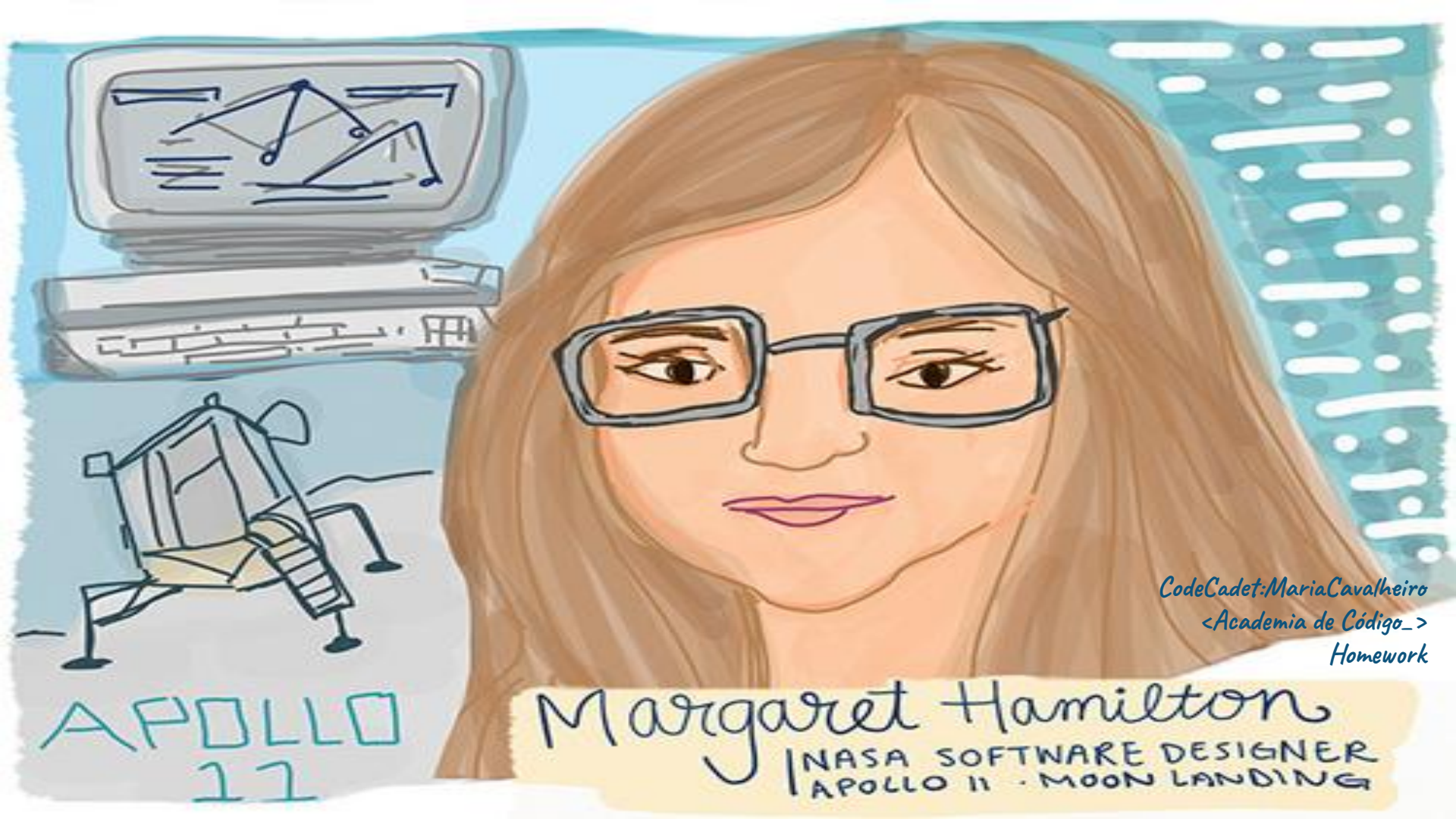

APOLLO
11
Margaret Hamilton
NASA SOFTWARE DESIGNER
APOLLO 11 · MOON LANDING
CodeCadet:MariaCavalheiro
<Academia de Código_>
Homework

Margaret Heafield Hamilton

an American computer scientist, systems engineer, and business owner.

"There was something about Math that I just like more than everything else."

1936
August 17

Born in Paoli, a small town in southern Indiana.

1955

After High School, started a Bachelor's degree in mathematics in University of Michigan
Met James Hamilton

1958

Taught mathematics and French in a high school for a short time

Later

Moved to Boston, Massachusetts, with the intention of doing a PHD in abstract mathematics at Brandeis University.

The plan failed…..

Meanwhile, she got an offer.....

In 1960, she put graduate school on hold, and accepted a job at the Massachusetts Institute of Technology (MIT), in order to support her husband while he worked on his law degree at Harvard.

At MIT she began programming software to predict the weather on the LGP-30 and the PDP-1 computers (at Marvin Minsky's Project MAC) for professor Edward Norton Lorenz in the meteorology department.

