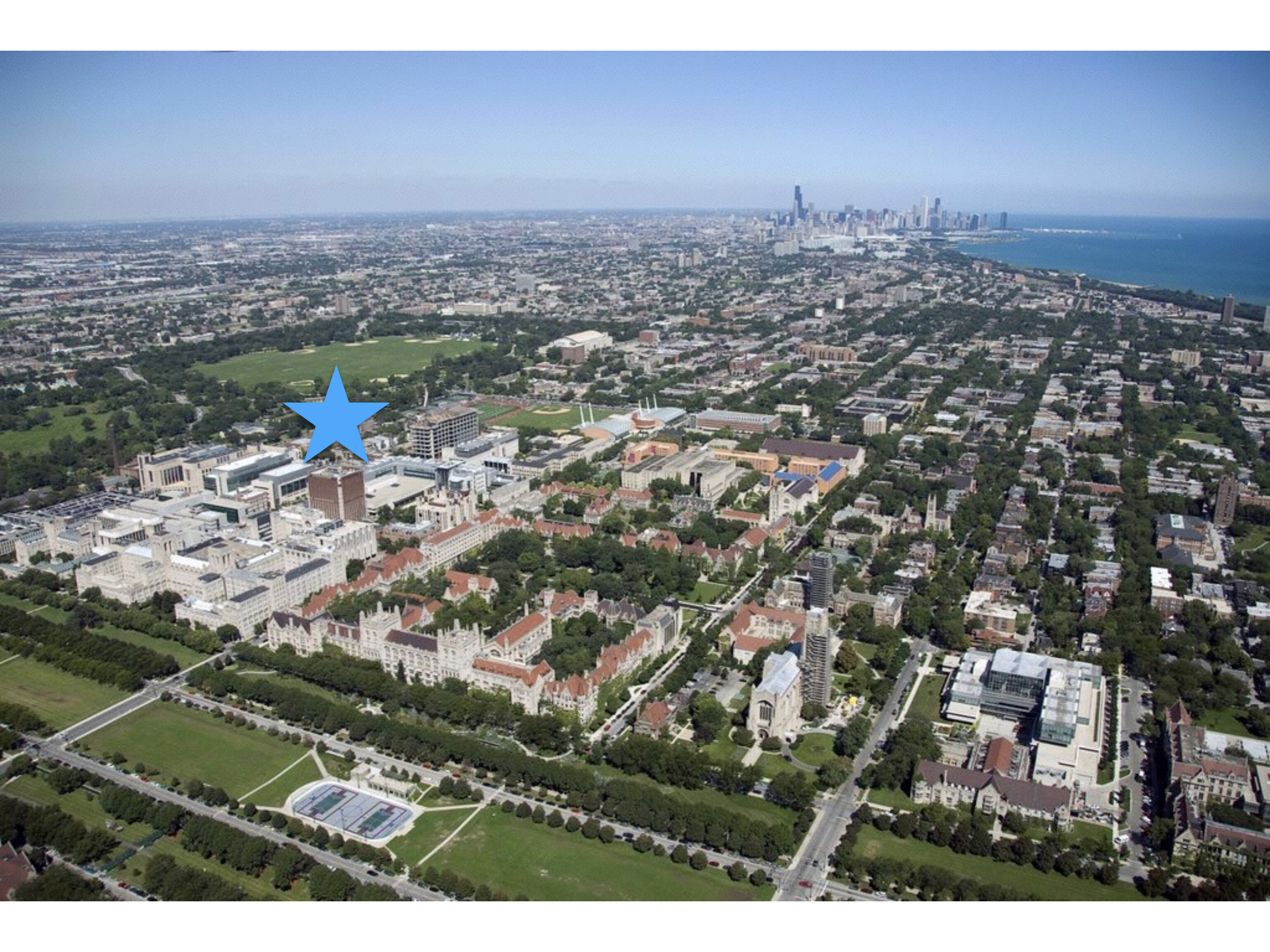
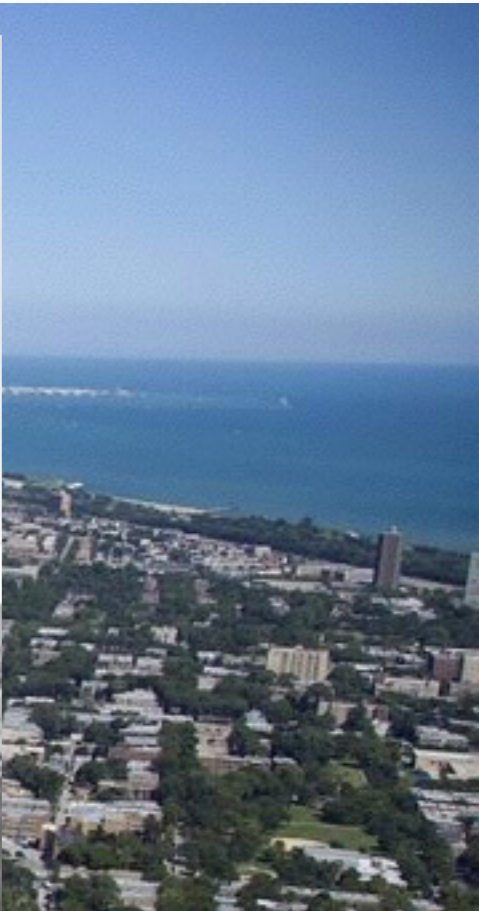


Cancer Immunology

Frank Wen

University of Chicago









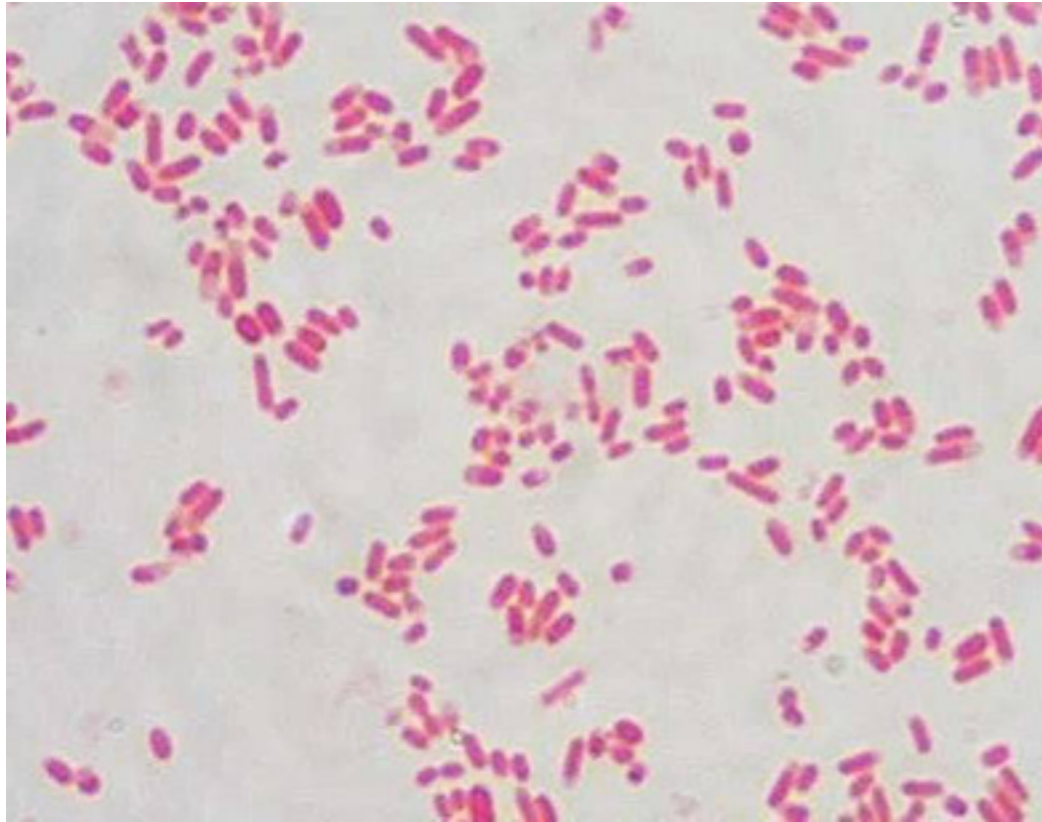
Cancer Immunology

What is life?

What is cancer?

What is the immune system?

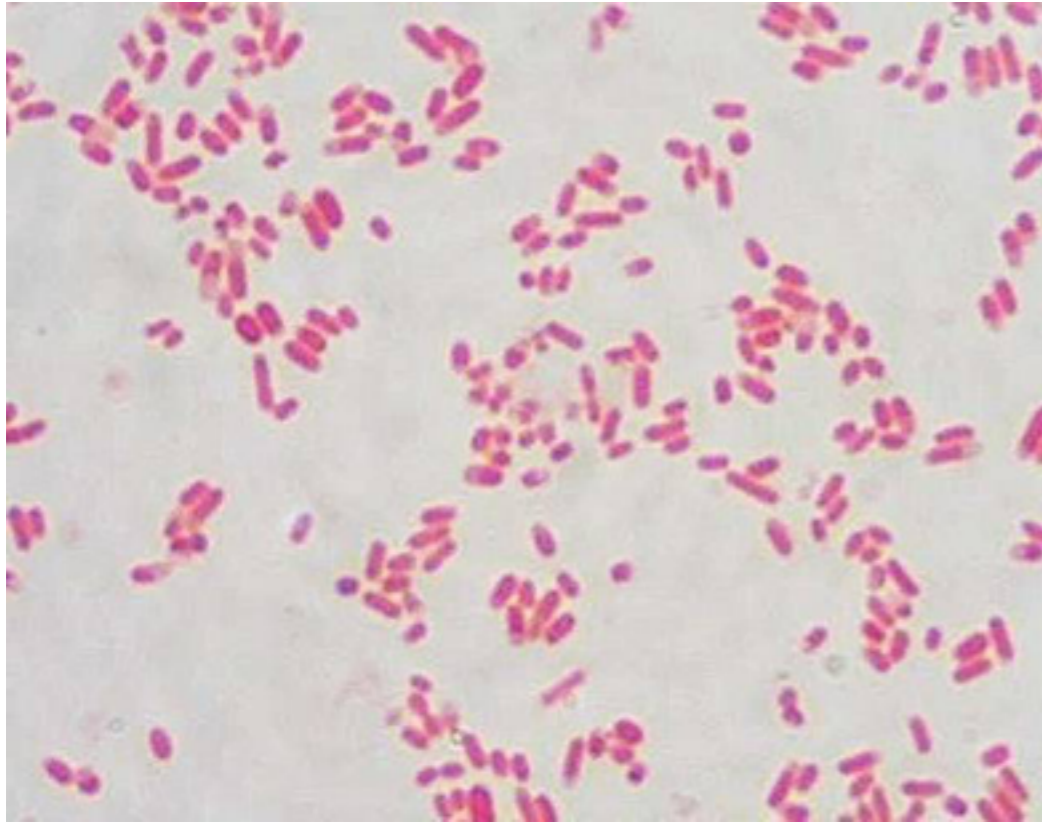
Life is made of cells



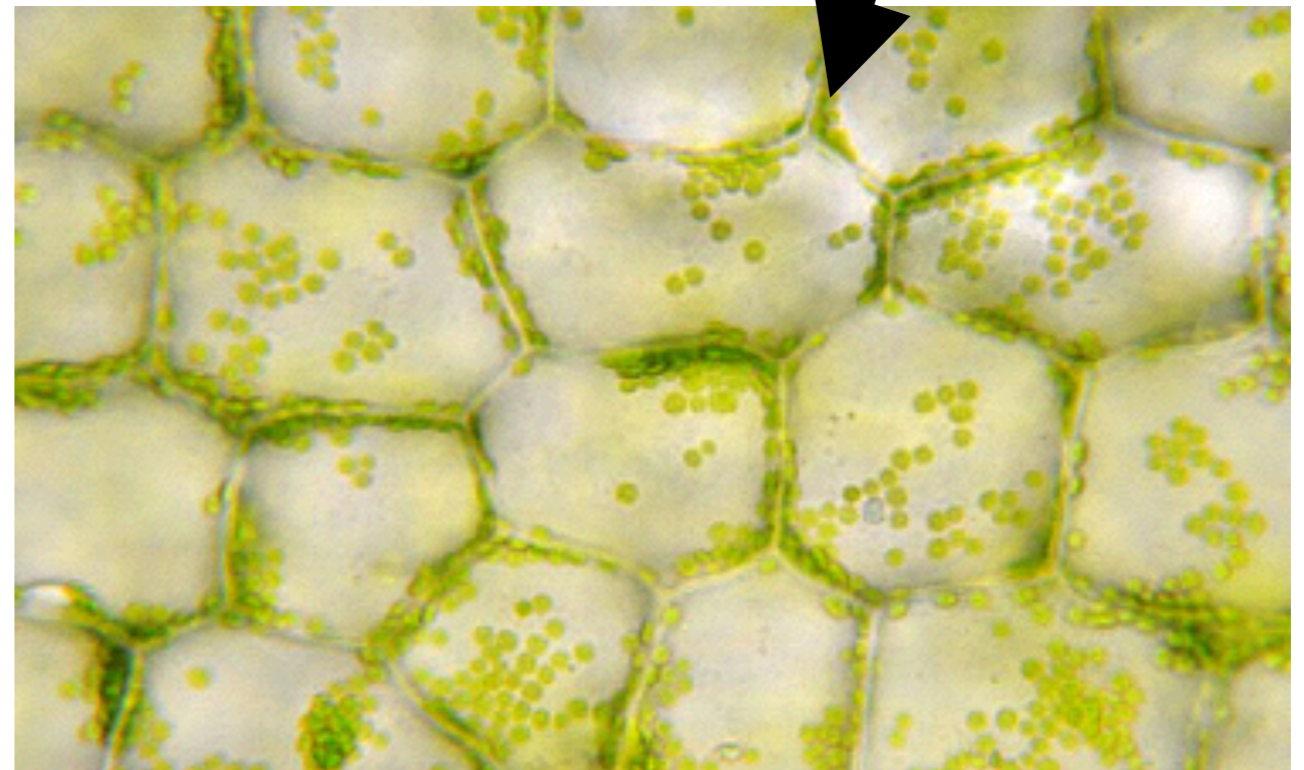
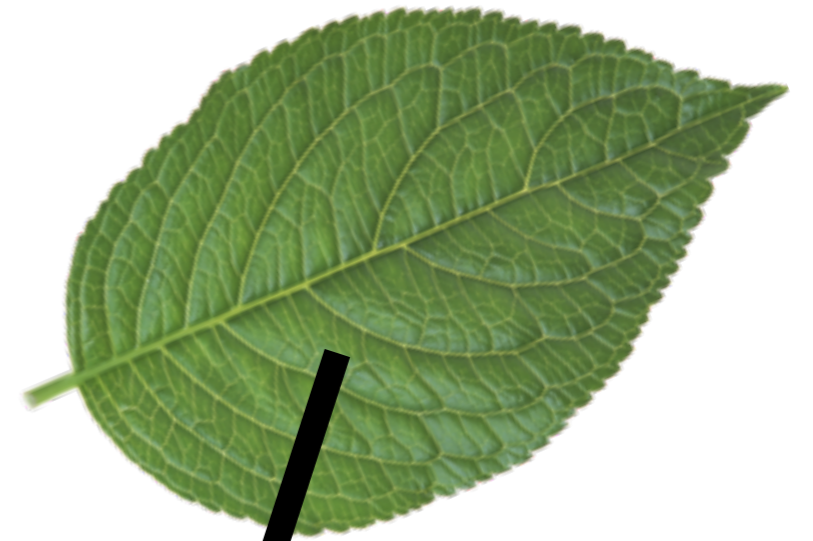
E. coli bacteria

