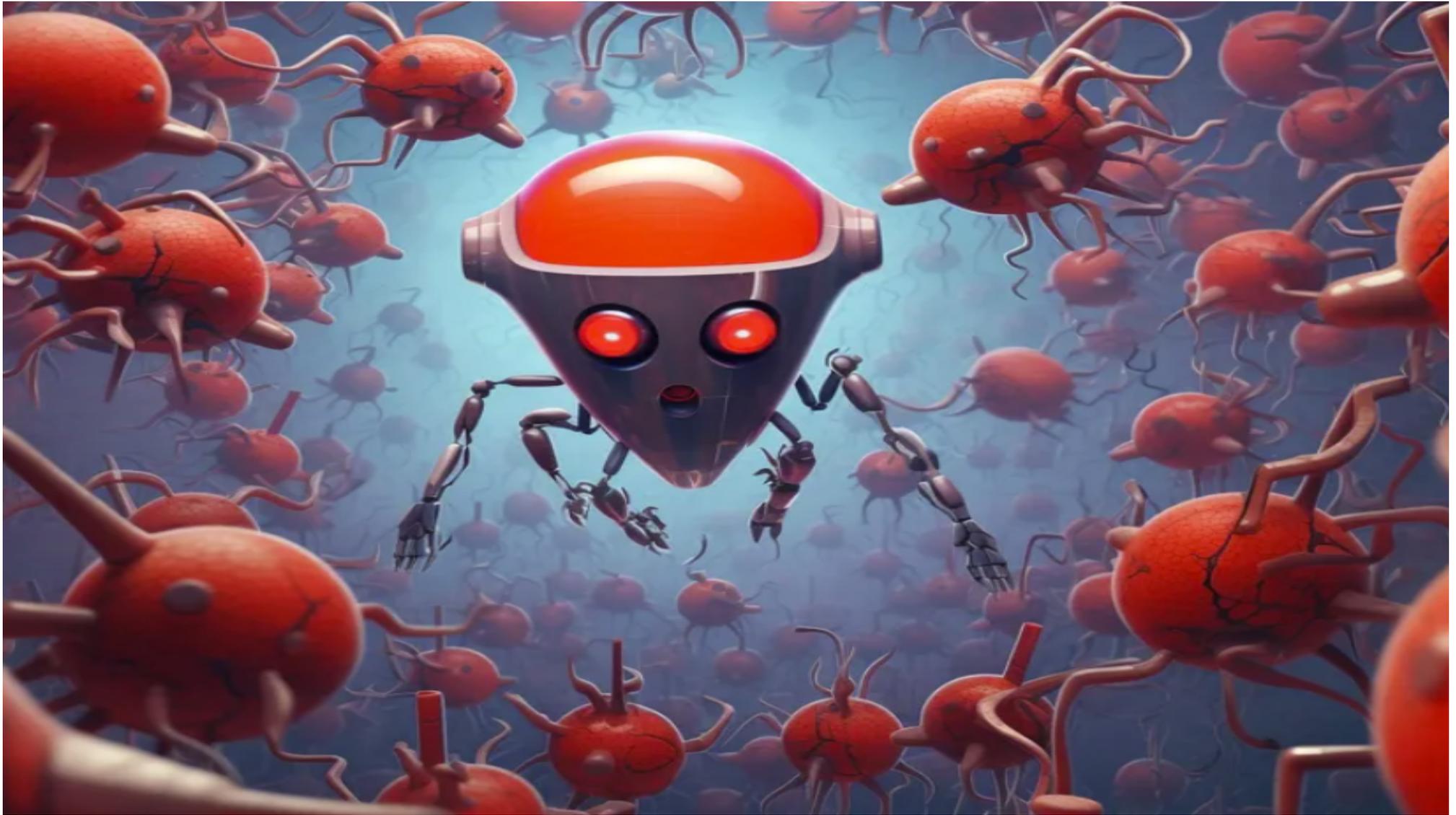




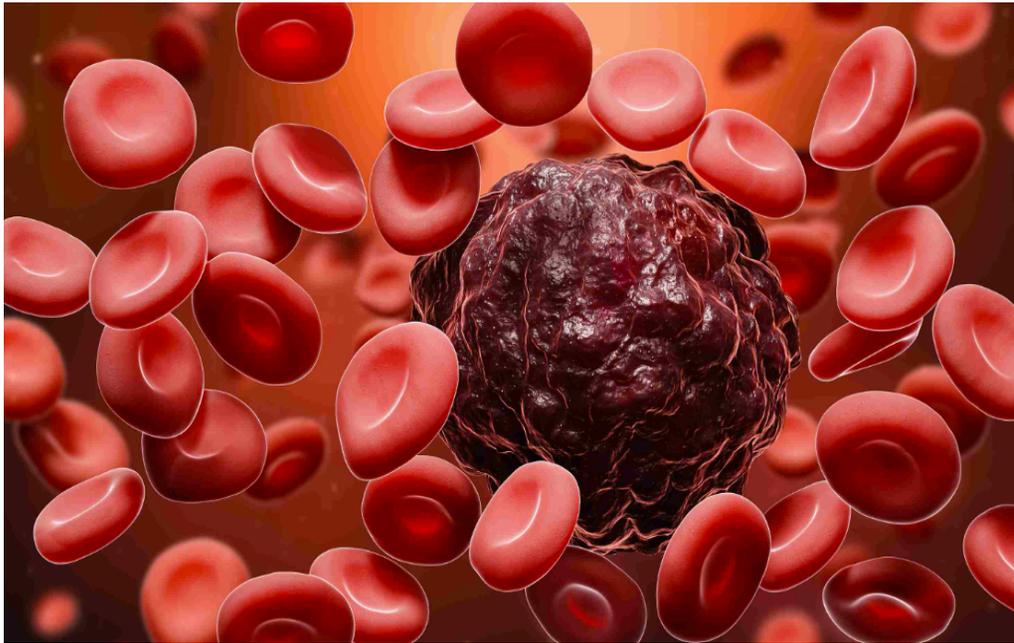
Sayyed Shaho Alaviani
*Center for Advanced Power Systems
(CAPS) & the National High Magnetic
Field Laboratory (MagLab)*
Medical Microrobots to Treat Cancer

The Office of Postdoctoral Affairs
The Graduate School | Florida State University



American Cancer Society: Cancer is the second most cause of death after heart disease in the USA.

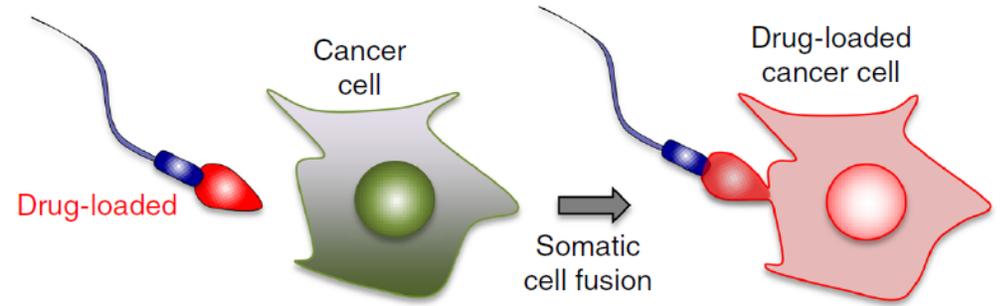
In 2022: 1.9 million new cases were diagnosed,
609,360 death from cancer were reported (=1,670 death a day)



Microrobots offer new opportunities for cancer treatment

What is a microrobot? A microrobot is a very small robot (with dimension *less than 1 millimeter*) built to do specific tasks.