SAGE Project - the first U.S. air defense system

From 1961 to 1963, she worked on the SAGE Project at MIT's Lincoln Lab.

What did she do there???

SAGE Project - the first U.S. air defense system

She was one of the programmers who wrote software for the first AN/FSQ-7 computer (the XD-1), to identify enemy aircraft;

The SAGE (Semi-Automatic Ground Environment) Project was an extension of Project Whirlwind, started by MIT, to create a computer system that could predict weather systems and track their movements through simulators;

SAGE was soon developed for military use in anti-aircraft air defense from potential Soviet attacks during the Cold War.

During this period, she also wrote software for the Air Force Cambridge Research Laboratories.

Difficult Stuff...

Programming software wasn't really a thing people went to school for;

The field was pretty new and developing quickly. So Hamilton, like a lot of early computer scientists, learned on the job;

It was this work that made her a candidate for a job opening that her husband spotted in the local newspaper;

Next Job....What a job!!!

A lab at MIT was looking for programmers to work on the computer that would take humans to the moon.

wooOoooOooWww!!!!

“I’ve got to go there!!”

NASA

Hamilton joined the Charles Stark Draper Laboratory at MIT, which provided aeronautical technology for NASA (the National Aeronautics and Space Administration).

She became the head of the Apollo flight software development team.

Hamilton's team was responsible for developing the software to the guidance and control systems of the in-flight command and lunar modules of the Apollo missions.

NASA

One day, Hamilton thought: “What if there is an emergency and they didn't know what to do?”

The goal was to prevent errors and keep everything running when they come up.

She had a meeting with software and hardware people and they said that it could not be done.

So the next day, she came back with the solution and they accepted it.

Hamilton concentrated on software to detect system errors and to recover information in a computer crash, such as restarts and the Display Interface Routines (AKA the Priority Displays), which Hamilton designed and developed.

NASA - Apollo 11 - The Landing

Three minutes before landing several computer alarms were triggered.

The computer was being asked to do more calculations than it could handle.

The program for the radar hadn't been set properly, and it was using about 13% of the total computer processing power.

In order to land on the moon, the computer needed 90% of its processing power - so it was overloaded.

The extra demand came from the rendezvous radar, which the landing module was using to keep track of the command module that stayed in orbit around the moon.

Emergency!!!!!

Go, Don’t Go, Land, Not Land……

NASA - Apollo 11

Luckily, Hamilton and her team designed Apollo's computer to take priorities into account, focusing only on the high-priority tasks.

On July 20th, 1969, 600 million people around the world watched Apollo 11 land on the moon thanks to Hamilton's software.

Businesses

In 1970 Hamilton left MIT to work in the private sector.

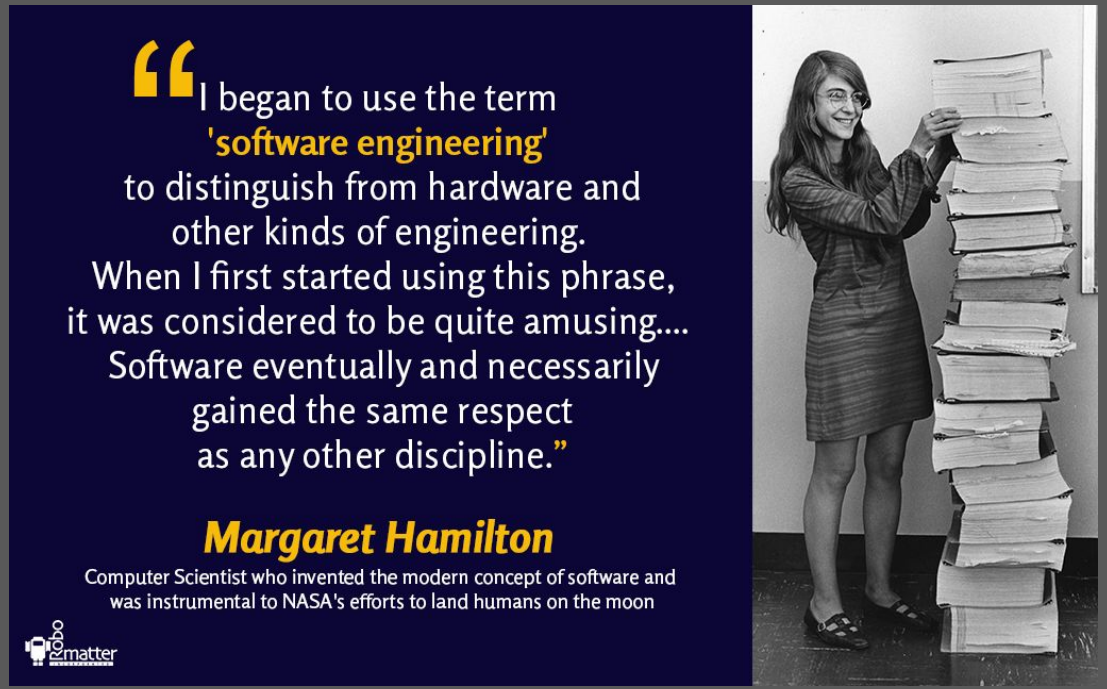
In 1976 she co-founded the company Higher Order Software to further develop ideas about error prevention and fault tolerance emerging from her experience at MIT.