- Grow
- Adapt
- Reproduce

Cells organize to make organisms

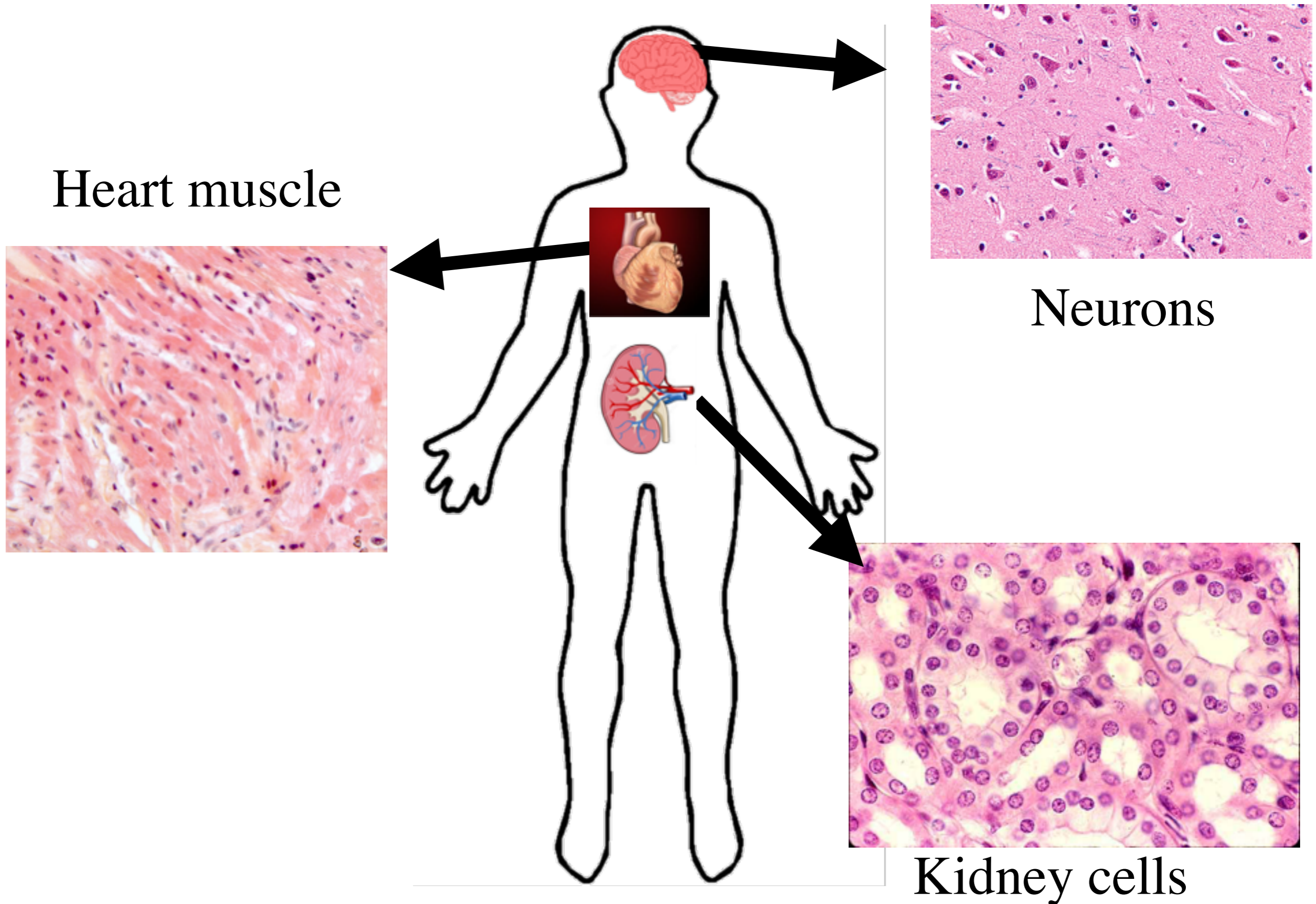


E. coli bacteria



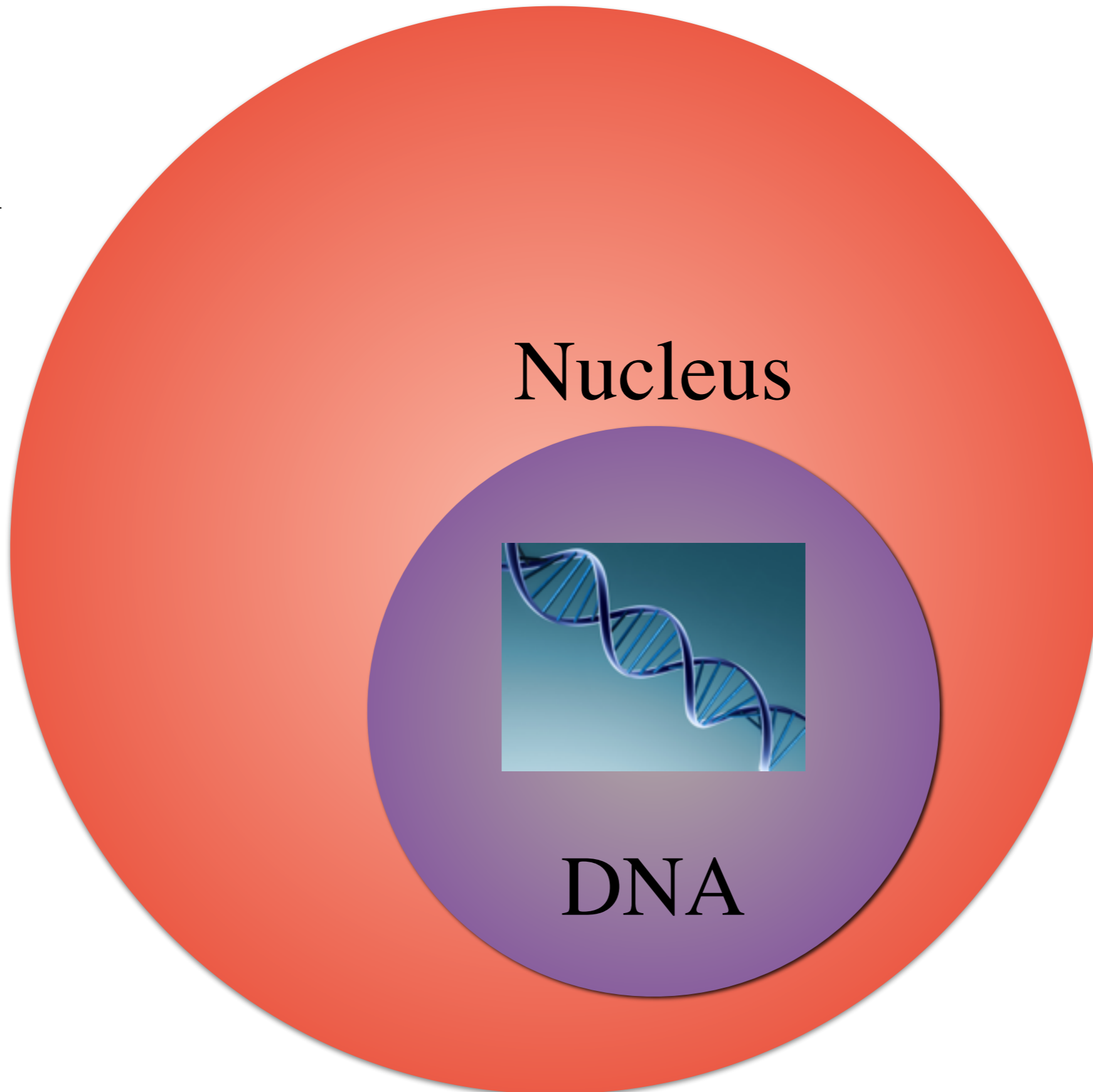
Plant cells

Cells organize to make organisms

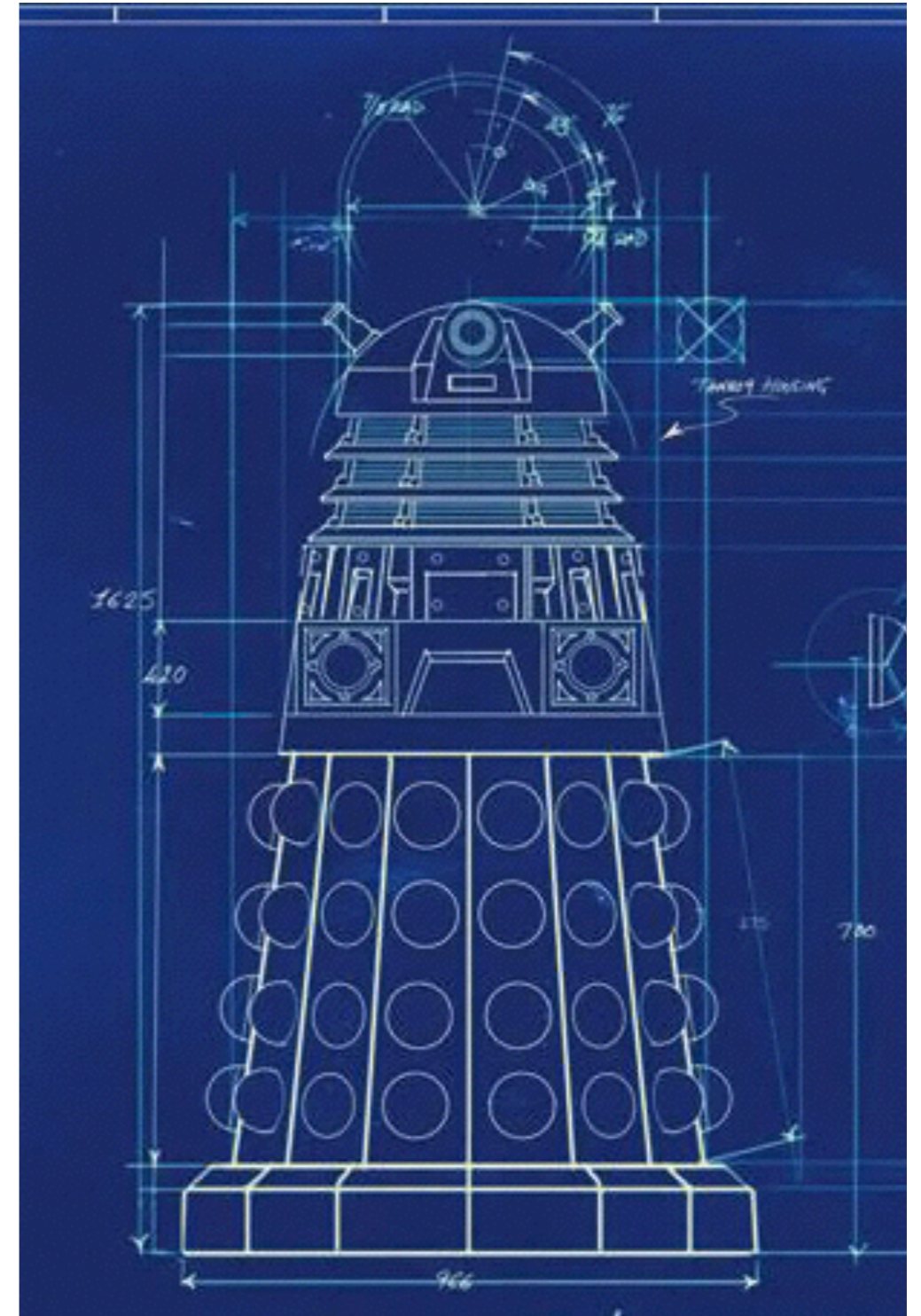


DNA is the blueprint

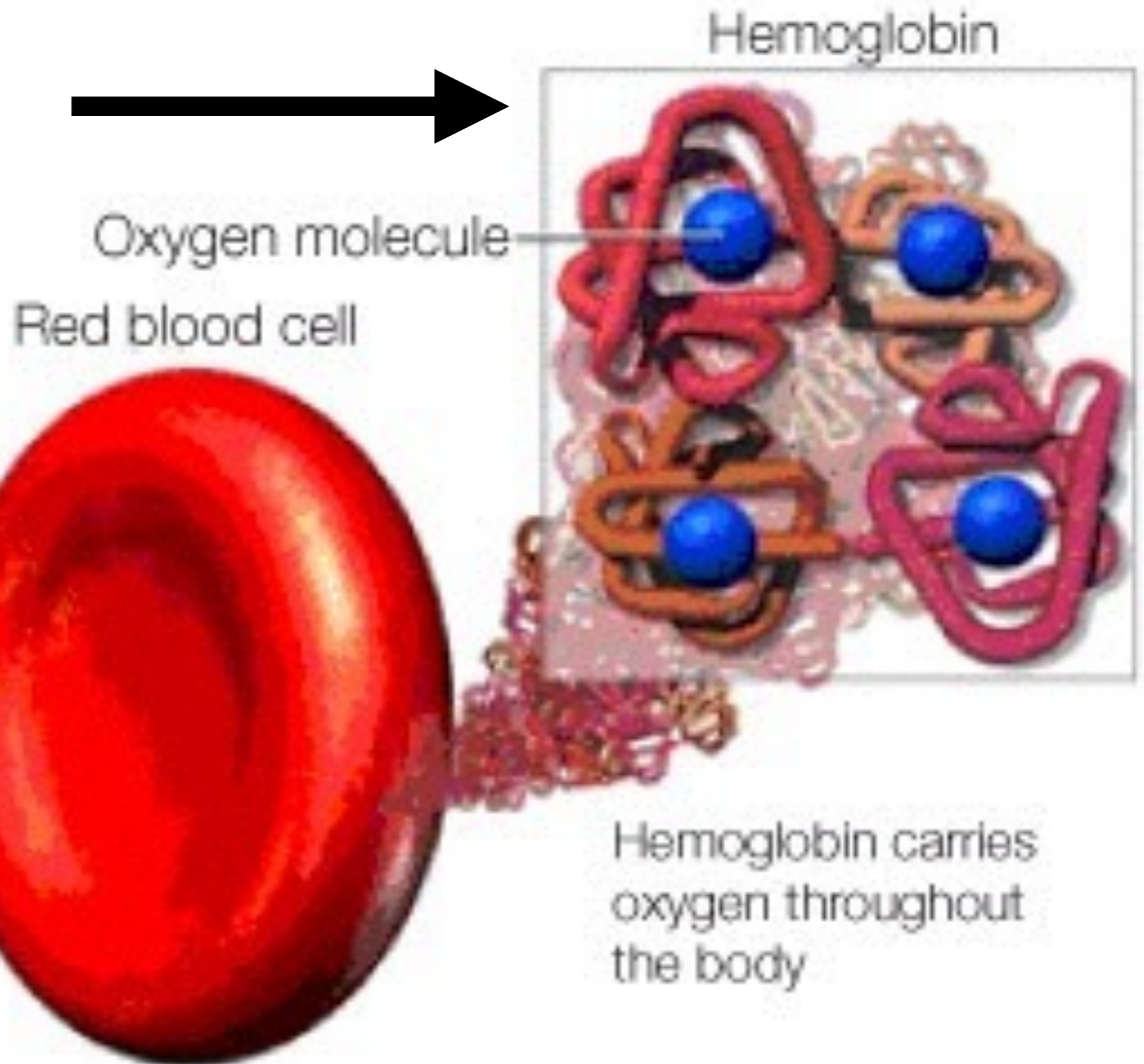
Cell



DNA is the blueprint

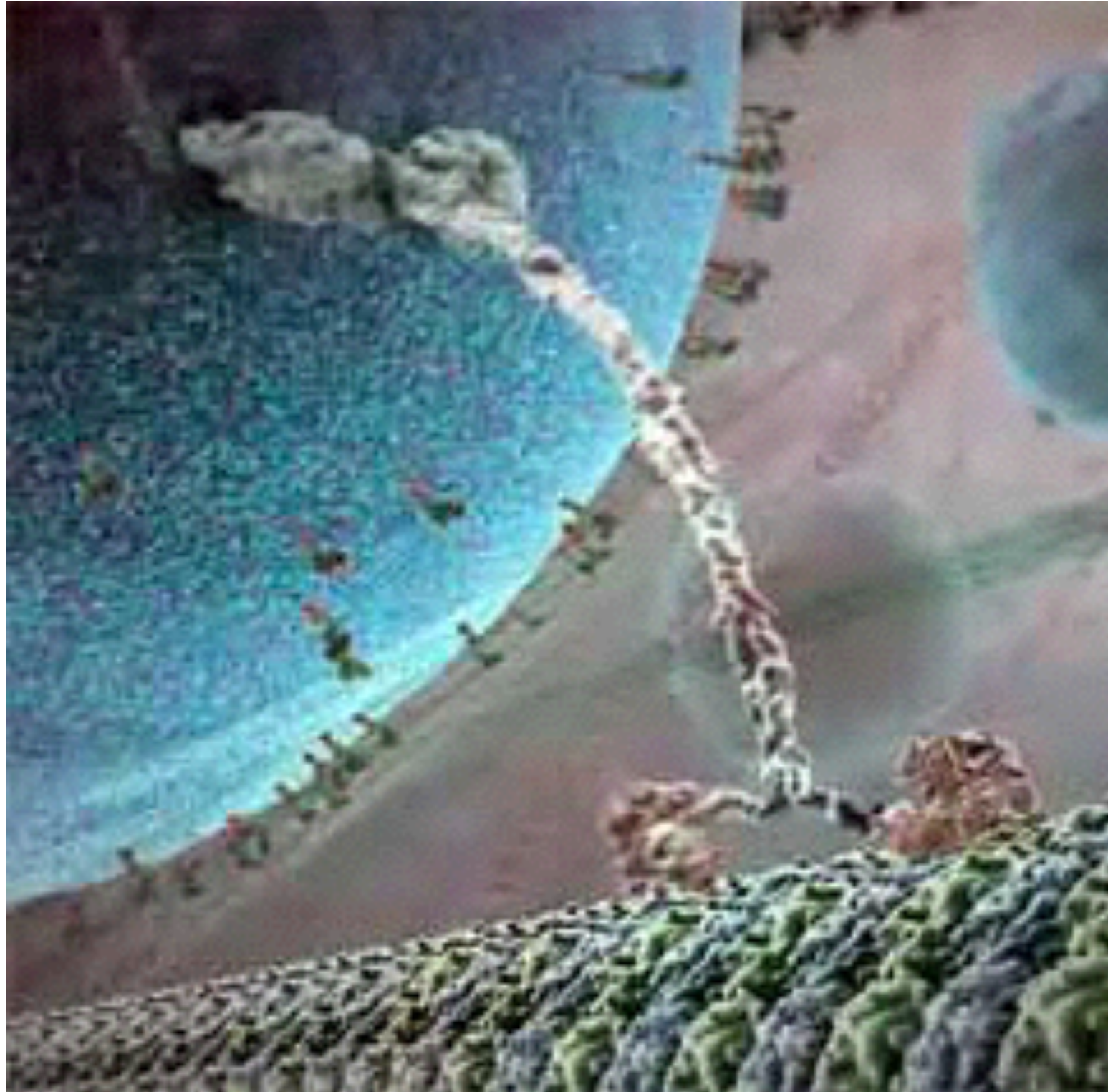


DNA is the blueprint for proteins



Hemoglobin carries oxygen throughout the body

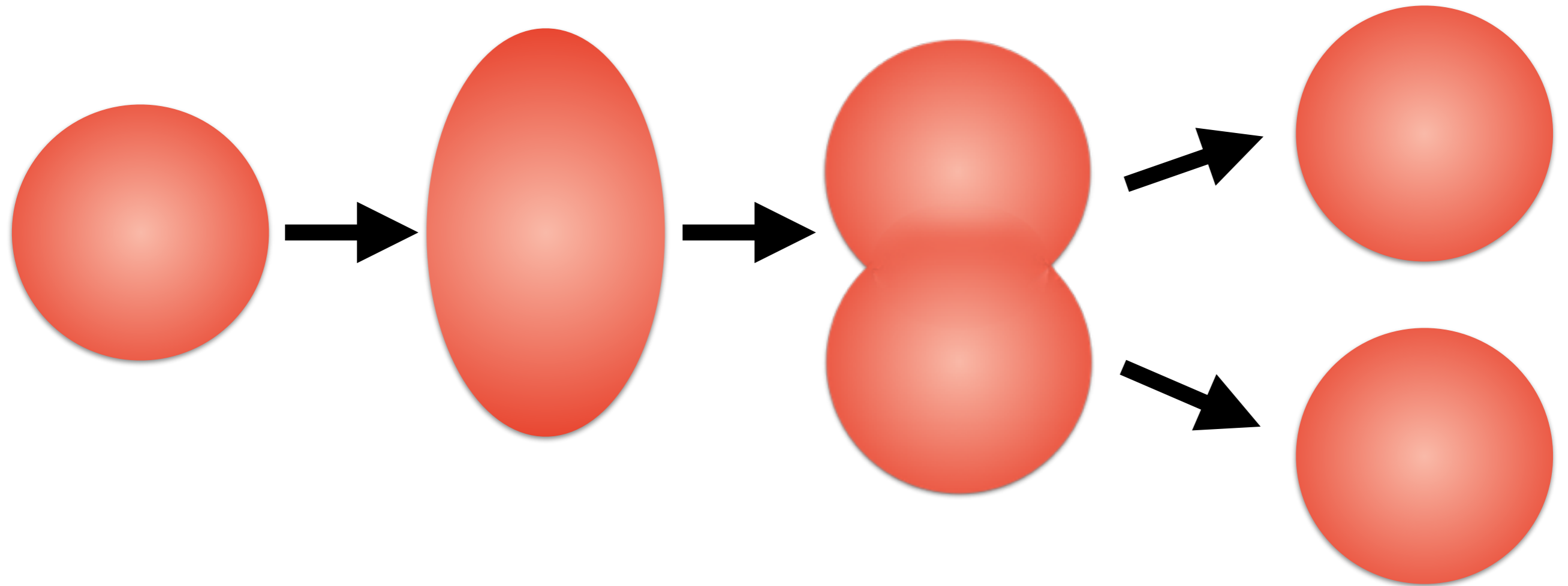
Proteins do things



Cells make copies of themselves

Grow

Divide

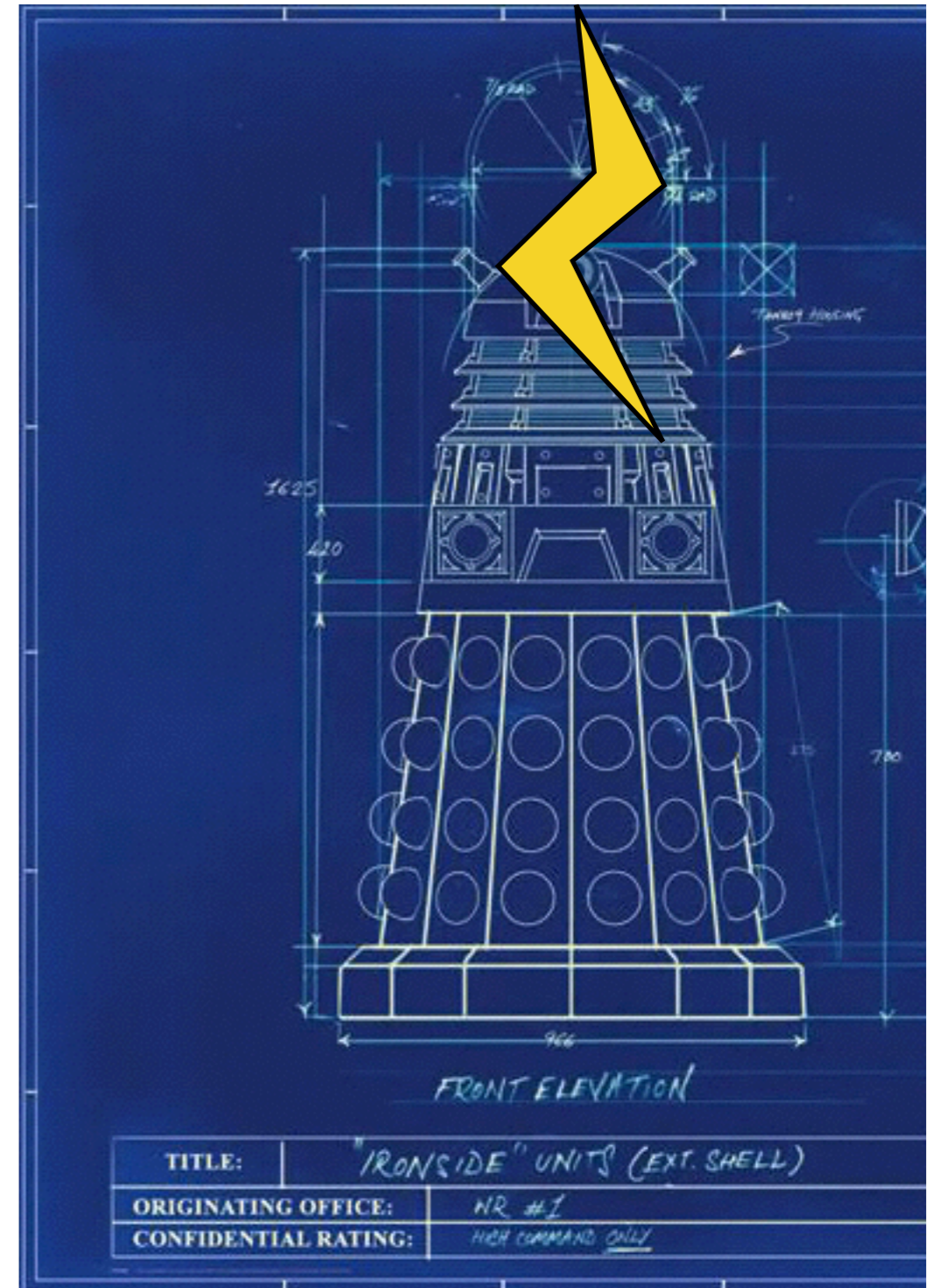


Life is made up of cells

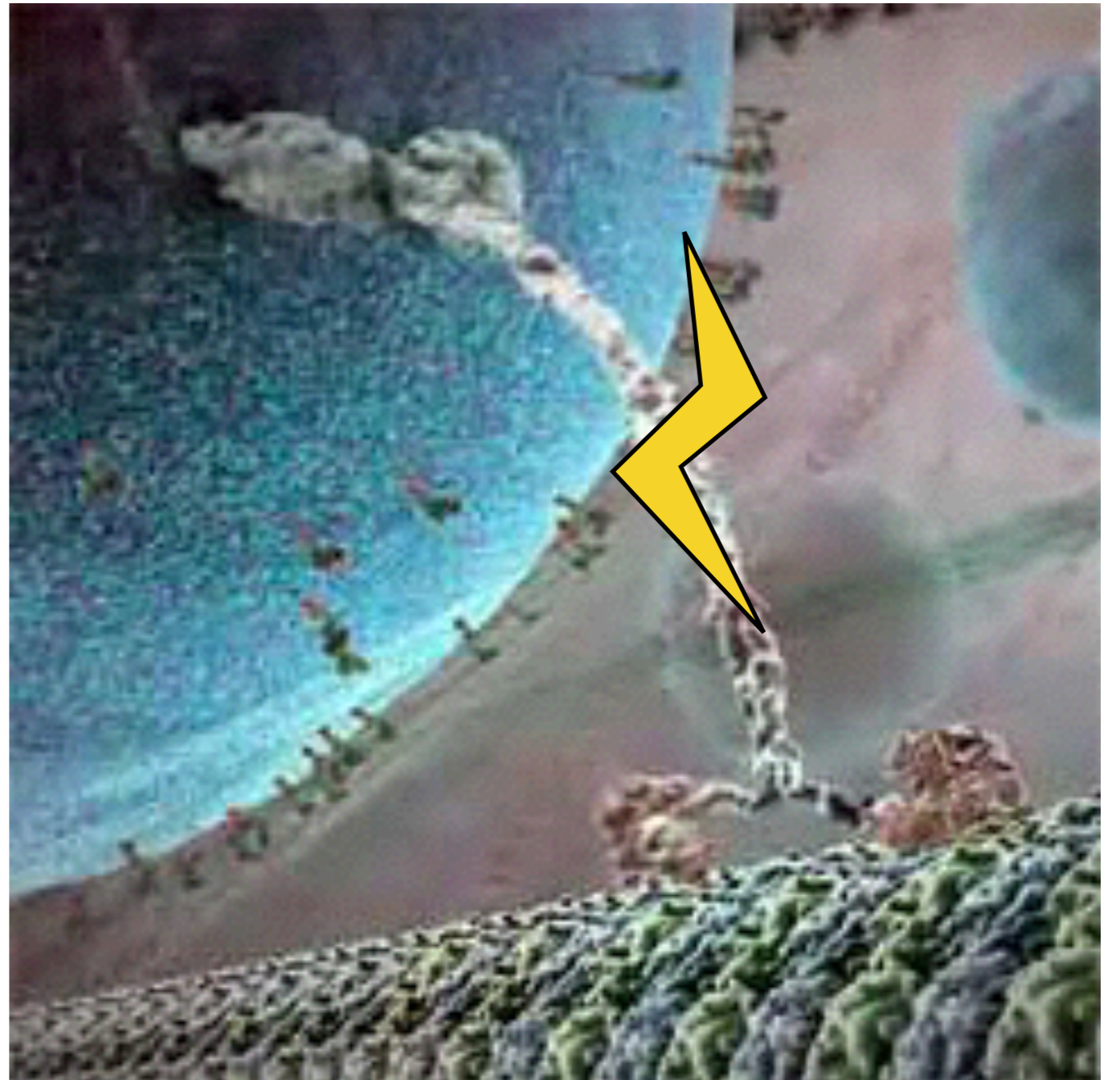
Cells replicate to make more cells

Cancer

Mutations cause problems



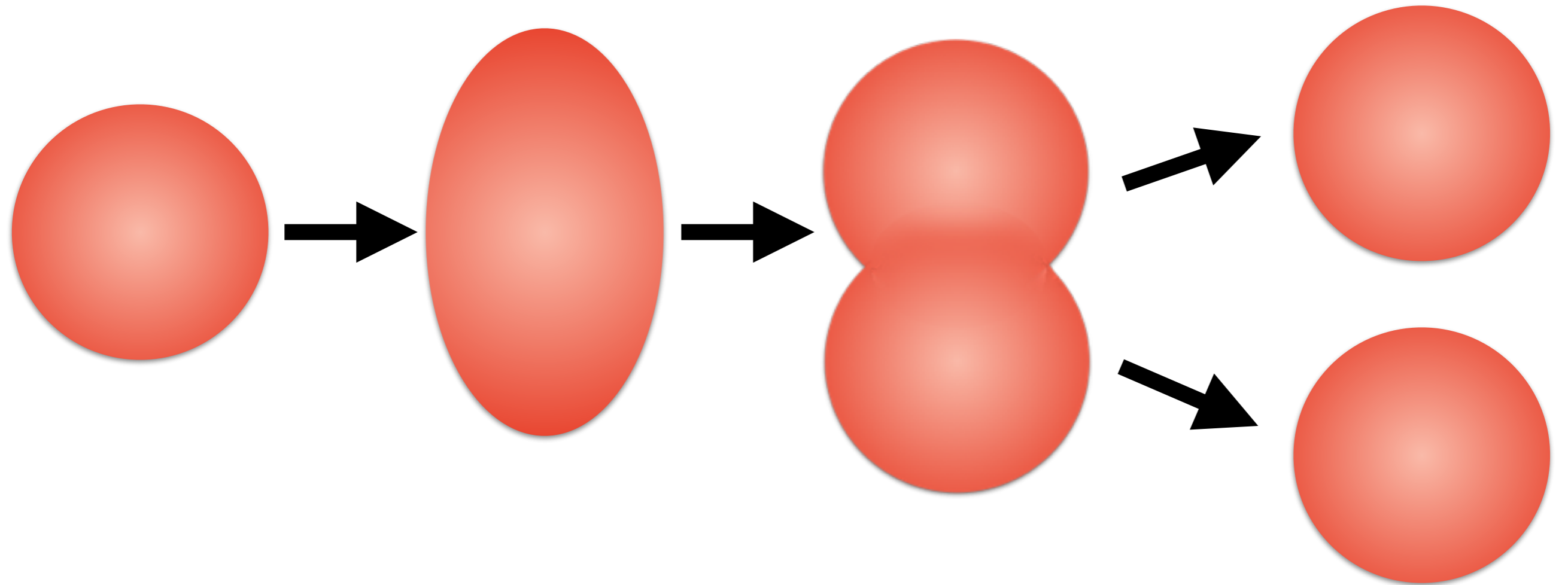