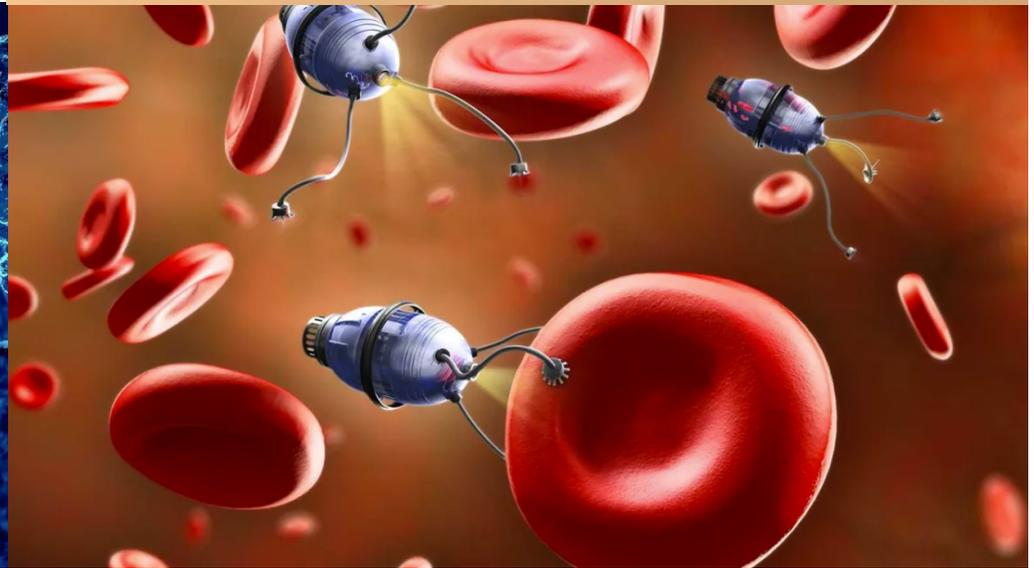
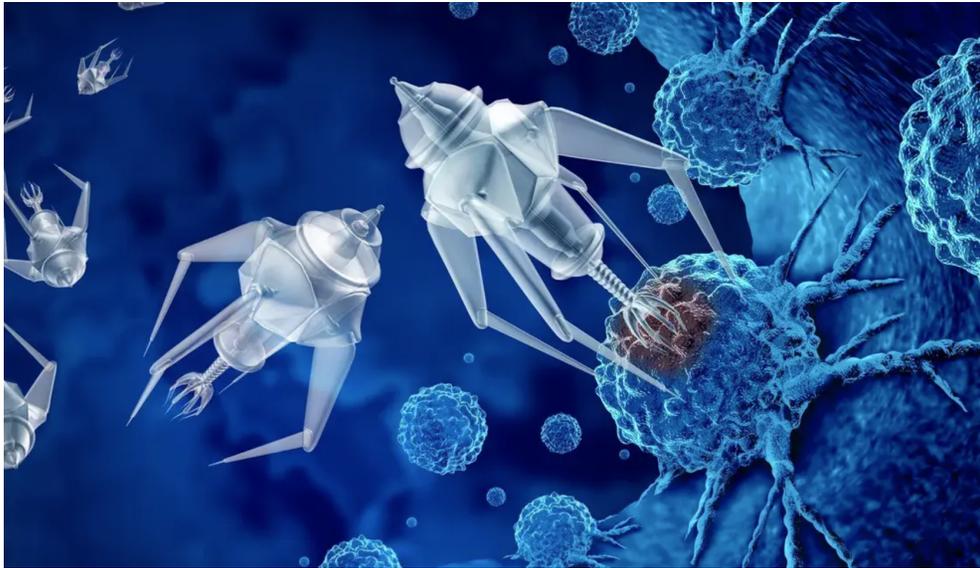
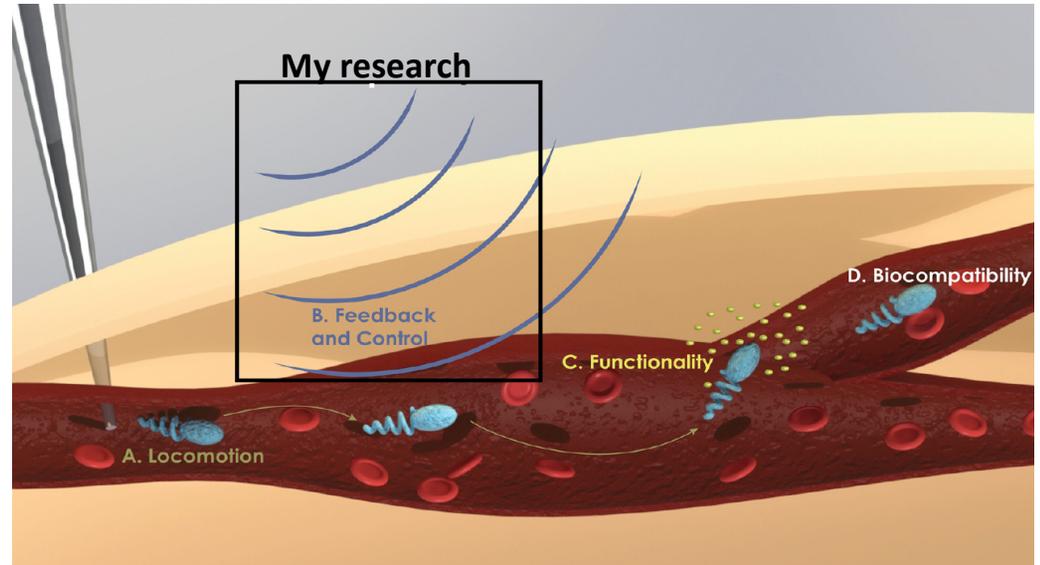
Why microrobots?