She is now the CEO of Hamilton Technologies, Inc., a company she founded in 1986, which provides a way for software engineers to integrate different programs so they act like one big system.
This helps prevent errors that can come from interfacing (when programs exchange information).

Legacy

Margaret Hamilton is still working on ways to get rid of software bugs.

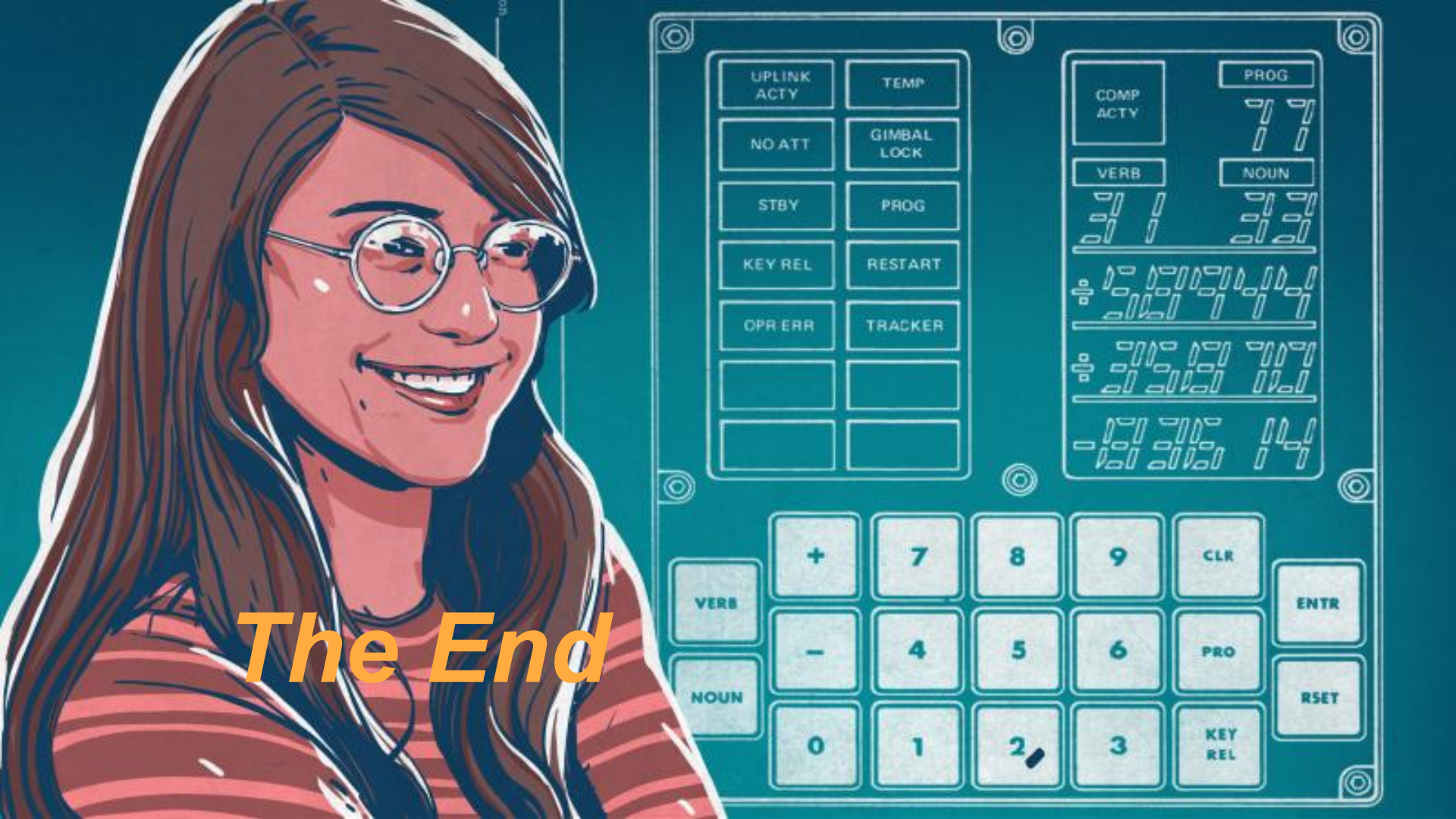
She is credited to have made up the software engineering concept.



Awards & Publications

- In 1986 - Augusta Ada Lovelace Award by the Association for Women in Computing;
- In 2003 - NASA Exceptional Space Act Award for scientific and technical contributions.
- In 2009 - Outstanding Alumni Award by Earlham College.
- In 2016 - Presidential Medal of Freedom from Barack Obama, the highest civilian honor in the United States.
- In 2017 - "Computer History Museum Fellow Award", ideas that changed the world.
- In 2017, - "Women of NASA".

130 papers, proceedings, reports about 60 projects and 6 major programs she has been involved with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