Mutations cause problems



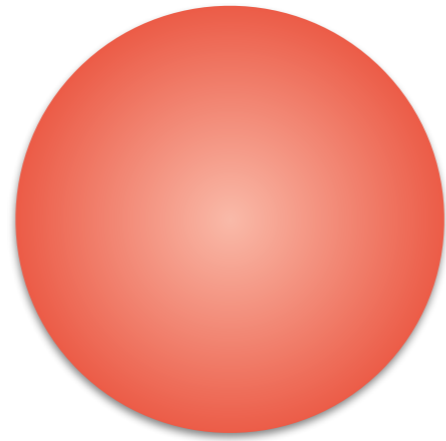
Mutations cause problems

Grow

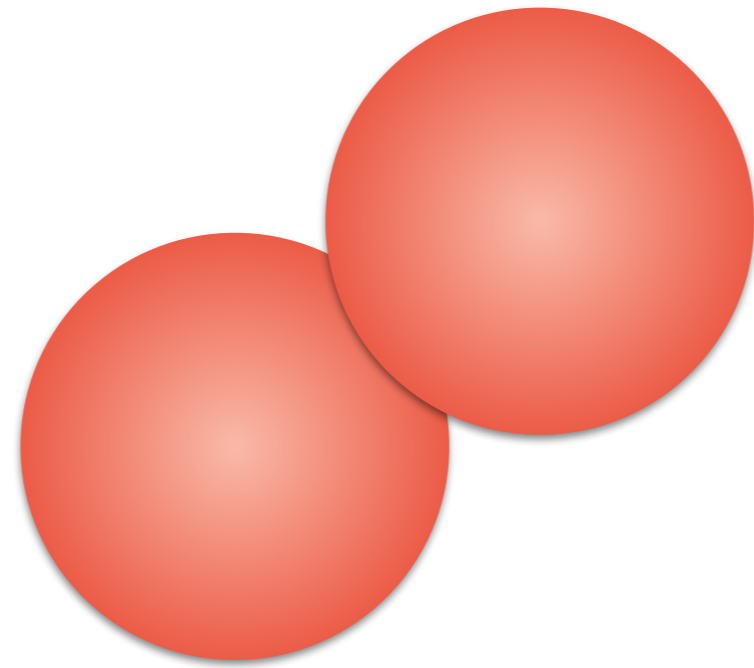
Divide



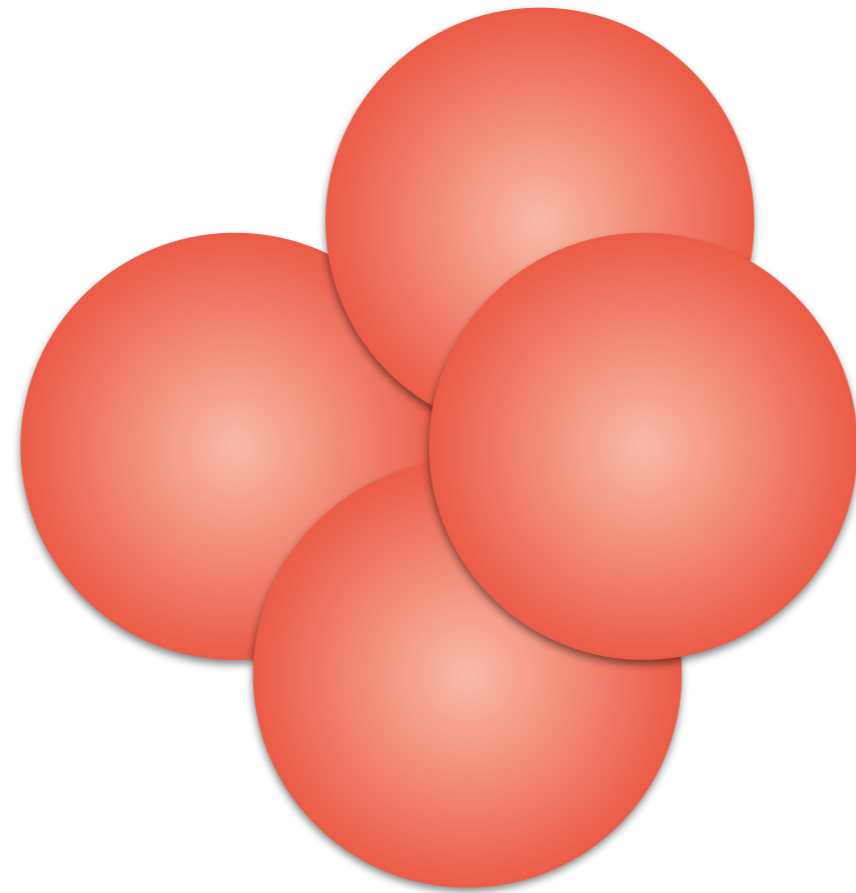
Uncontrolled cell division



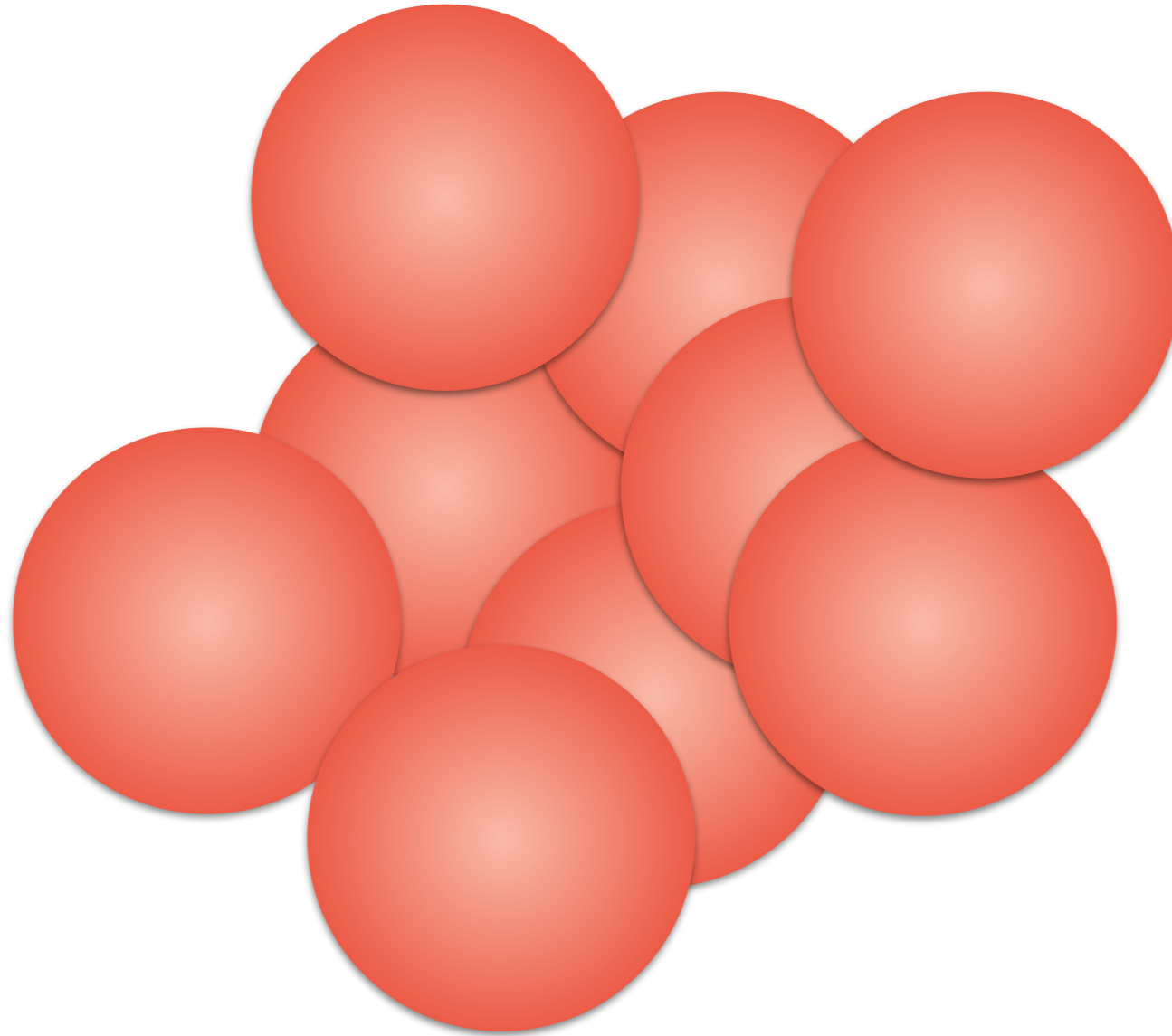
Uncontrolled cell division



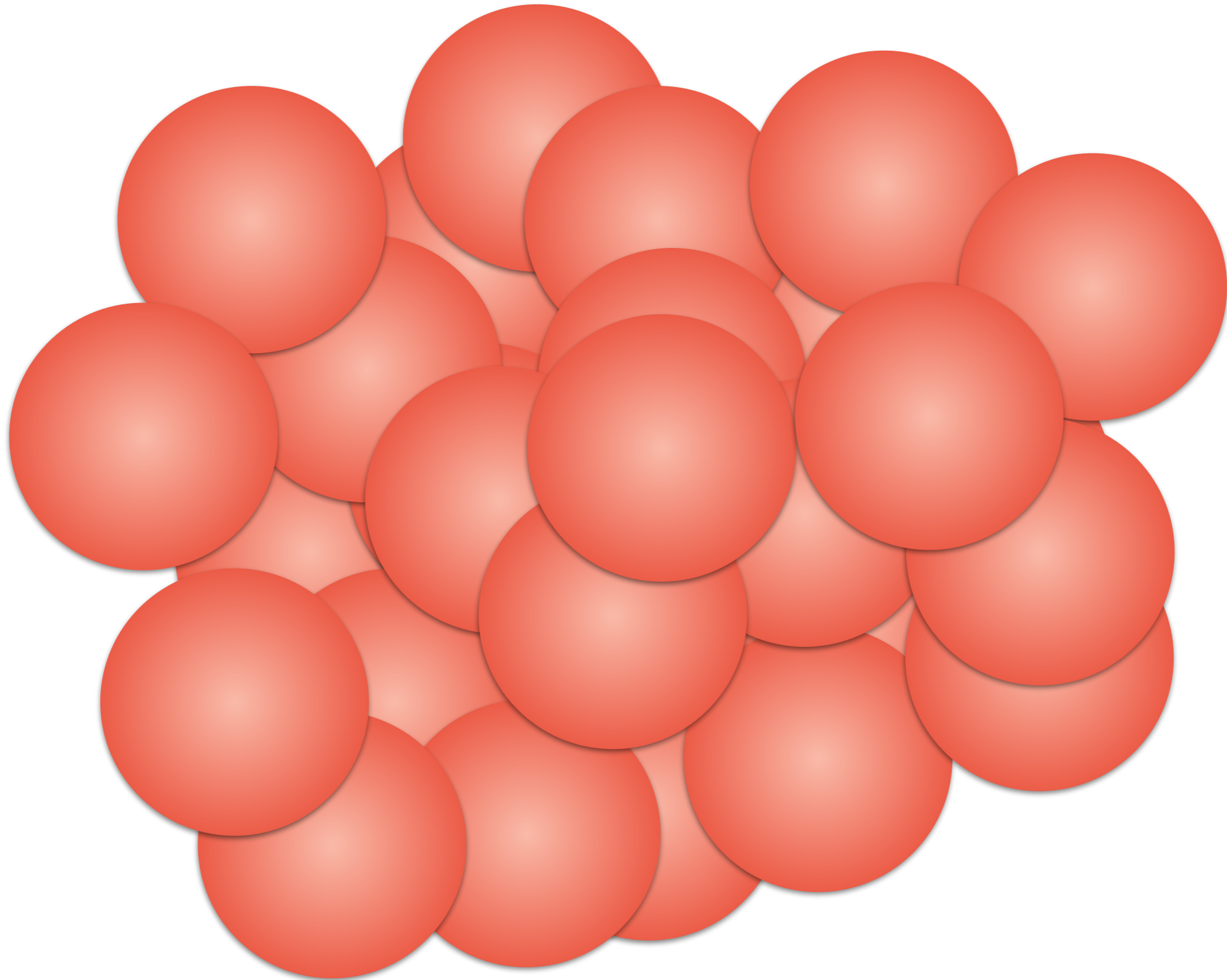
Uncontrolled cell division



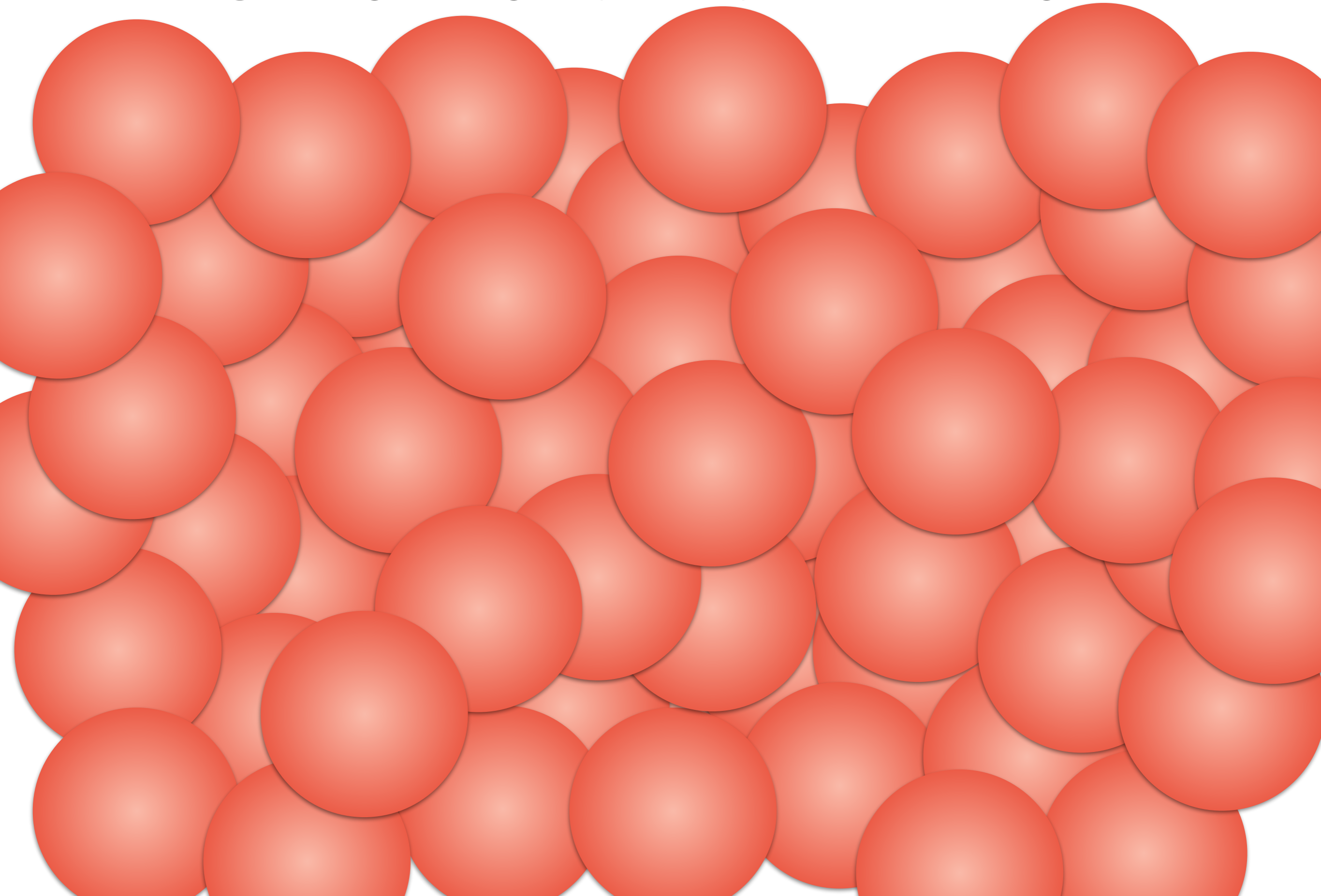
Uncontrolled cell division



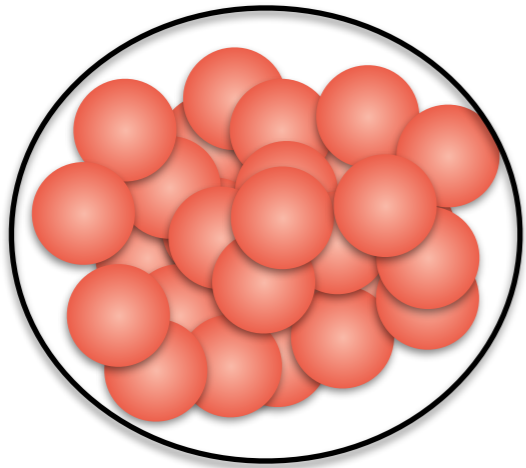
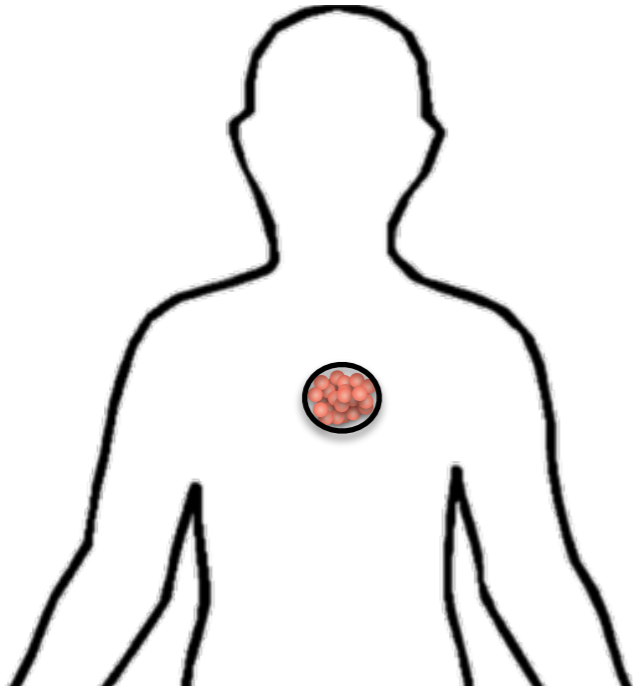
Uncontrolled cell division



Uncontrolled cell division



Benign

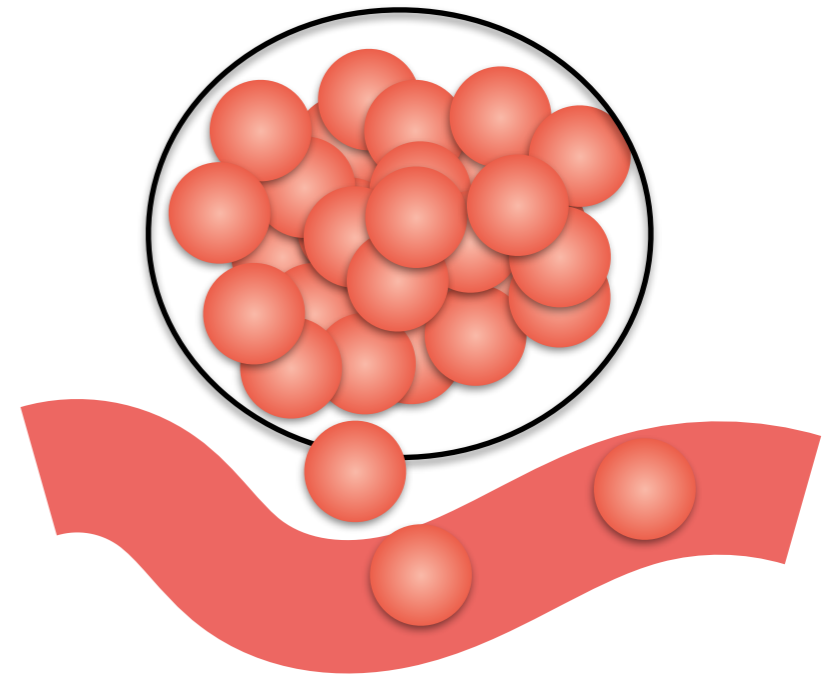
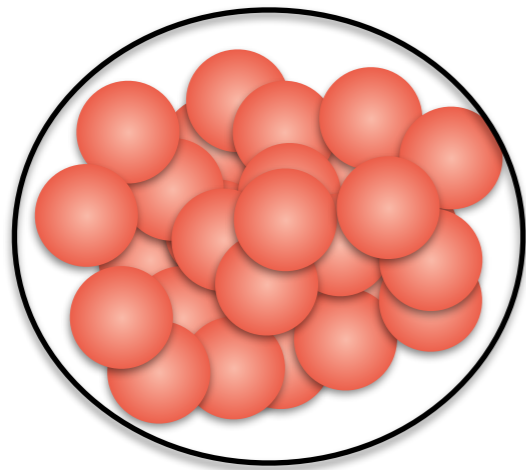
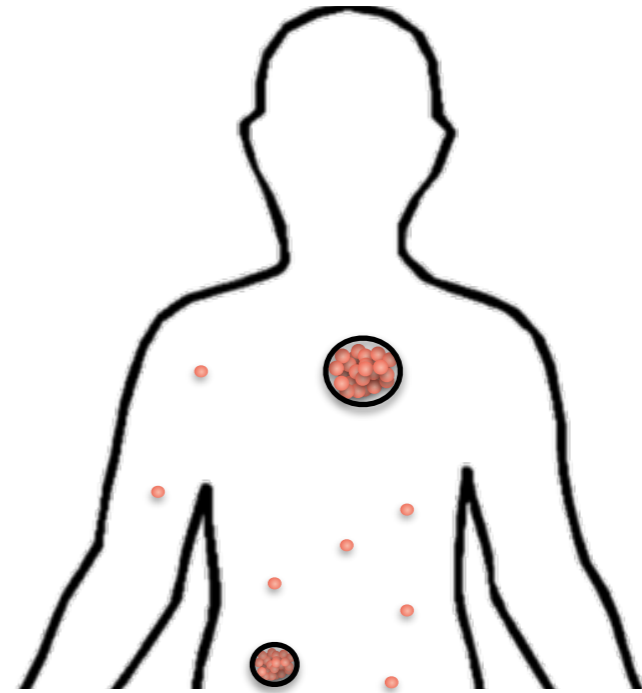
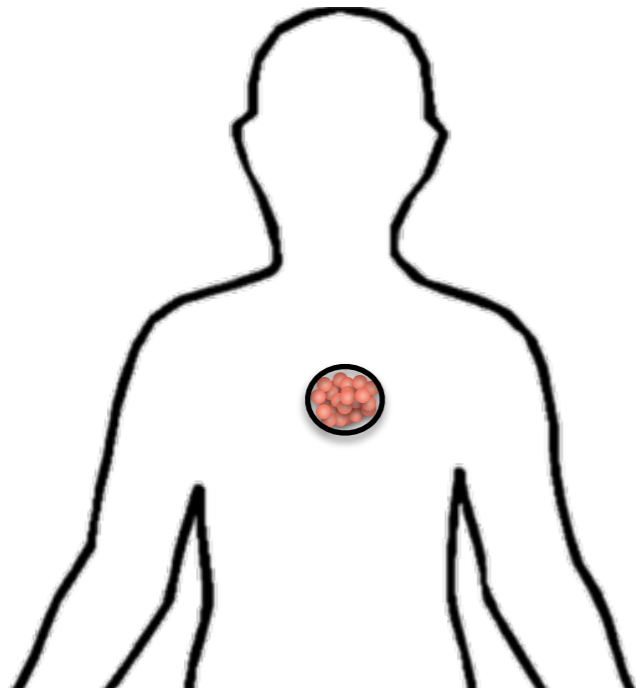


Contained

Benign

