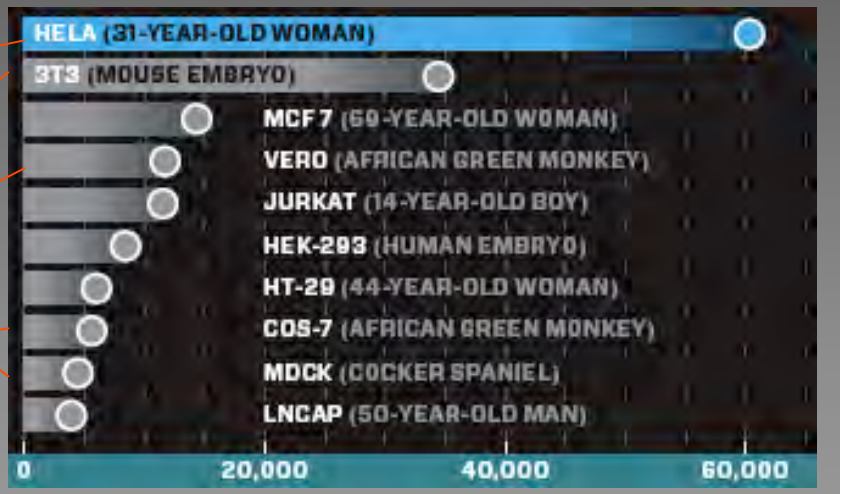
Mrs. Lacks died on October 4th, 1951, only 8 month after the diagnosis of her aggressive cancer.

(A note to the author:)
"The (bad) cancer cells that killed Henrietta Lacks are alive today, not her (good) normal cells."

TABLE 1.1
Commonly studied cell lines (a small selection)

Name	Cell type	Origin	Karyotype	Medium
Species: Canine				
MDCK	epithelioid	kidney; cocker spaniel	aneuploid 78	MEM + NEAA 10% FBS
Species: Hamster				
BHK-21	fibroblastic	kidney	aneuploid 44–45	MEM + NEAA 10% FBS
CHO-K1	epithelioid	ovary	aneuploid 20	Ham's F12 +10% FBS
Species: Human				
A431	epithelial	epidermoid carcinoma	aneuploid 76, XX	DMEM +10% FBS
BeWo	epithelioid-trophoblastic	choriocarcinoma	aneuploid 84–86	F12K modification of Ham's medium +15% FBS
Caco-2	epithelioid	colonic adeno-carcinoma	aneuploid 96–101	MEM + NEAA +20% FBS
Daudi	lymphoid	Burkitt's lymphoma	aneuploid 45–47, XY	RPMI 1640 +20% FBS
EB-3	lymphoid	Burkitt's lymphoma	aneuploid 46–47, XY	RPMI 1640 +10% FBS
HeLa	epithelioid	cervical carcinoma	aneuploid 81–83, XX	MEM + NEAA 10% FBS
Hep G2	epithelioid	hepatocellular carcinoma	aneuploid 55, XY	MEM + NEAA +10% FBS
HUT 78	lymphoid	cutaneous T-cell lymphoma	n.d.	RPMI 1640 +10% FBS
Species: Monkey				
COS-7	fibroblastic	kidney SV40-transformed African green monkey	n.d.	DMEM + 10% FBS
CV-1	fibroblastic	kidney African green monkey	aneuploid 58–60	MEM + 10% FBS
Vero	fibroblastic	kidney African green monkey	aneuploid 57–59	medium 199 + 5% FBS
Species: Mouse				
3T3-L1	fibroblastic to adipose-like	clonal derivative of 3T3-Swiss albino	aneuploid highly variable	DMEM +10% FBS
Species: Rat				
AR42J	fibroblastic	pancreatic tumor	n.d.	Ham's F12K + 20% FBS

Use of common cell lines in research and number of scientific publications in which they are cited:



http://www.wired.com/magazine/wp-content/images/18-02/st_henrietta2_f.jpg

-- Why use cells (and especially human cells) as a research tool?

1) Homogeneity (all researchers use the same material)

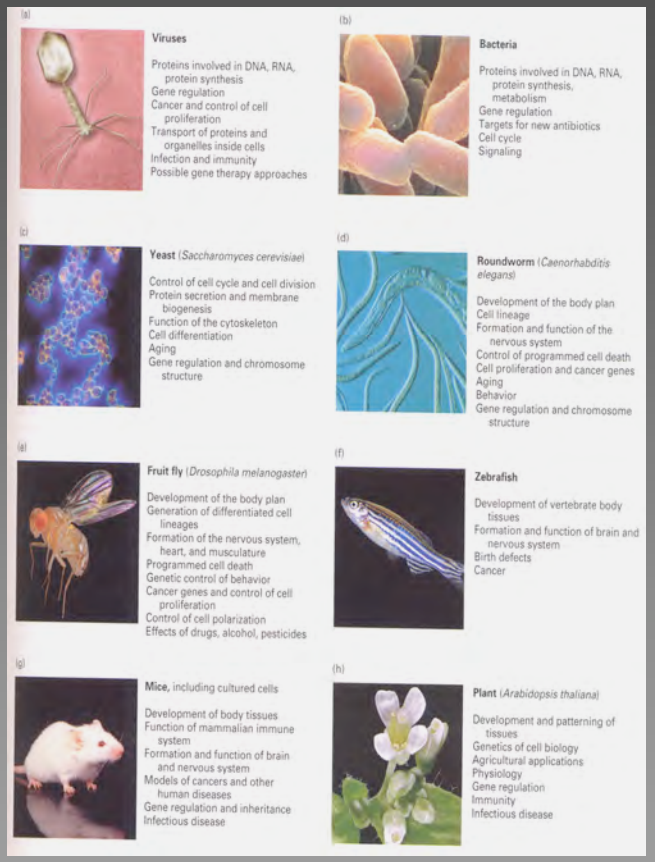
2) Cells grow faster than whole organisms

3) No ethical issues related to the use of animals in research

4) Human subjects can not be used for certain experiments

5) Depending on the research question, the whole animal is not needed.

Commonly used Model Organisms:

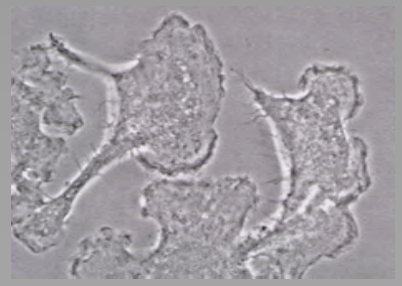


HeLa or other human cells were used to discover/develop:

-- Poliovirus vaccine (Jonas Salk, 1954)
-- Papilloma virus infection can cause cancer/vaccine
-- Anti-cancer drugs (vinblastine, taxol)
-- Ibuprofen (the active ingredient in Motrin and Advil) is highly toxic to cats!

etc. ...

Cells in culture:



Summary

Henrietta Lacks, an African-American woman from a tobacco farming slave family, consented to surgery and treatment when diagnosed with cervical cancer – she was not informed that some of her tissue would be removed and used for research. After successful cultivation (1951), distribution, commercialization and many scientific breakthroughs using HeLa cells her identity was uncovered in 1971. During all the decades of research and discovery the Lacks family did not get any recognition or compensation.

HeLa cells sparked a legal controversy between patient's rights and ownership of medical matter

Some Ethics Questions and Concerns

HeLa: the leak of Henrietta's name: How can patient privacy be better protected?

What kind of information should be included in the 'informed consent'?

'Informed consent' – what do you do with people who lack basic education?

Who owns the tissue that is removed during surgery?

Can this tissue be used for research?

What if this research results in a profitable product?