



Flow Cytometry Core Facility

... cell analysis & cell sorting

salk
Where cures begin.

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Complete Blood Count

Neuroscience

Clinical & Diagnostics

Developmental
biology

Immunology

Microbiology

Biomedical

Stem cells

Research

Transplantation

DNA abnormality

Metabolism

Aging

Immunodeficiency
disorders

Cancer Diagnosis

Cancer biology

Flow Cytometry

... cell analysis & cell sorting

Plant cell biology

Plant & Marine Biology

Brewing & Winemaking
yeast analysis

Aquatic Ecology
phytoplankton, algae, bacteria

Food &
Pharmaceutical
Manufacture
bacteria monitoring

Industrial

THORN
STREET
BREWERY



Cytometry

... the science of measuring cells



1947

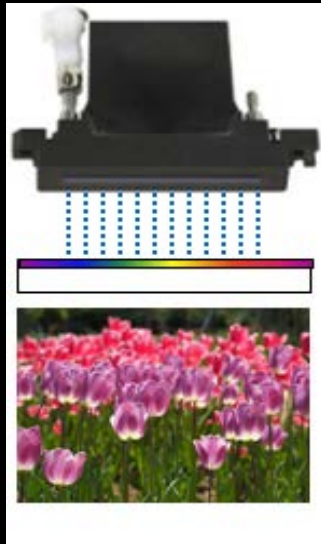
Spore detector

**US Army sponsored*

1953

Cell Counter

**Counting and sizing*



1965

Droplet based
cell sorter

*Ink-jet printing:
droplet technology*

1969-1972

Fluorescence based cytometers

Flow Cytometry

... cell analysis & cell sorting

Multi-cellular organisms are complex

what are their **roles?**

what **cells**
are present?

what is the
significance
of each cell?