vs.

Malignant



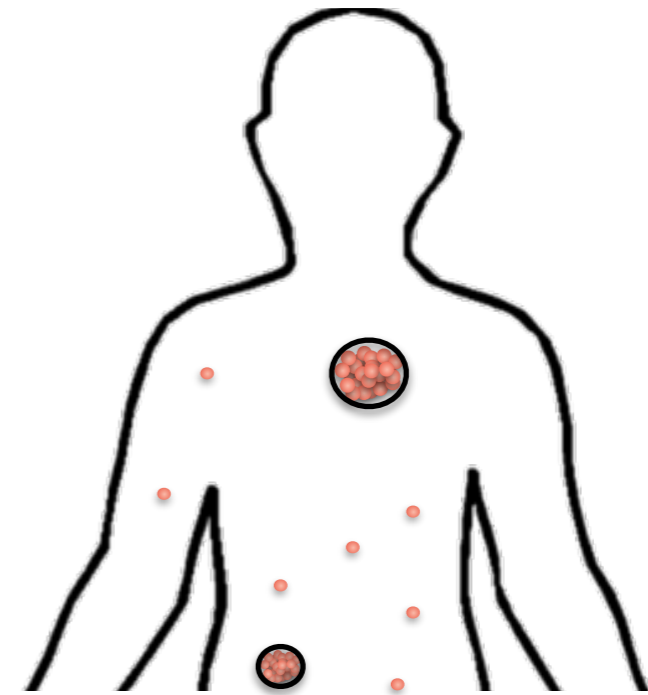
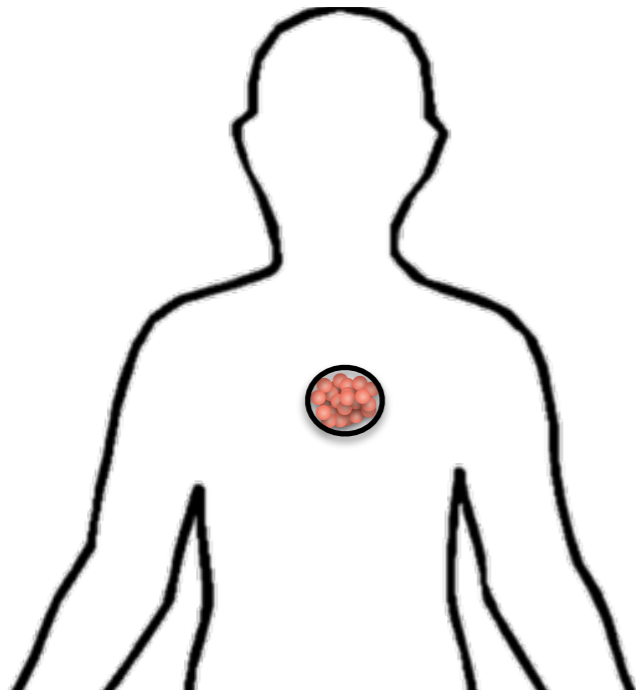
Contained

Spreads

Benign

vs.

Malignant



Contained

Spreads

Life is made up of cells

Cells replicate to make more cells

Uncontrolled replication causes
cancer

How do doctors treat cancer?

Surgery

Removes most of
tumor

Always miss
some fragments



Radiation

Radiation

Less invasive

Some cancers
resist



Chemotherapy

Kills fast-growing
cells

Some cancers resist

Side effects



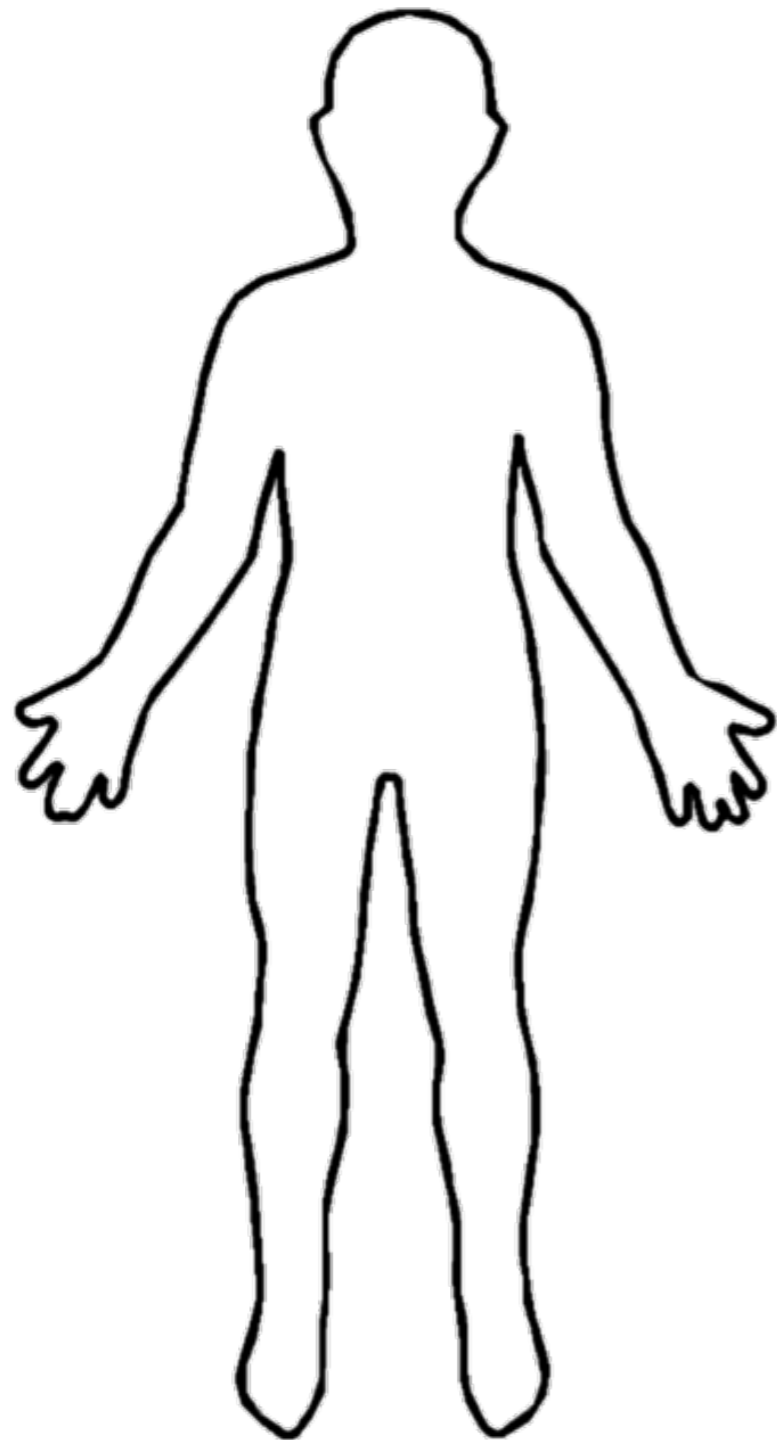
Treating cancer is difficult

Cancer cells:

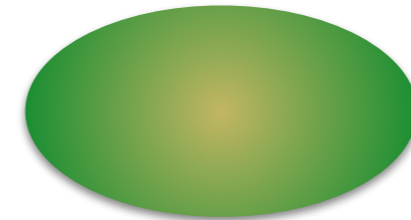
- can be hard to find
- are similar to healthy cells

The immune system

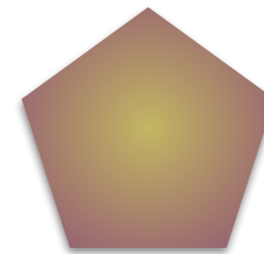
The immune system protects us against infection