We need many (or **swarm**) of microrobots

My research: magnetic control of swarm of microrobots in a living organism for cancer treatment

Why magnetic field  ?



*Do you know that **heat** can kill cancer cells?*

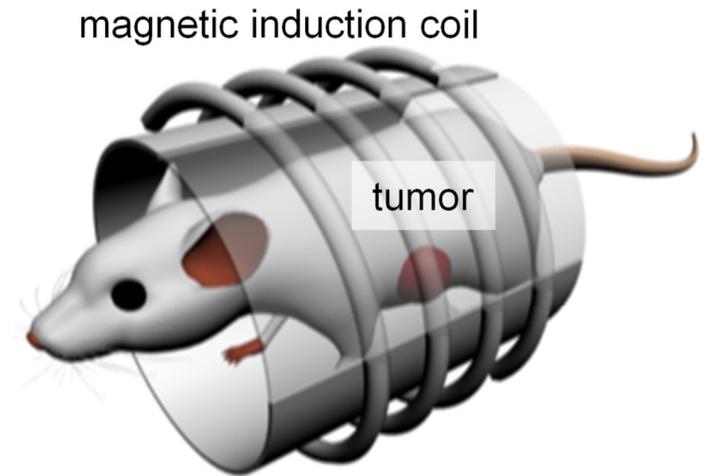
Magnetic microrobots can generate heat in the cancer cells when activated using an alternating magnetic field.

When heated to temperatures ranging from **42 to 46 degree** Celsius, they can kill cancer cells.

This form of cancer treatment is a promising and developing method for cancer treatment, known as **magnetic hyperthermia**.

*Has it been done on **human** body?*

There have been successful preliminary clinical trials using magnetic hyperthermia to treat patients with **glioblastoma** and **prostate** cancer.



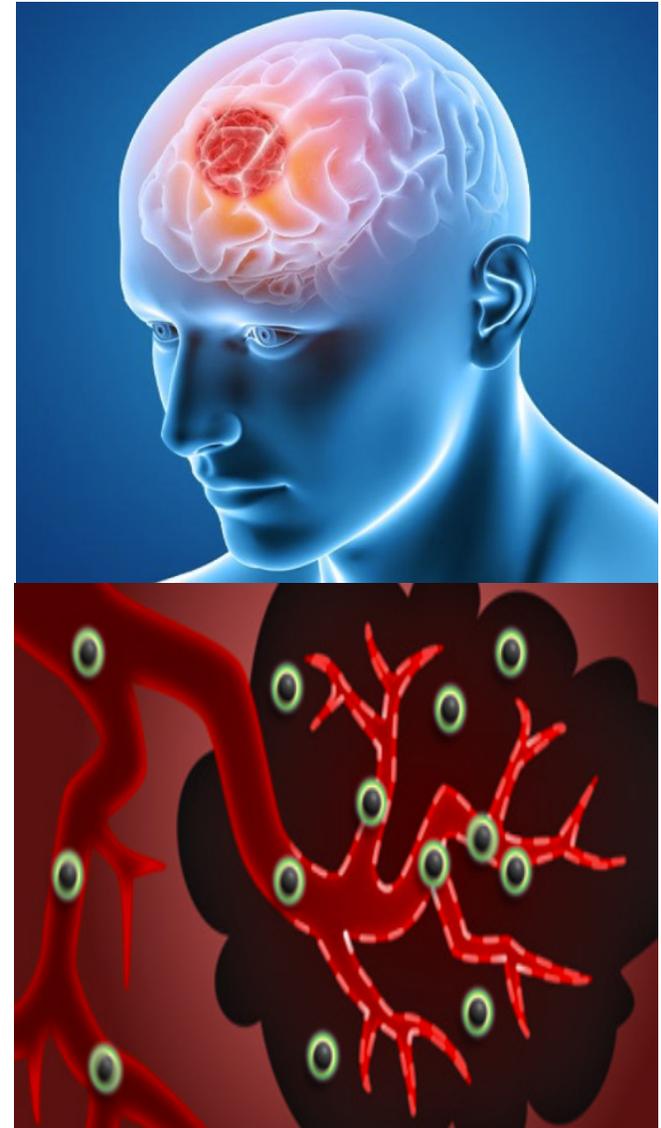


THE ROAD TO
SUCCESS
IS ALWAYS
UNDER
CONSTRUCTION

What are roadblocks on human body?