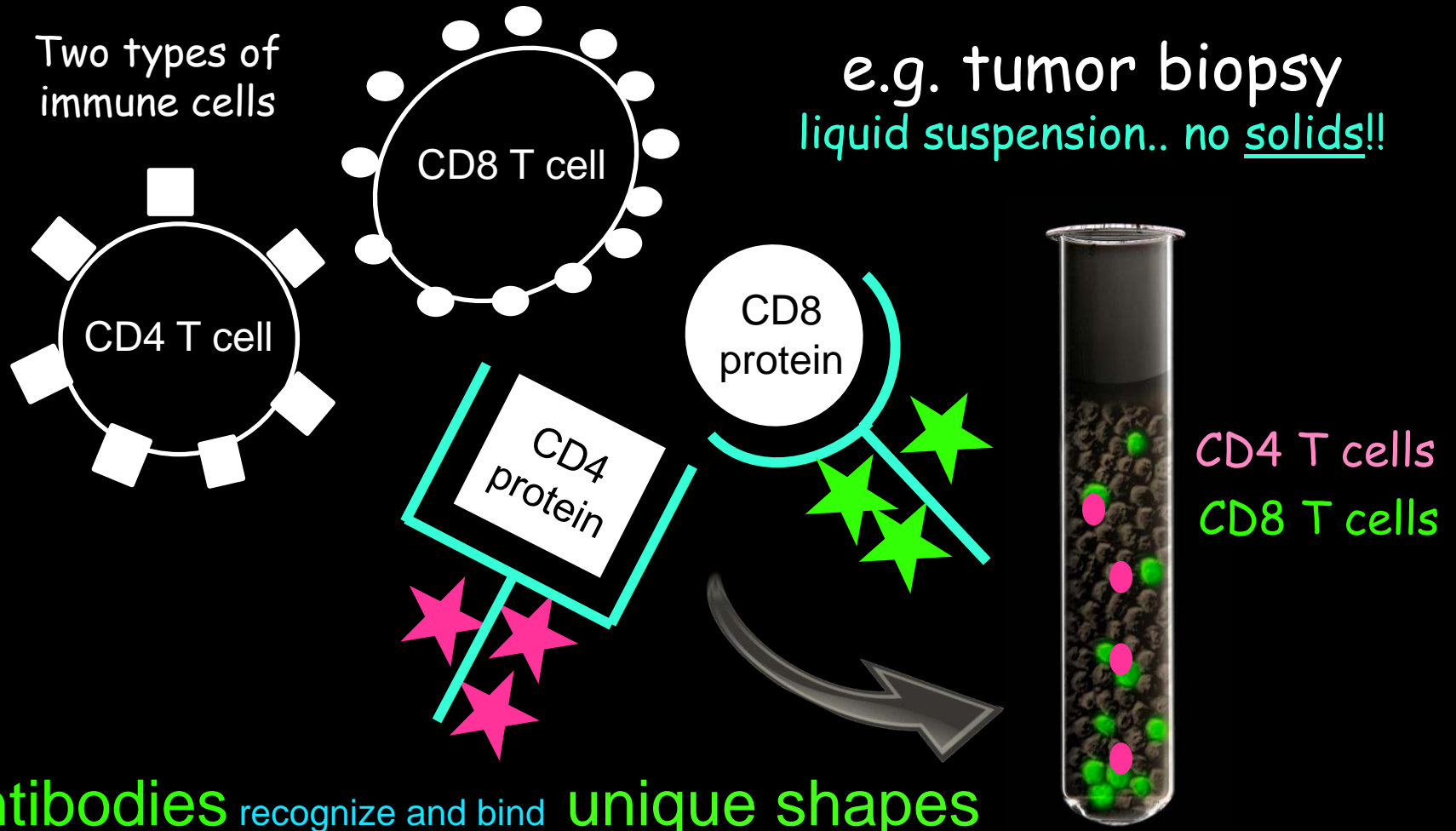
health
disease
aging

how many
of each cell?

are they
interacting?

Identifying cells by antibody labeling

specific proteins on cells



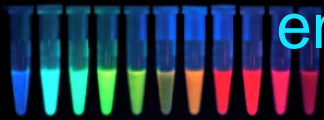
antibodies recognize and bind unique shapes