Bacteria



Viruses

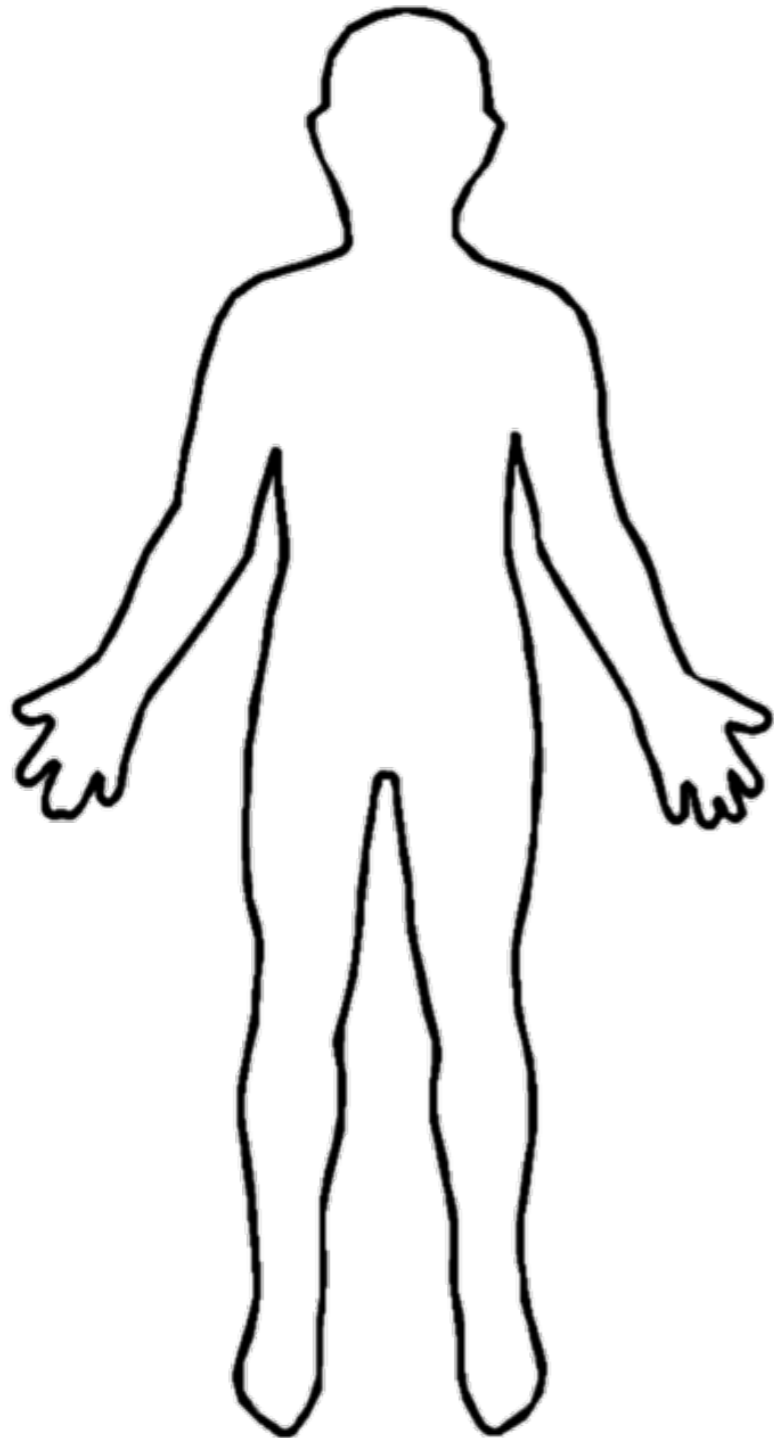


Parasites

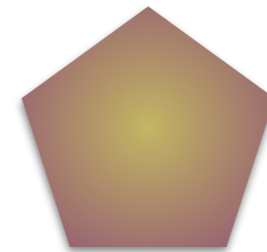
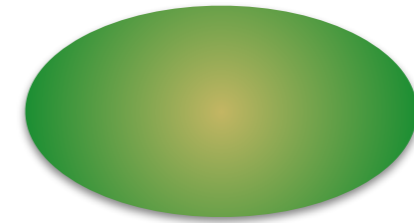


The immune system distinguishes

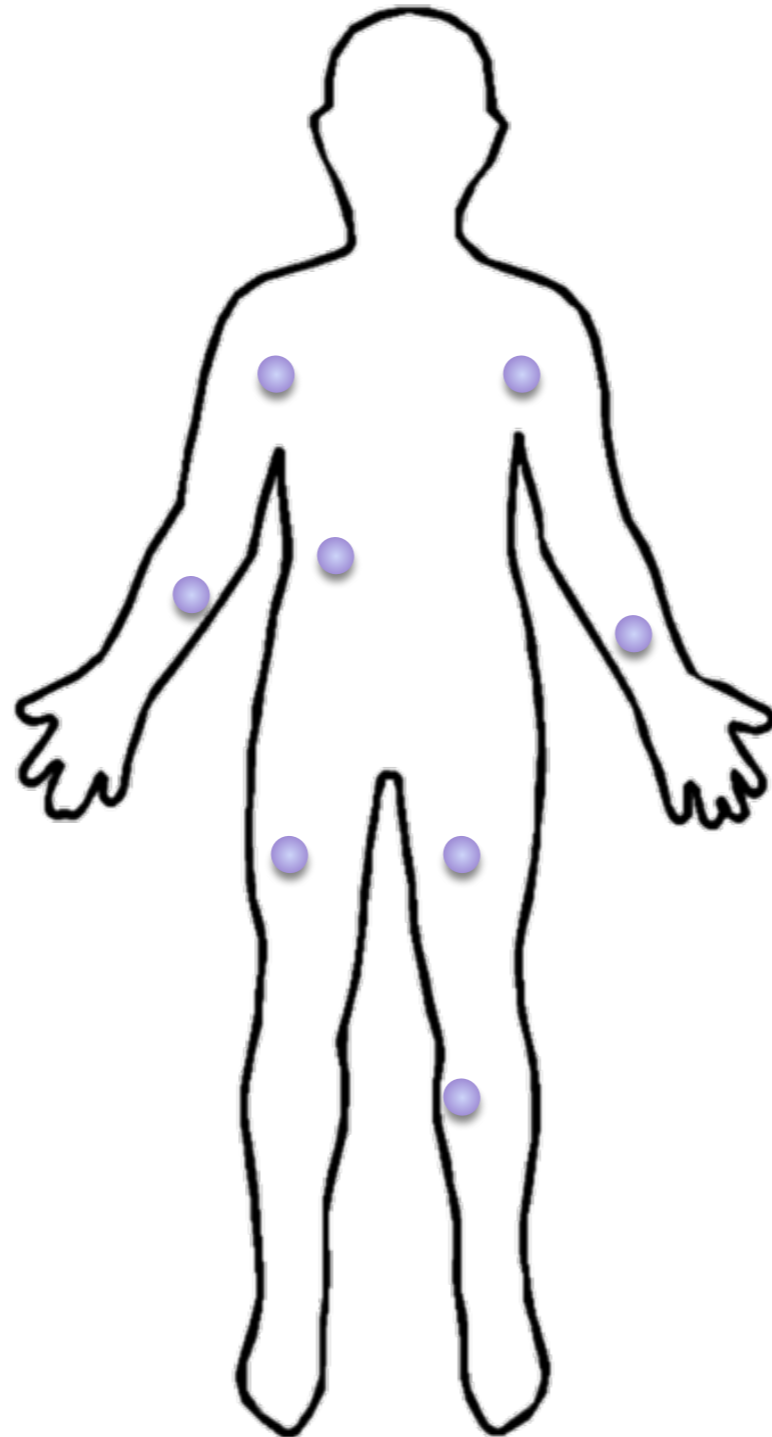
Self



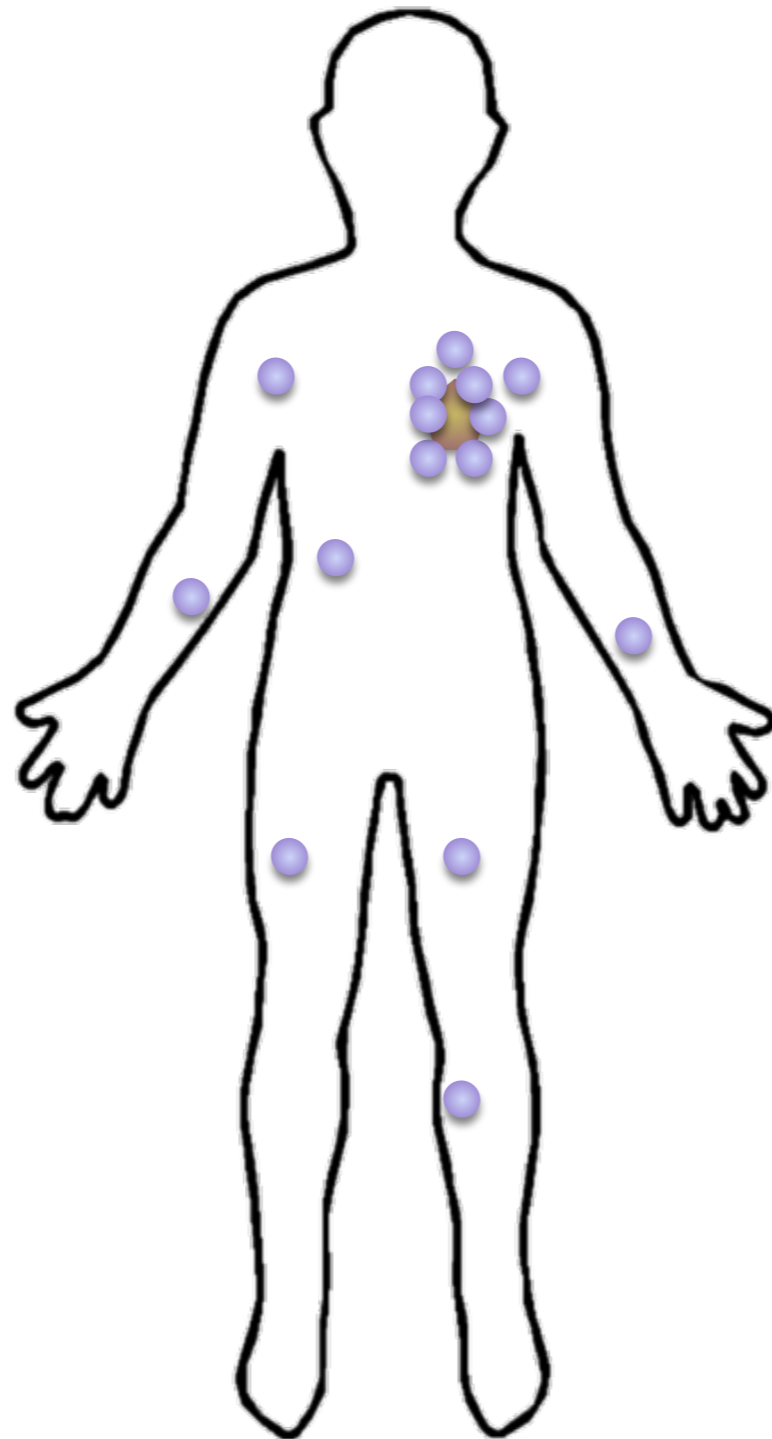
Non-self



Immune cell surveillance



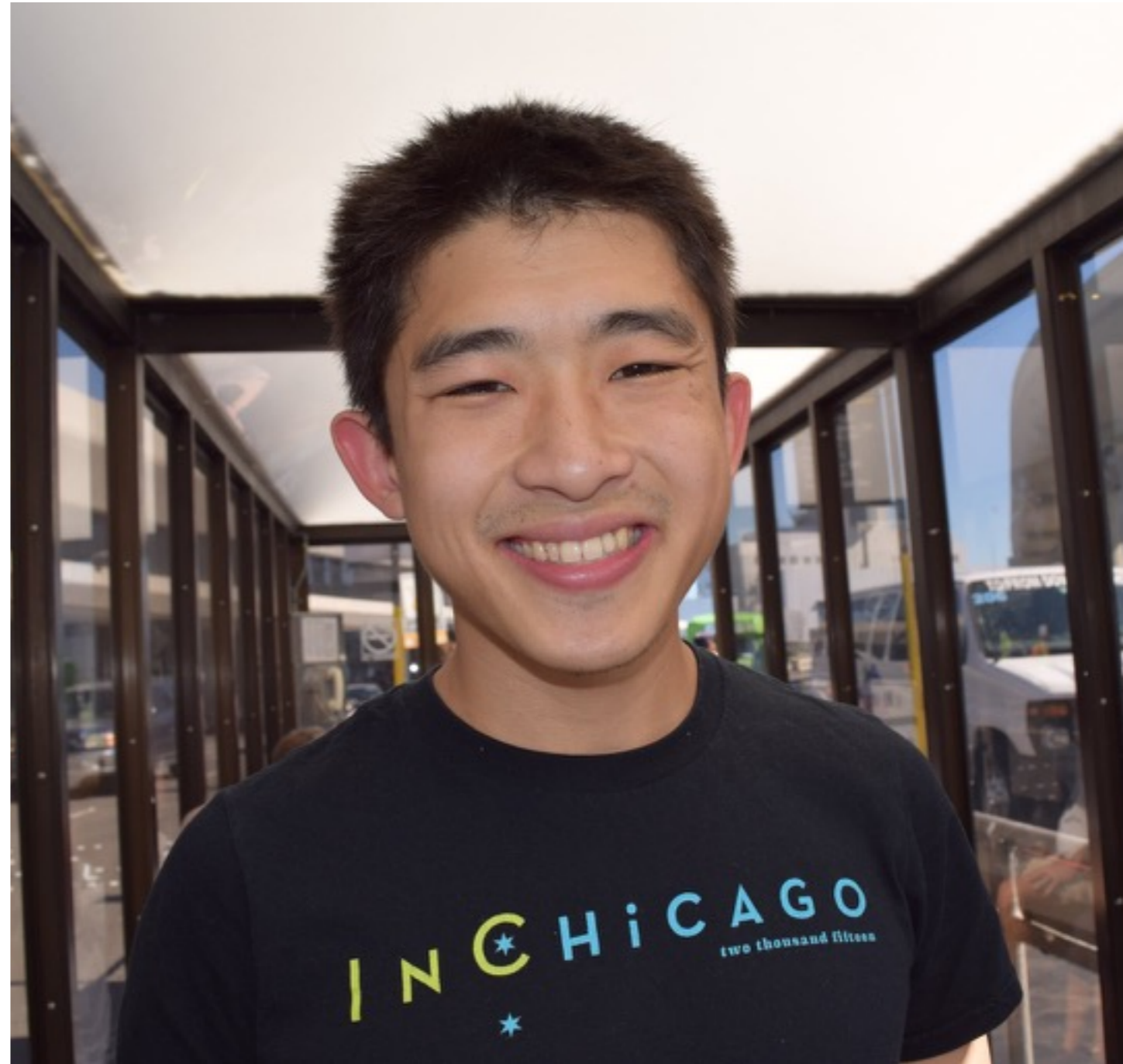
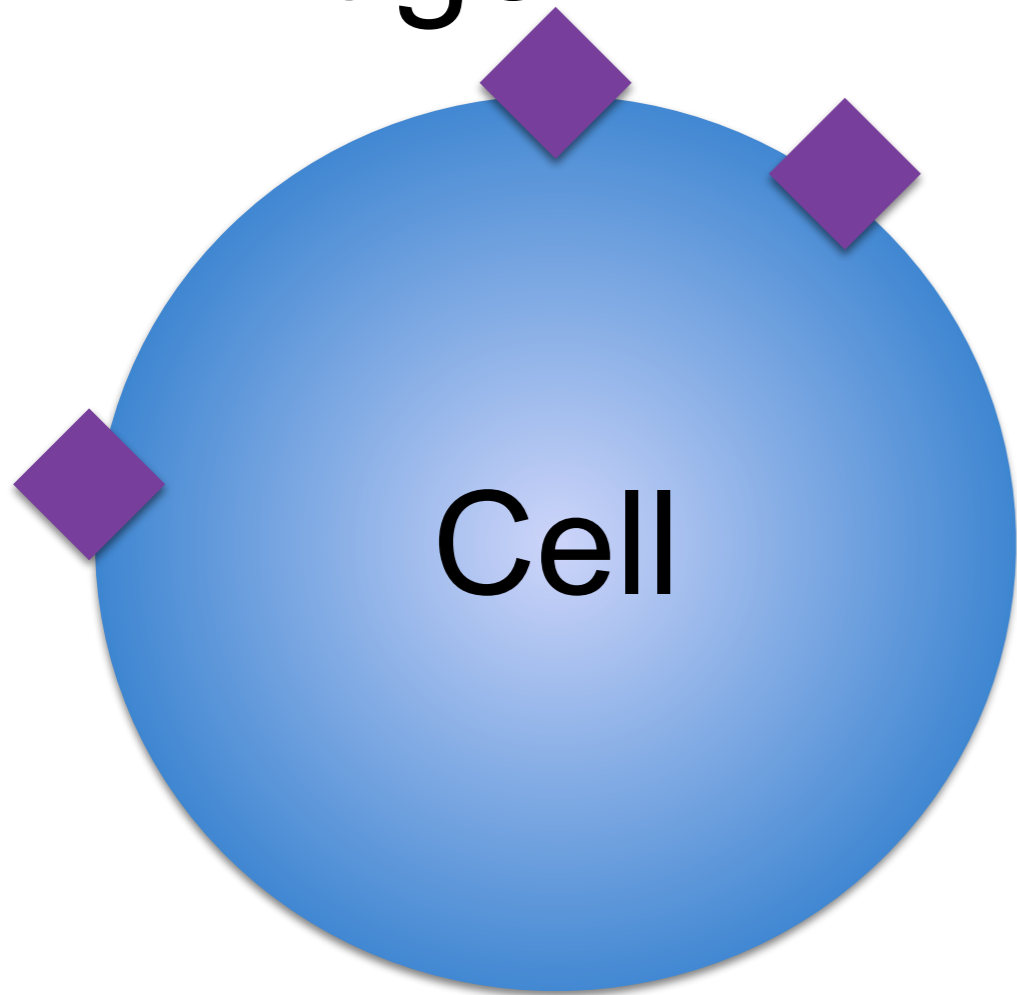
Immune cell surveillance



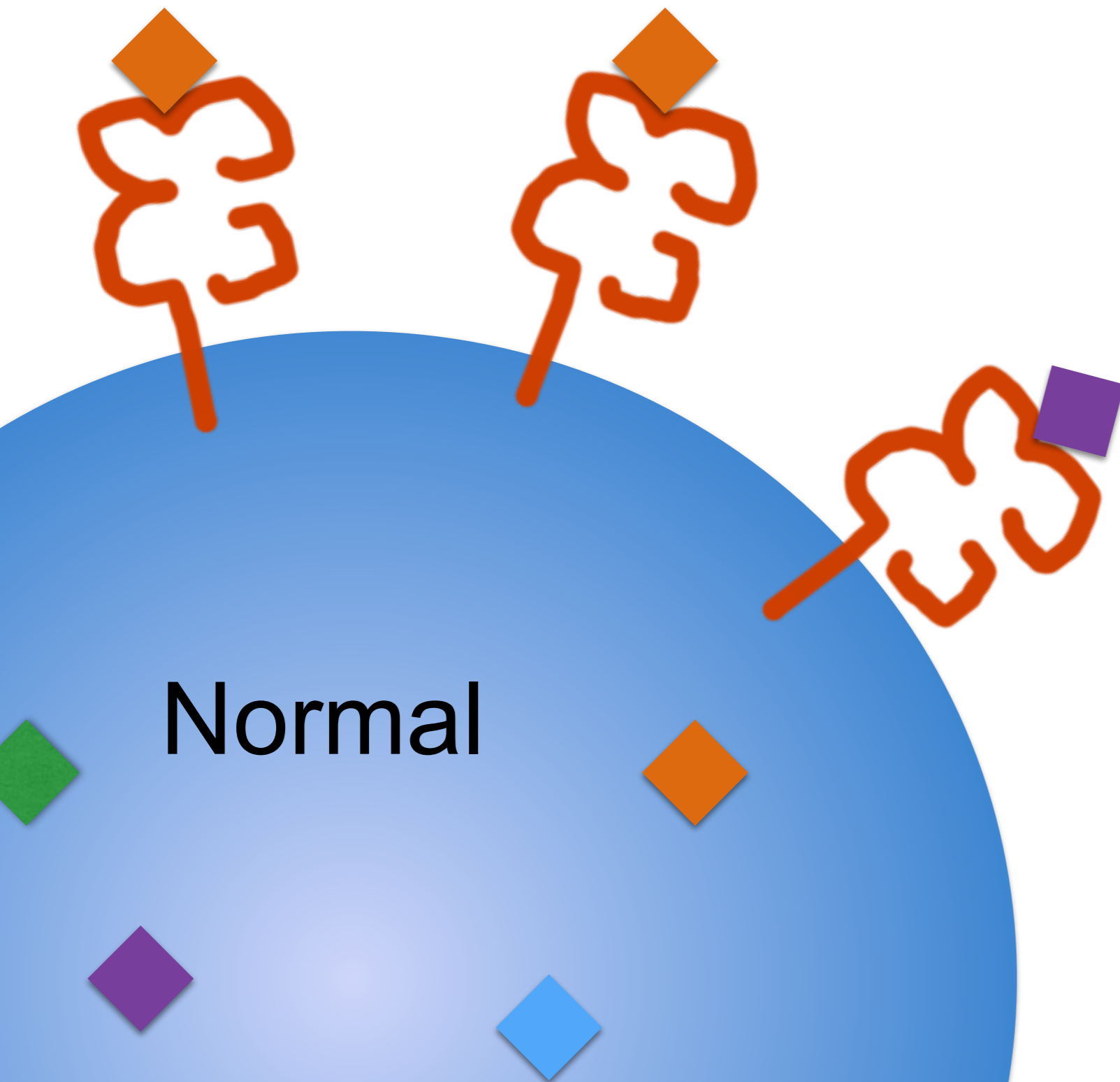
How does immune recognition work?