- ❖ **Effectively targeting magnetic microrobots to tumors that are *deep inside the body* and/or *inaccessible tumors***
(There is a successful method to overcome this challenge on mice but *not* on human body)

- ❖ **Low level of accumulation of microrobots in a tumor that are *deep inside the body* and/or *inaccessible tumors***
(no method exists both on mice and human body)

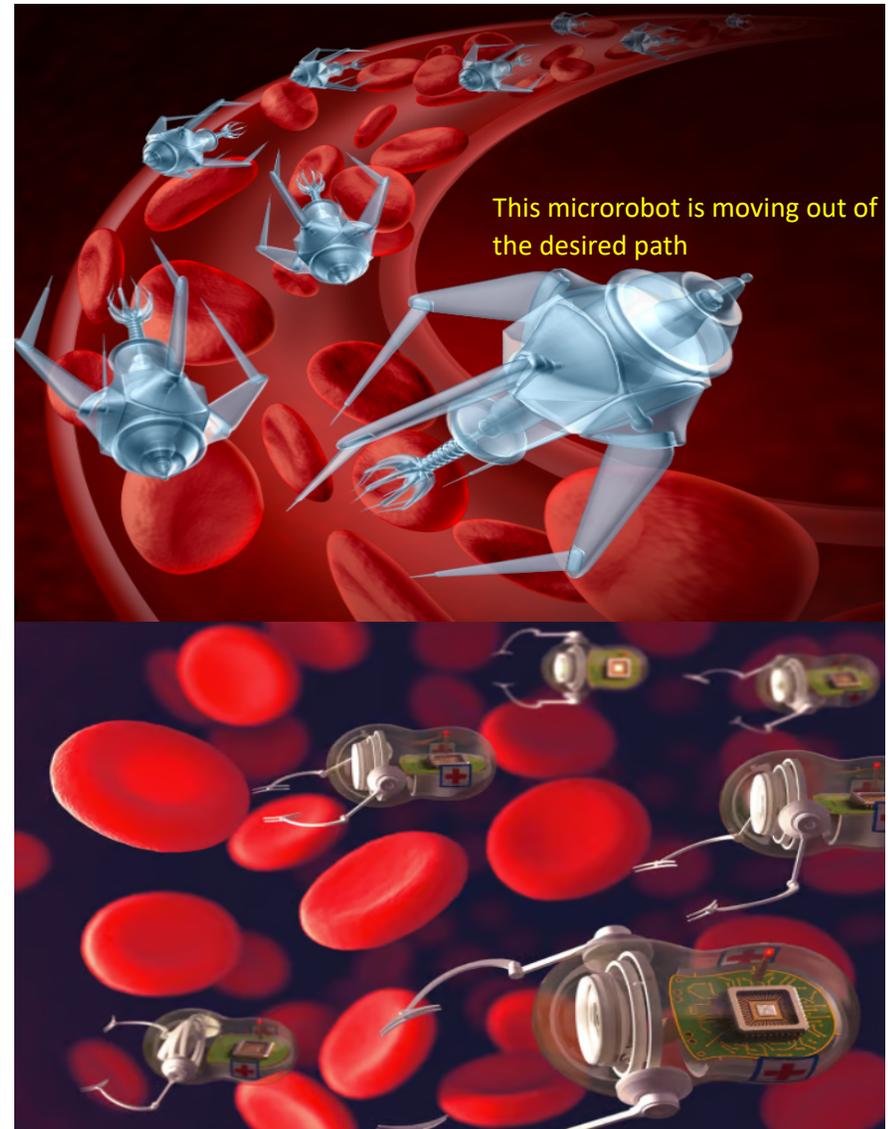


What are challenges in *my* research?

The roadblocks yield two challenges in human blood vessels
(= variable viscosity/thickness) for swarm of microrobots:

Path following (or following a desired path)

Resilient control



THANK YOU
FOR
YOUR ATTENTION