we can color code cells using fluorescent labelled antibodies

Other examples of labels



fluorescent proteins

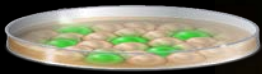


engineered fluorescent proteins

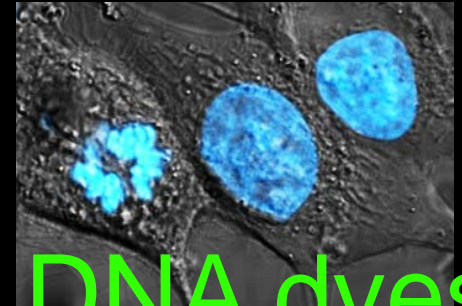


genes inserted into cell genomes

expressed in stem cells



form fluorescent tissues



DNA dyes

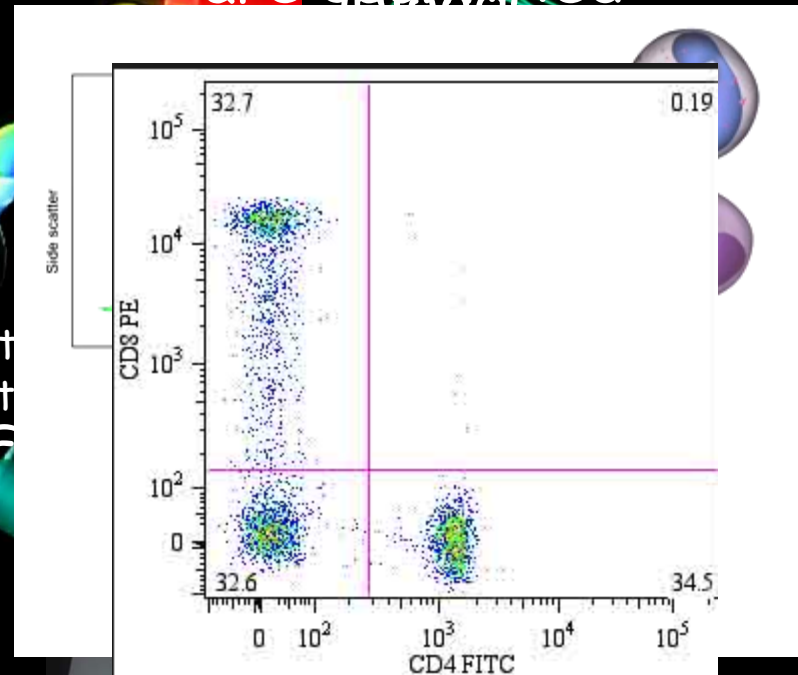
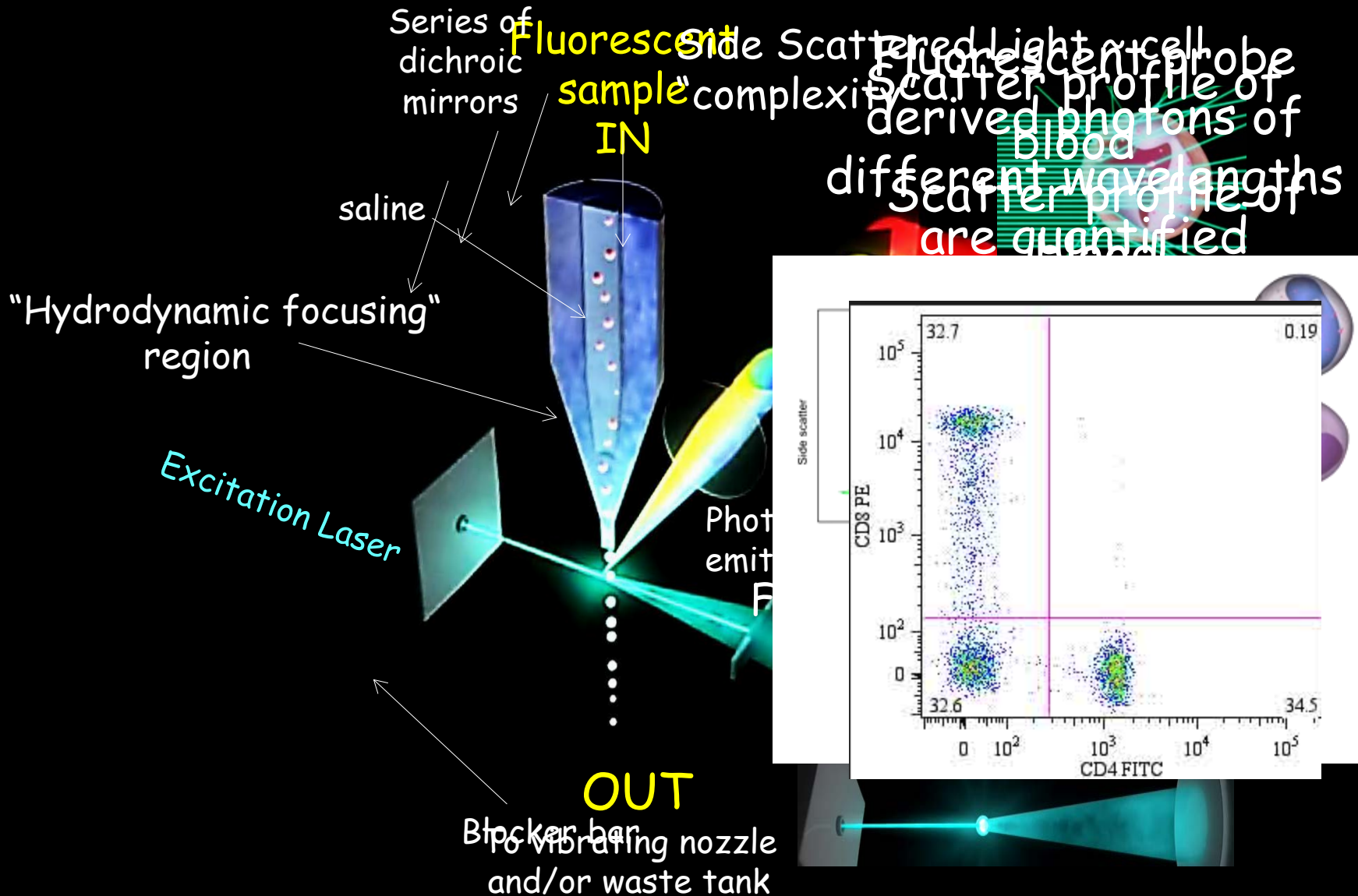
can inform cell cycle phase

fluorescent indicators

pH	phagocytosis
Mitochondrial function	cell health
Reactive Oxygen Species	oxidative stress