Antigens are like labels

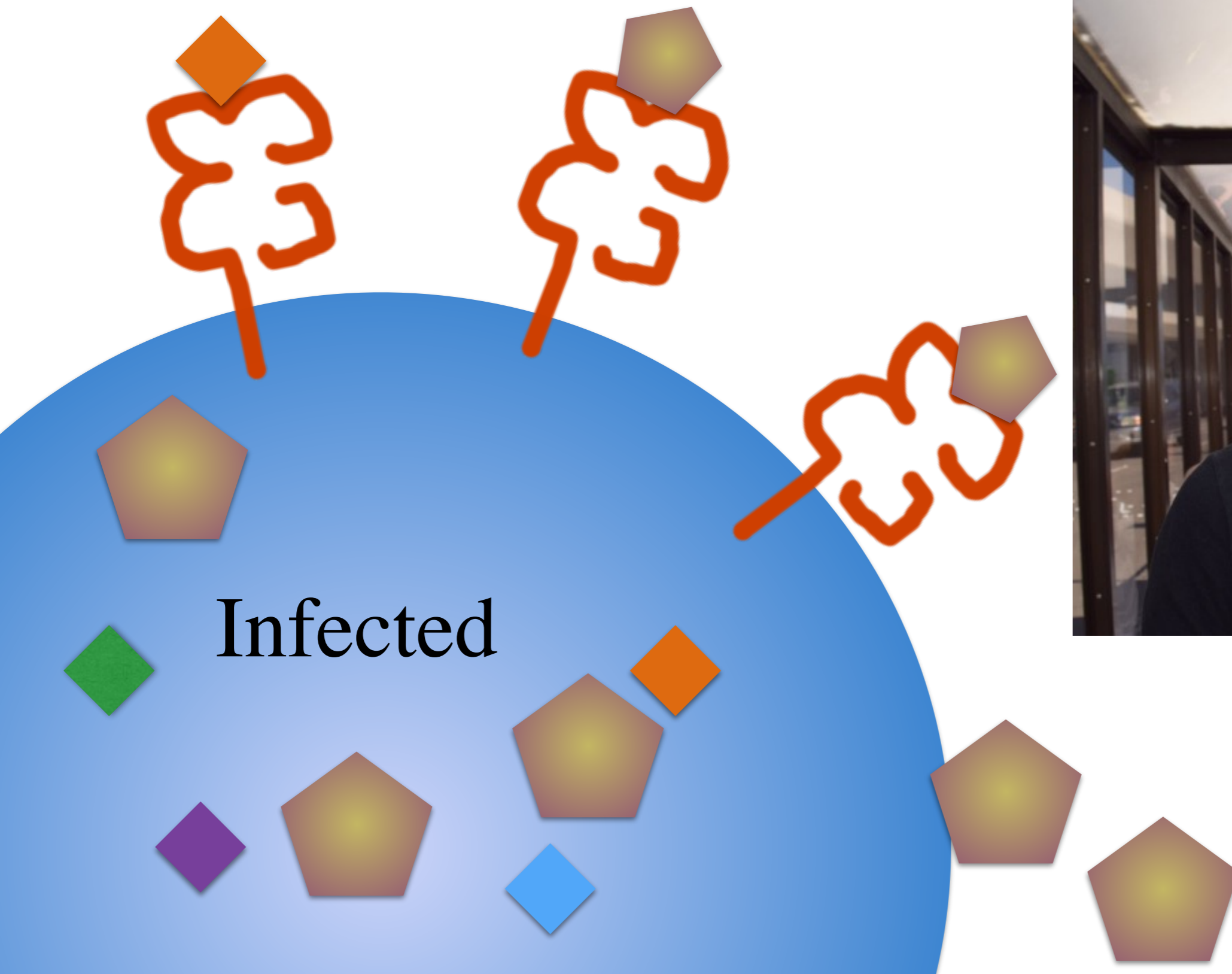
Antigen



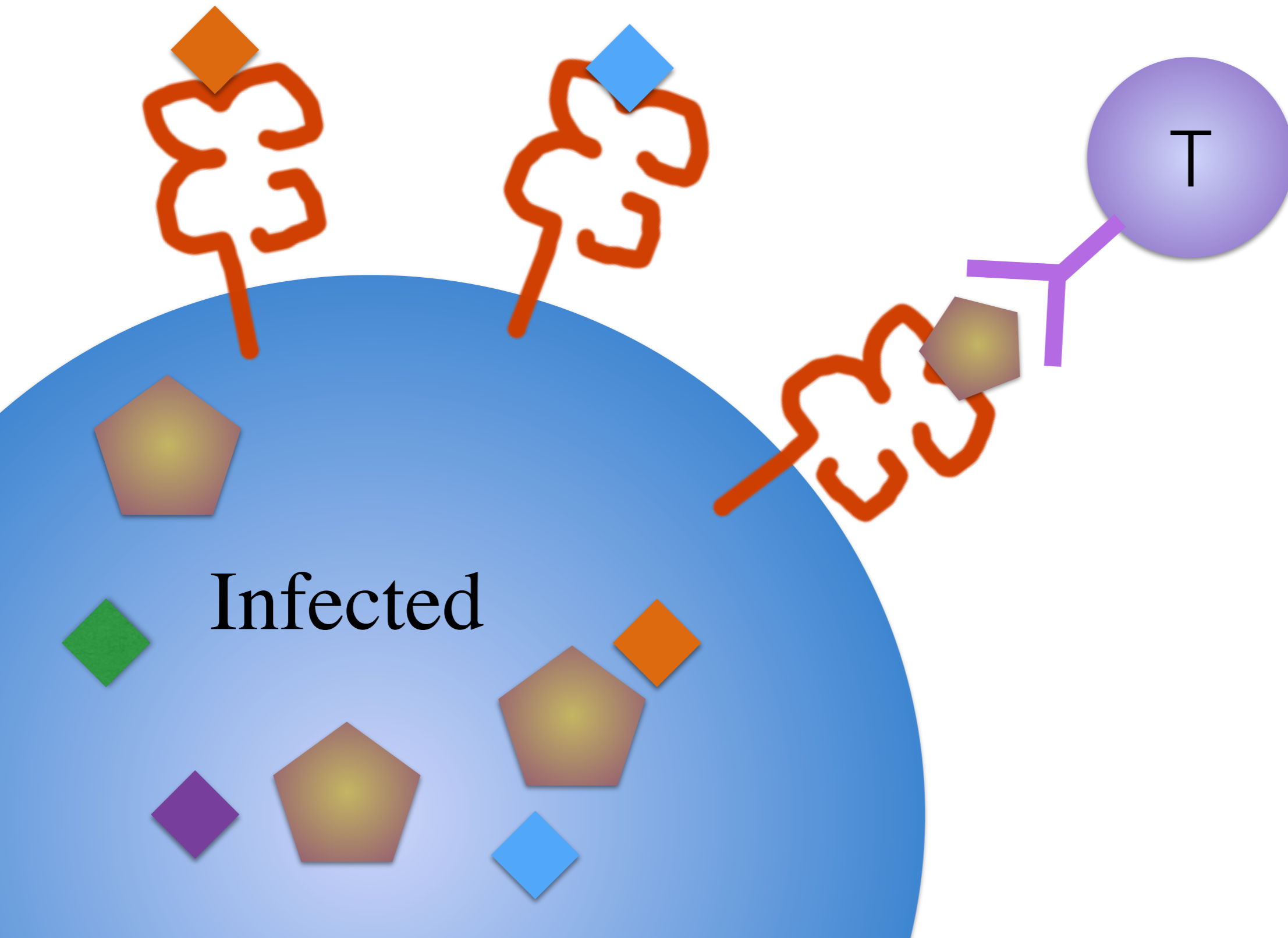
MHC molecules show what is going on inside a cell



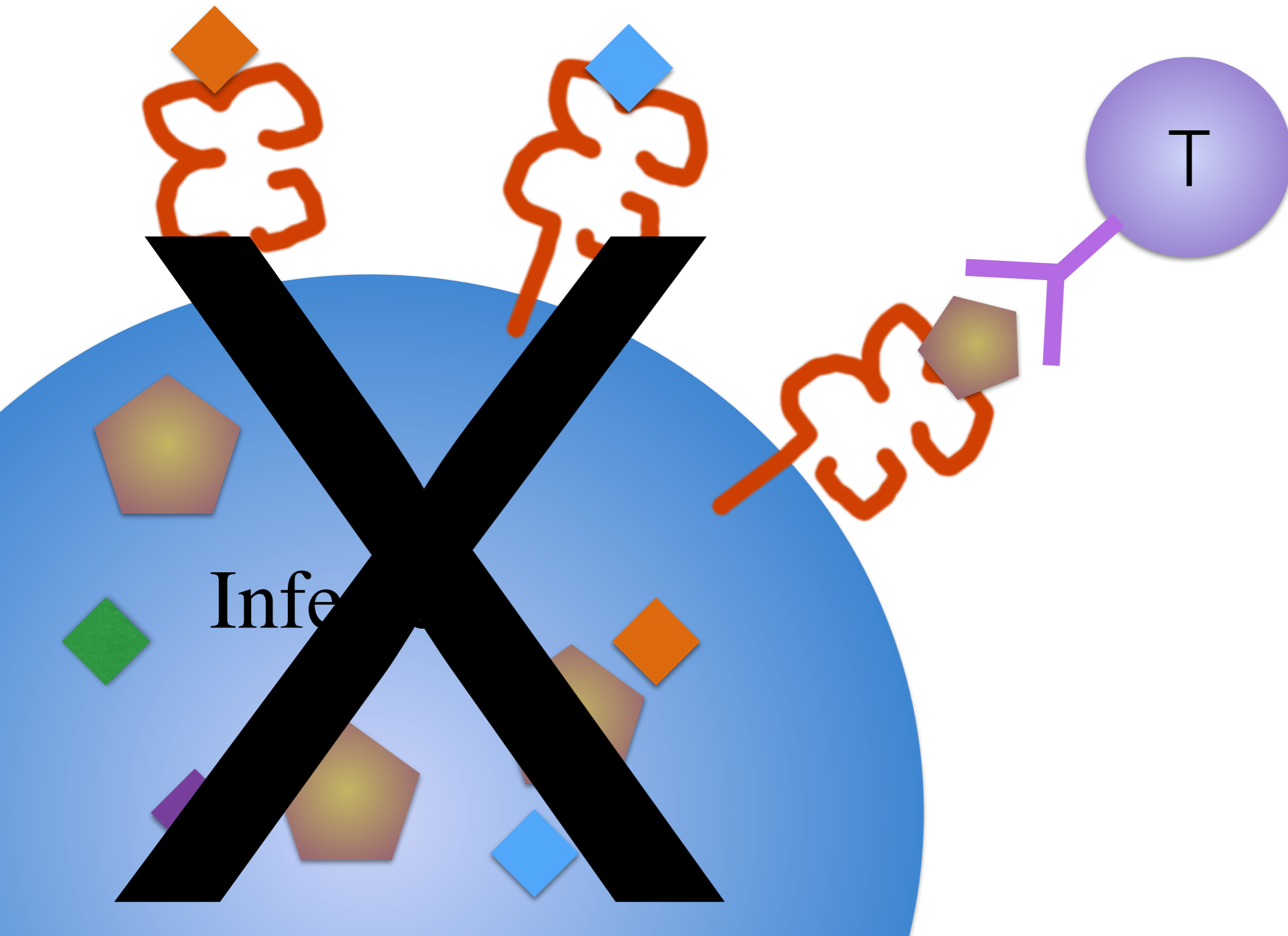
Infected cells can alert immune cells



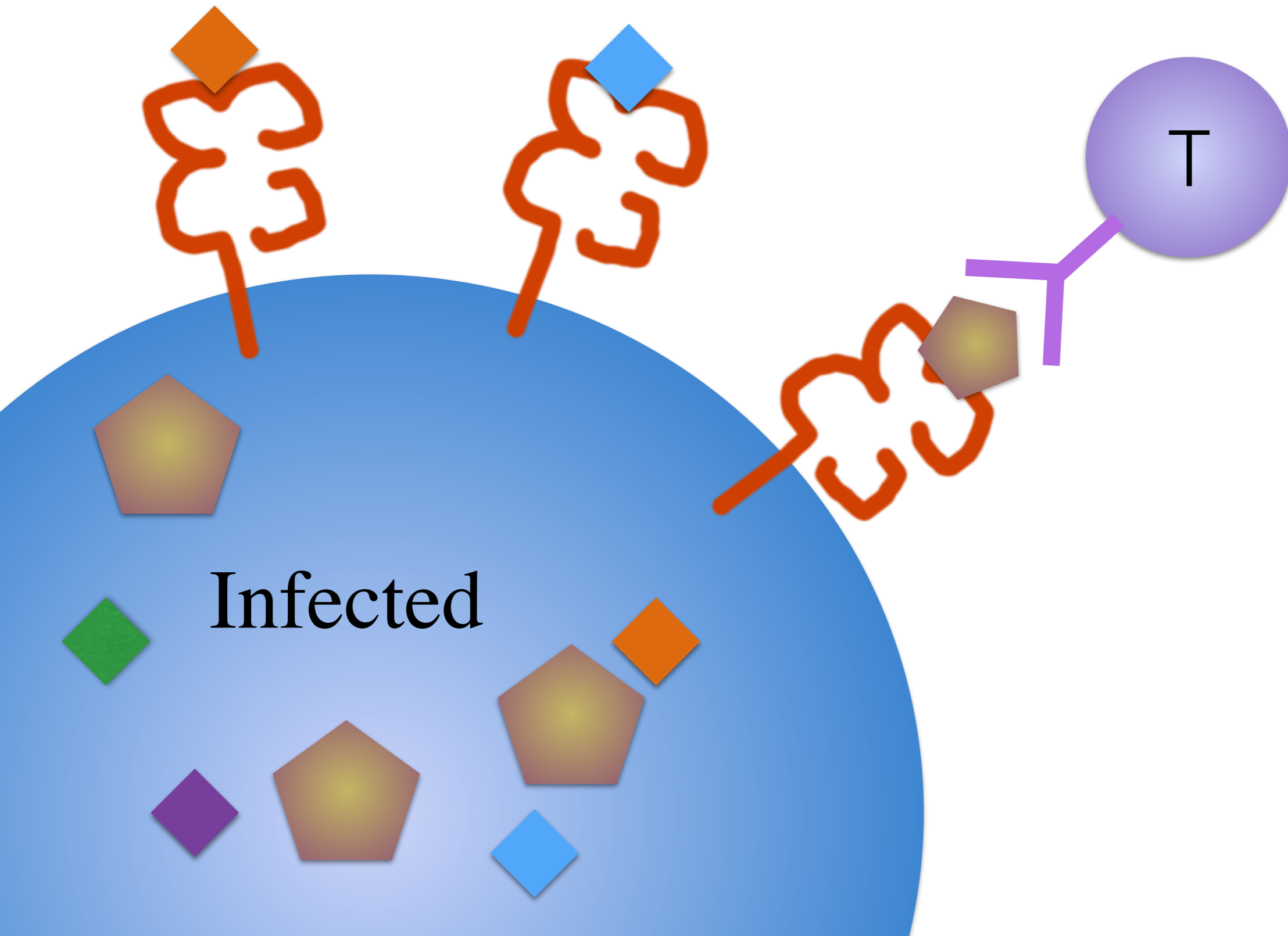
T cells bind to antigen...



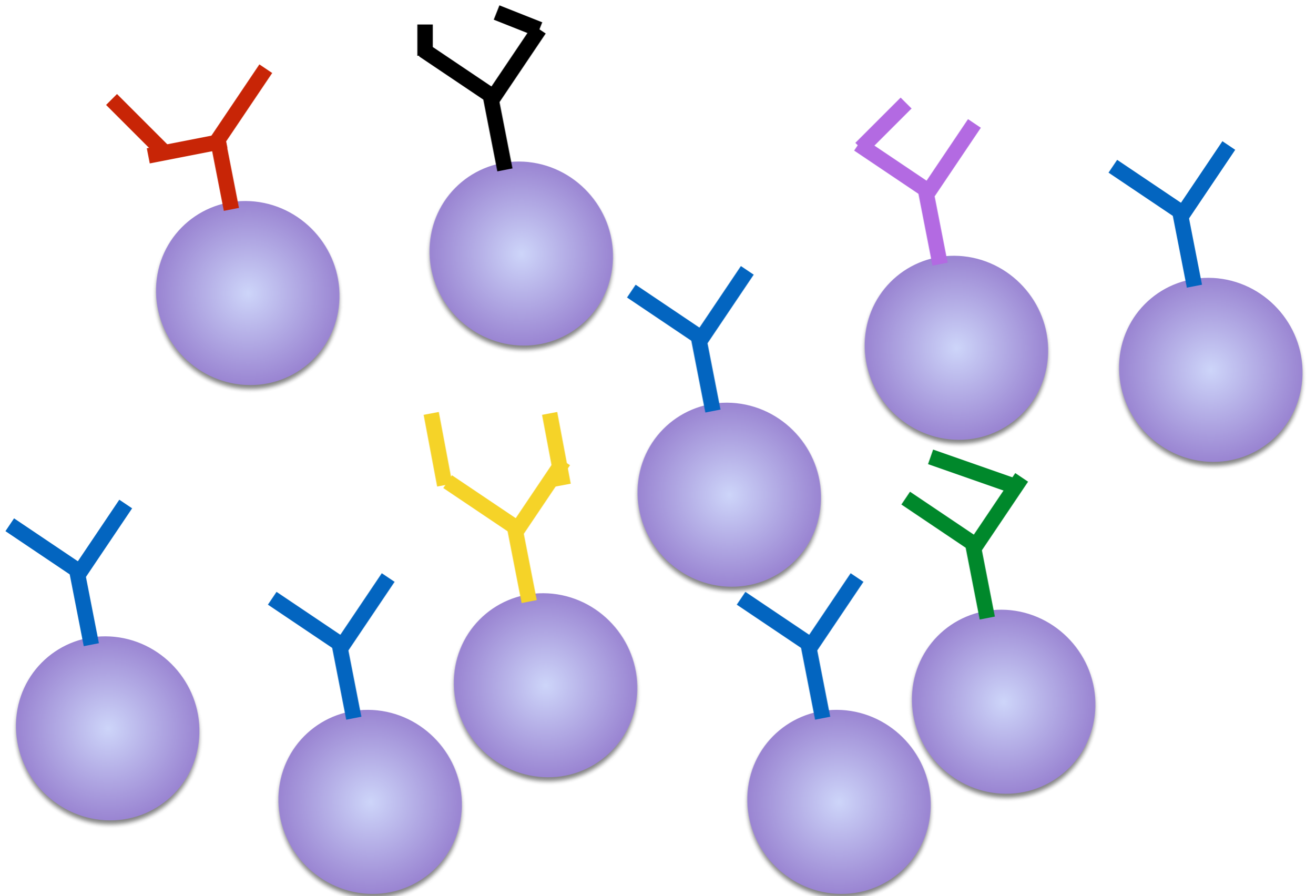
...and kill the targeted cell



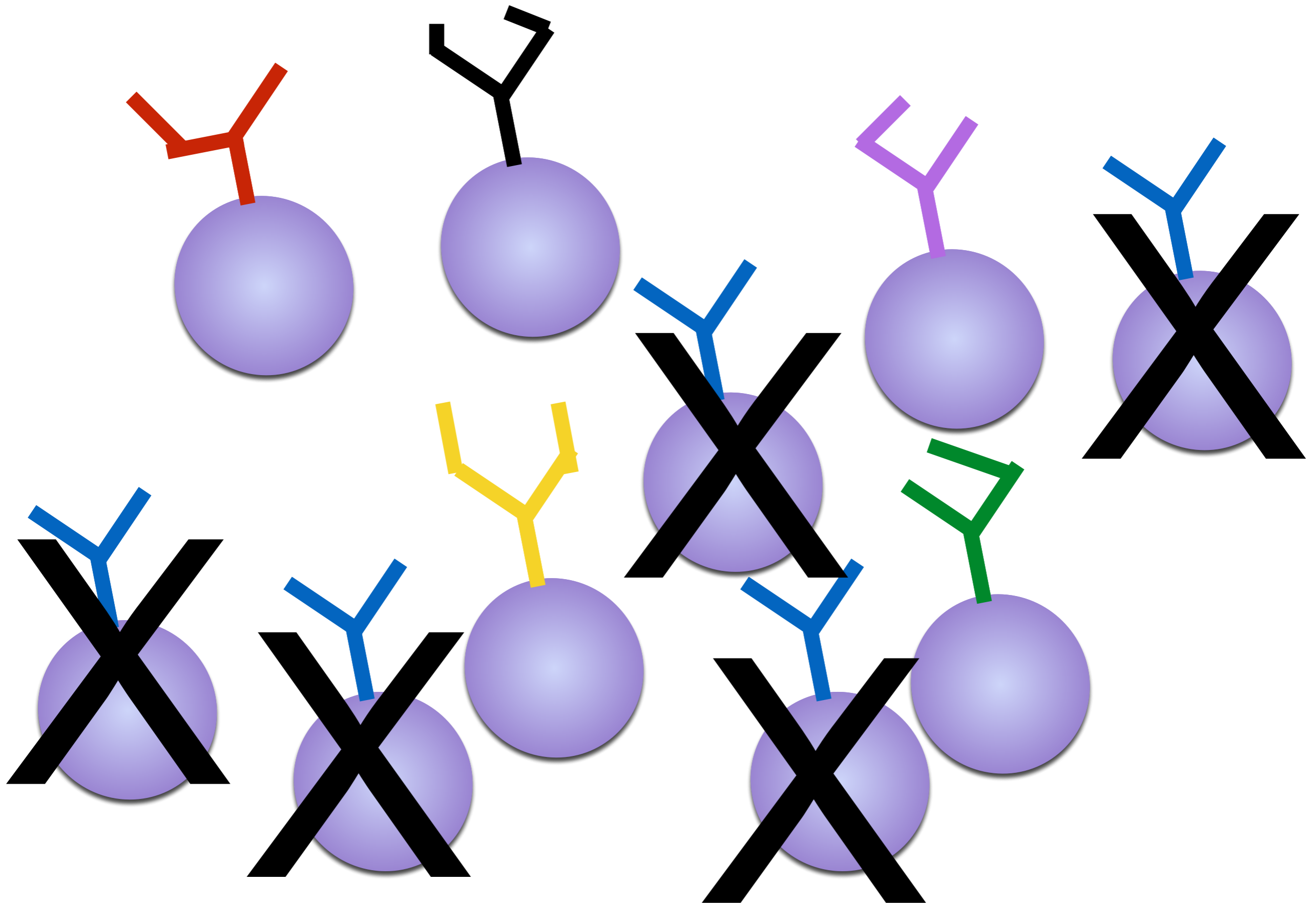
How does the T cell know?



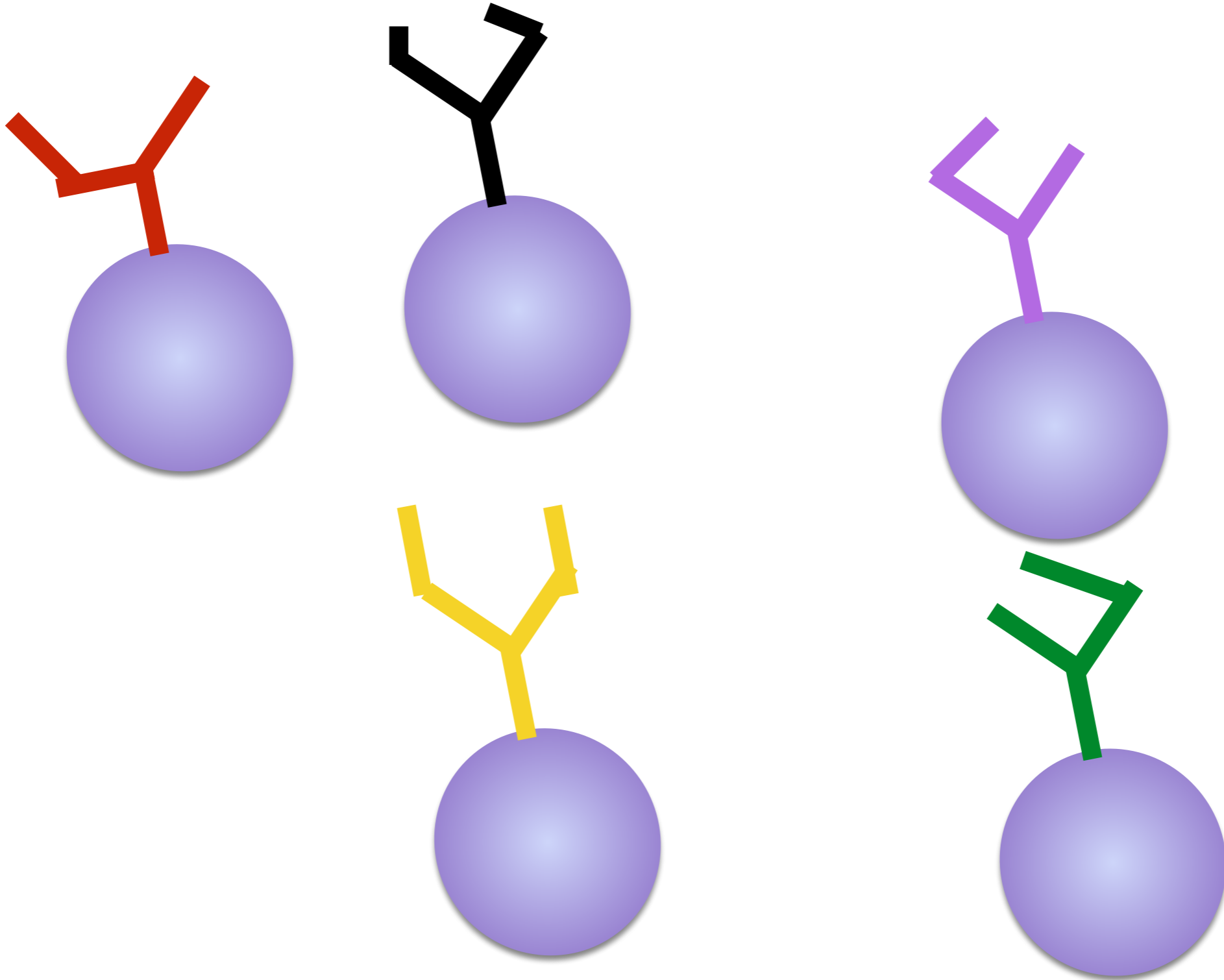
Our bodies make millions of different T cells



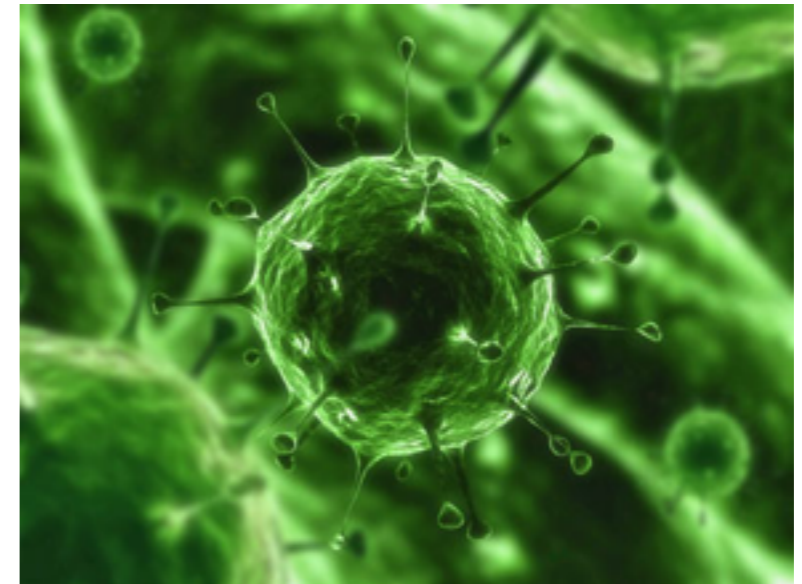
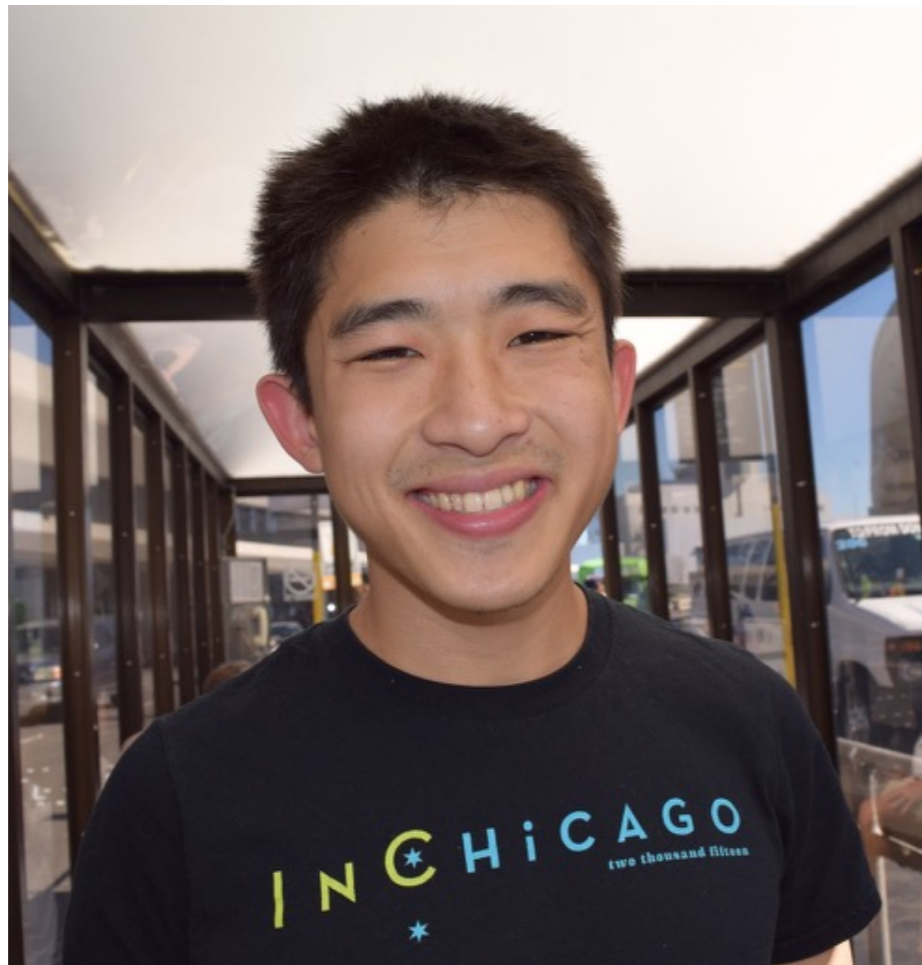
T cells that recognize self are deleted



T cells recognize non-self



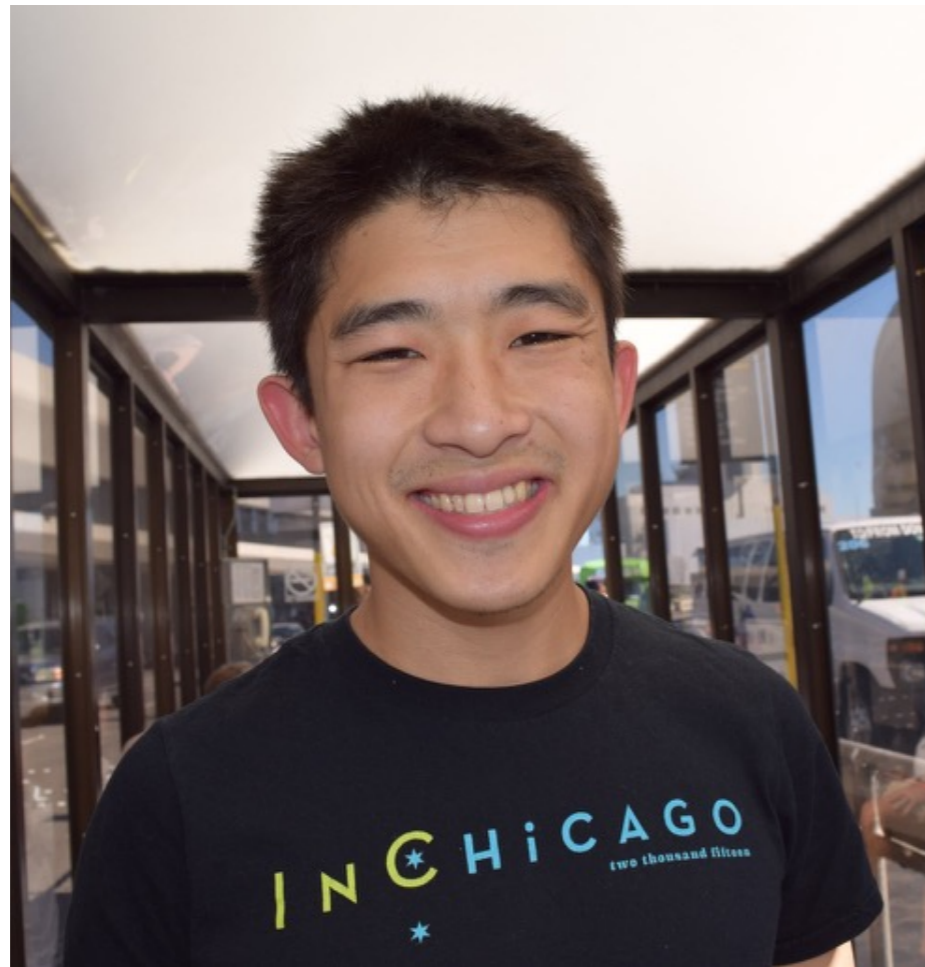
The immune system distinguishes self vs. non-self



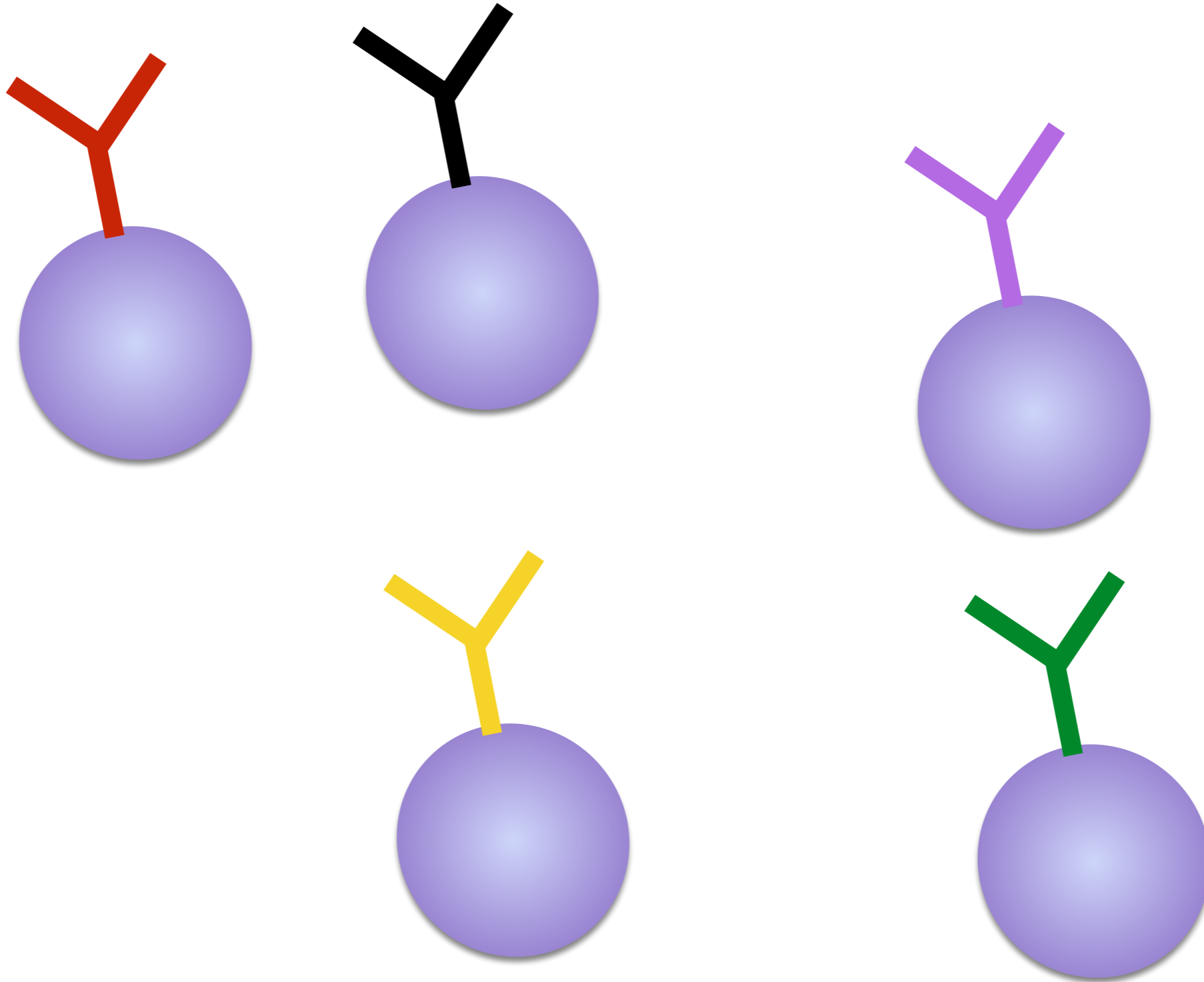
Cancer is modified self



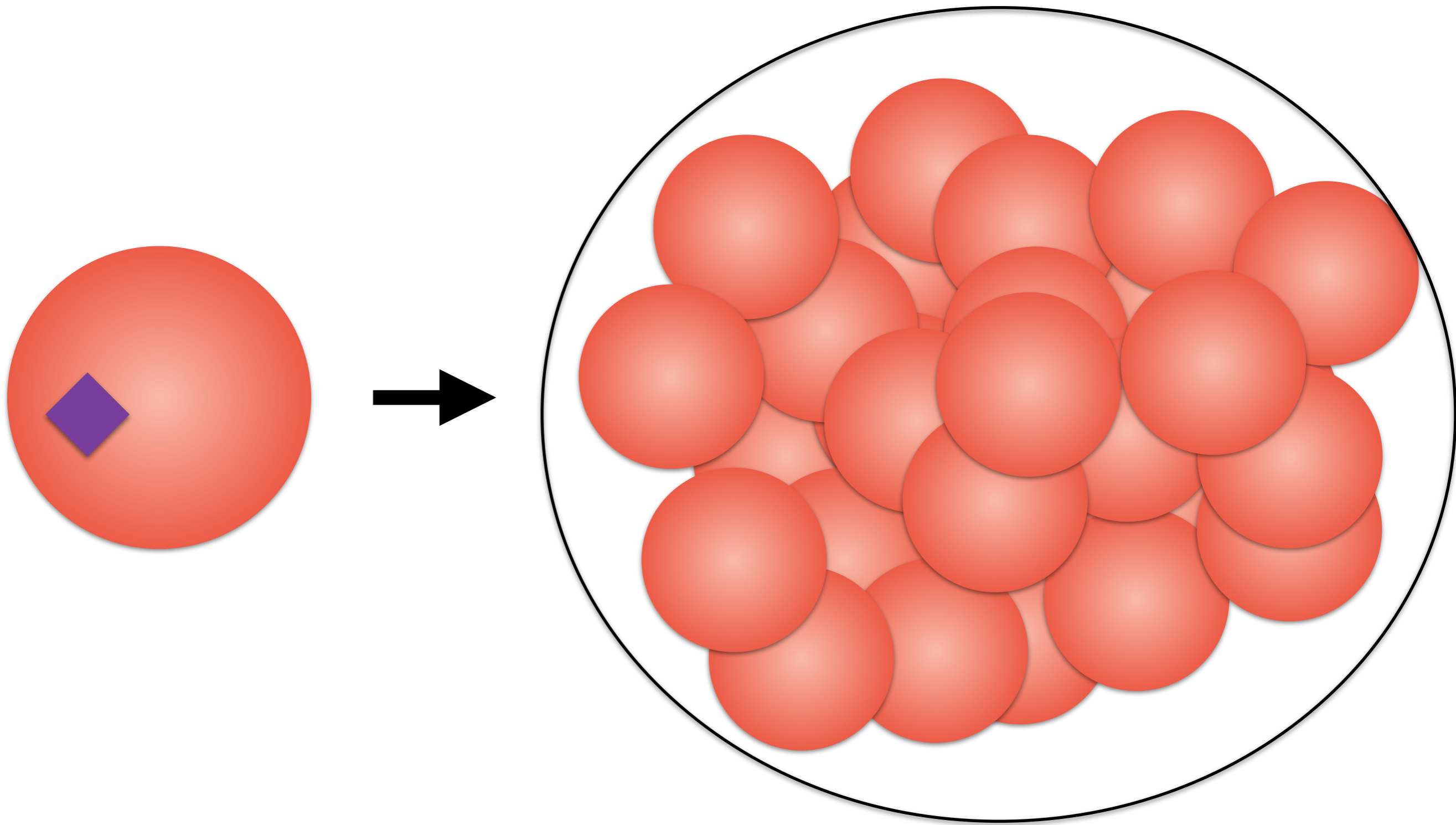
Can the immune system tell the difference?



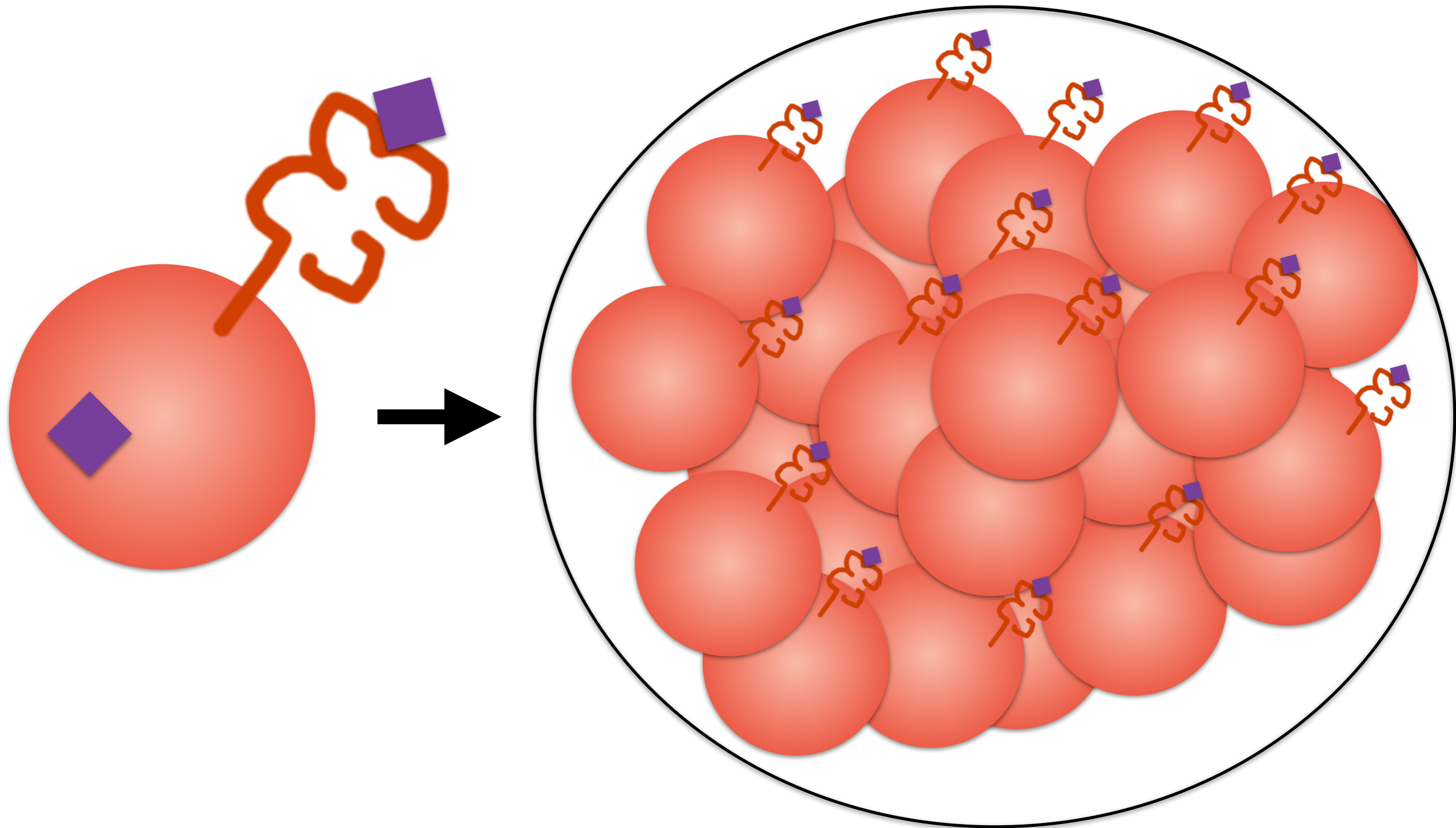
Some of these T cells recognize cancer



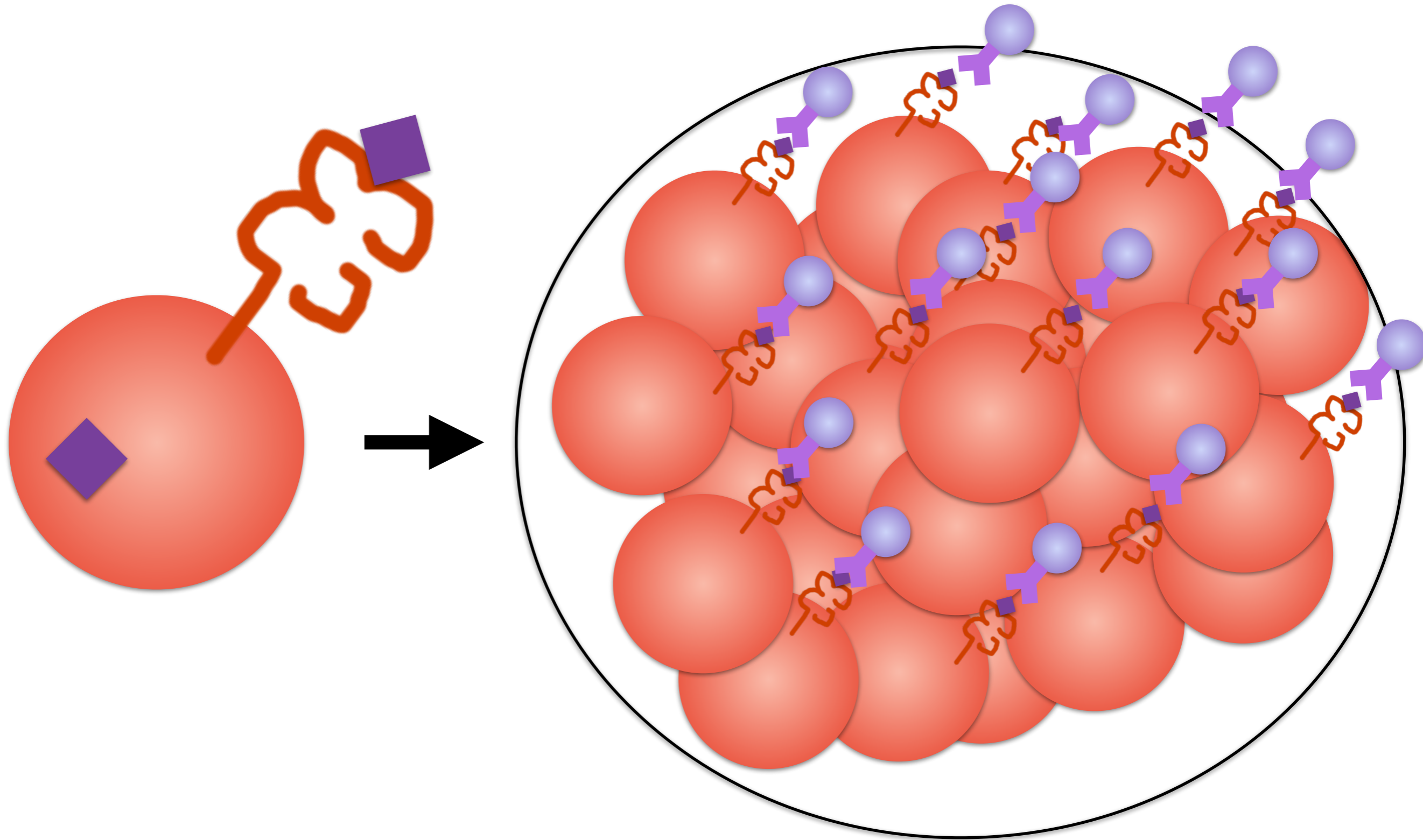
Some cancer mutations are presented on MHC



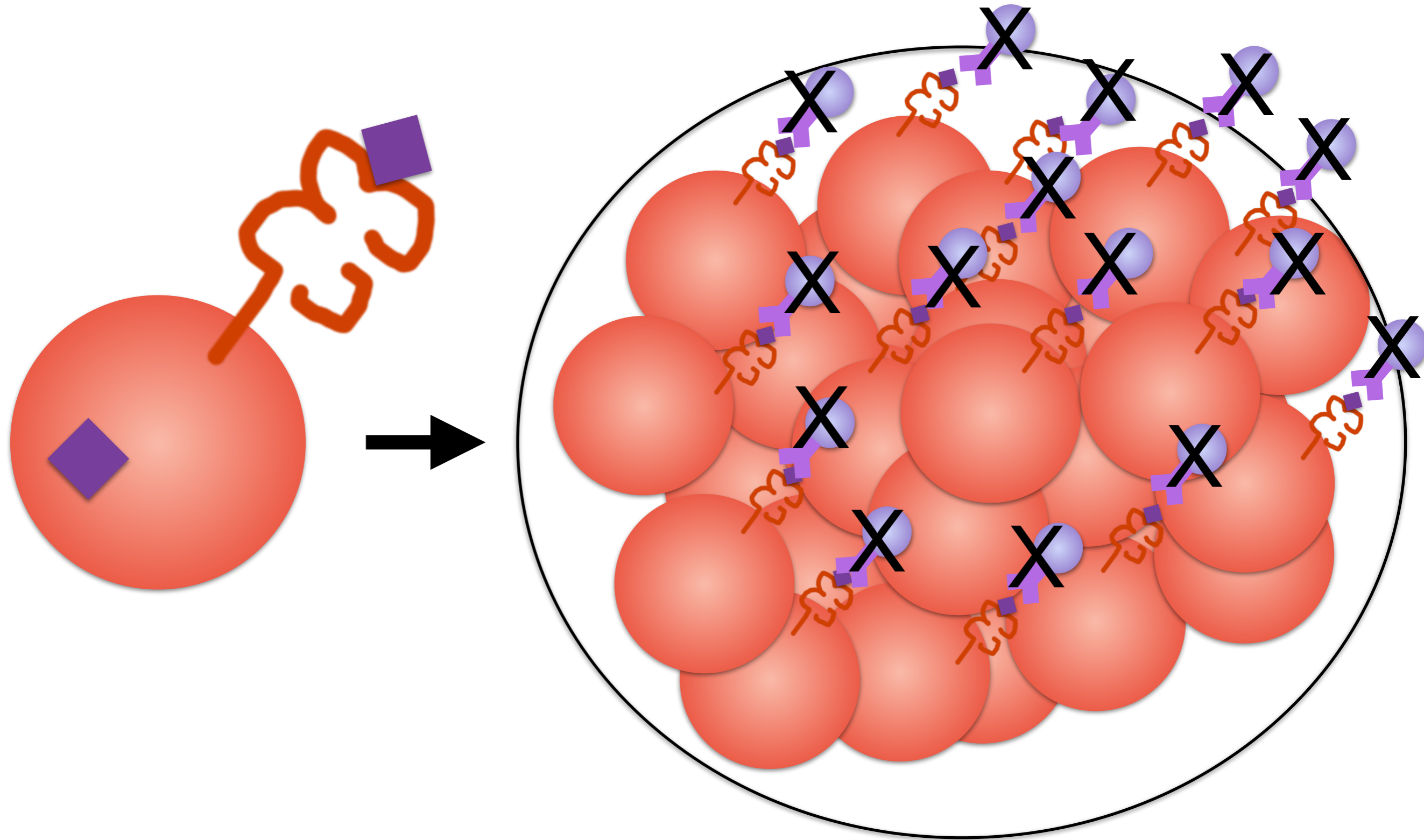
Some cancer mutations are presented on MHC



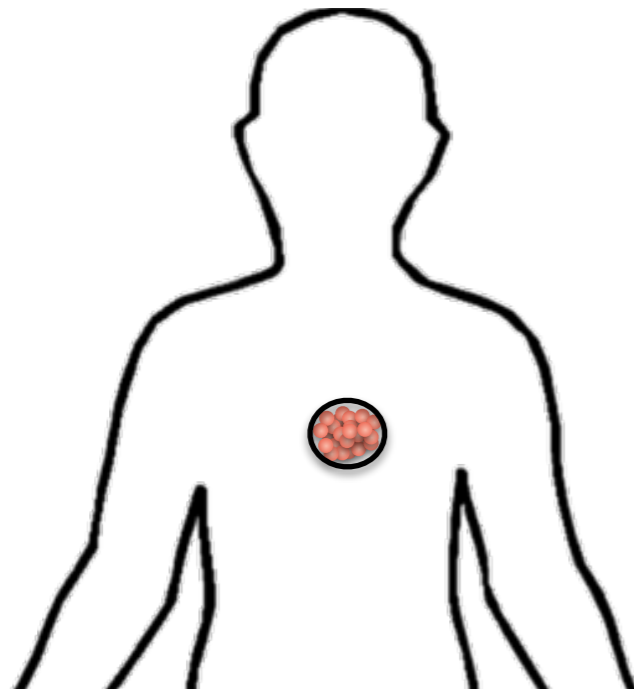
T cells can target cancer-specific antigens



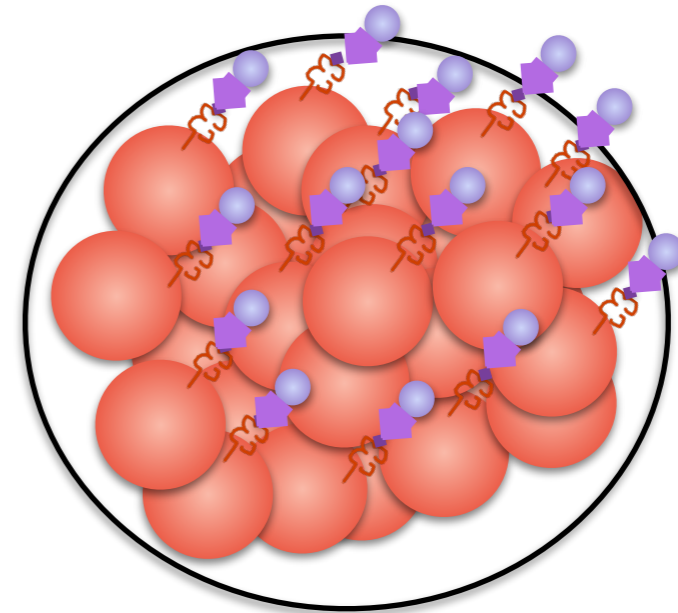
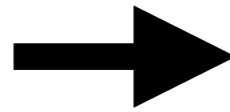
Cancer cells suppress T cells



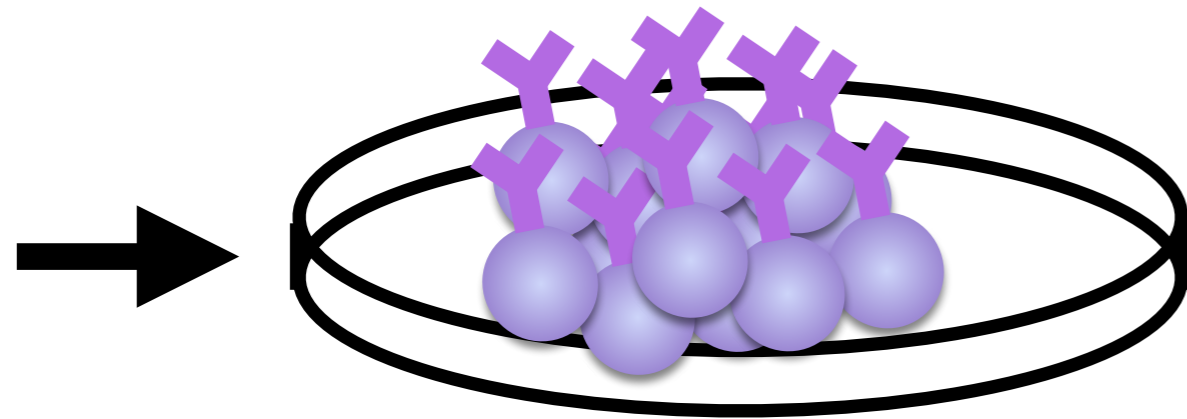
Model for therapy



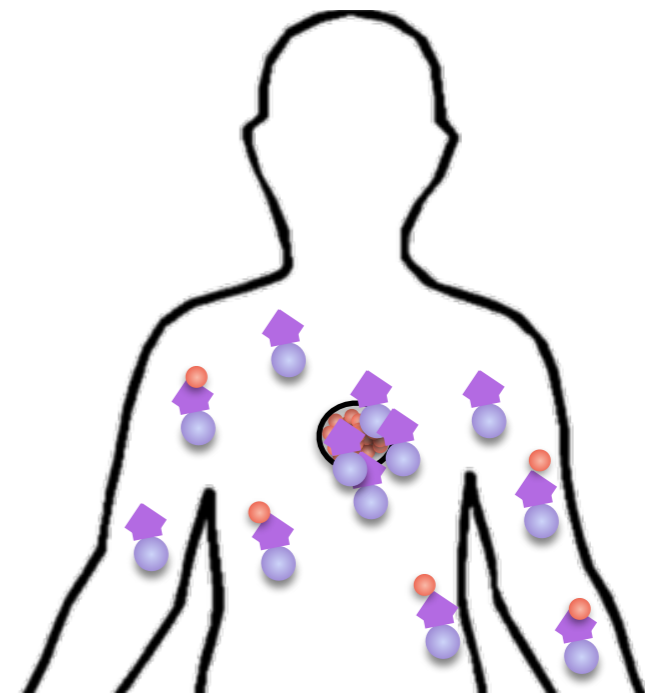
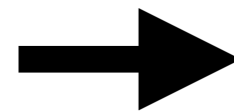
Isolate tumor



Grow and activate
T cells



Give to patient



Eradicate cancer

The big question:

What is a good cancer antigen?

1. Cancer specific
2. Can be presented on MHC
3. Cannot be lost