Probes can be combined in sophisticated experiments

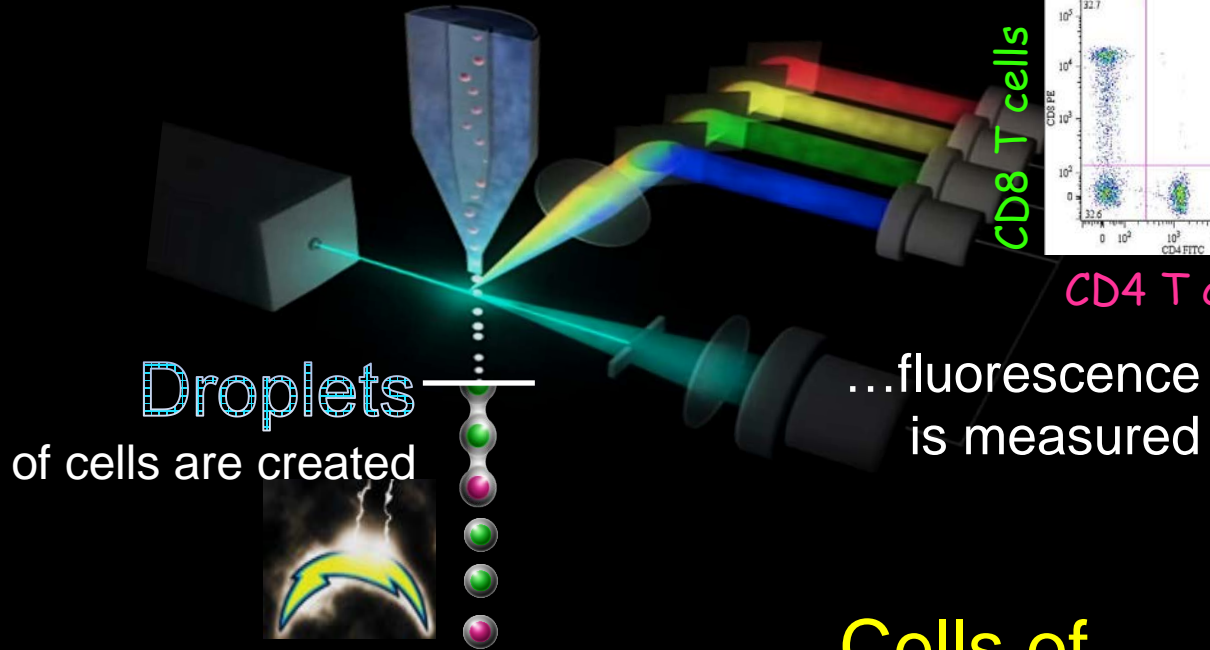
Sample profiling, cell by cell



Isolating cells by "FACS"

Starting mixture

CD4 T cells
CD8 T cells

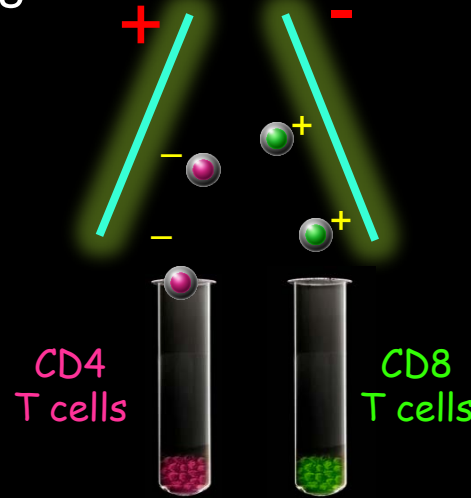


Droplets
of cells are created

...fluorescence
is measured

... the drops get charged

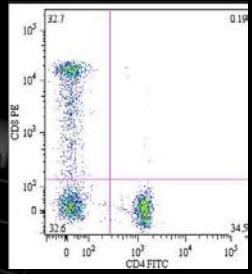
an electric field guides
the charged drops



CD4
T cells

CD8
T cells

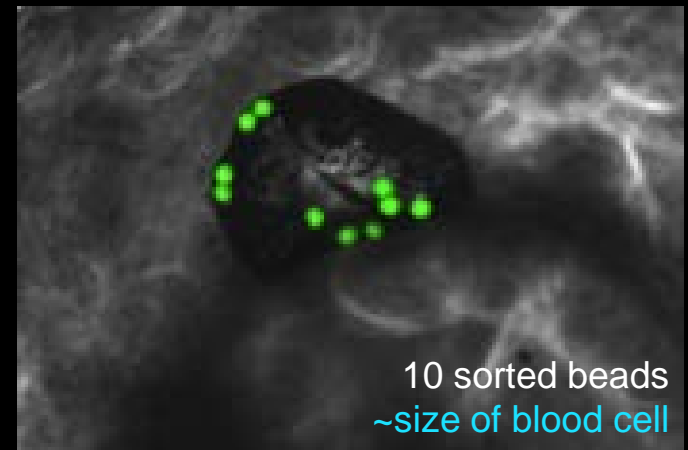
Cells of
interest can be
purified from a
mixture



CD8 T cells

CD4 T cells

Sorting technology in the core



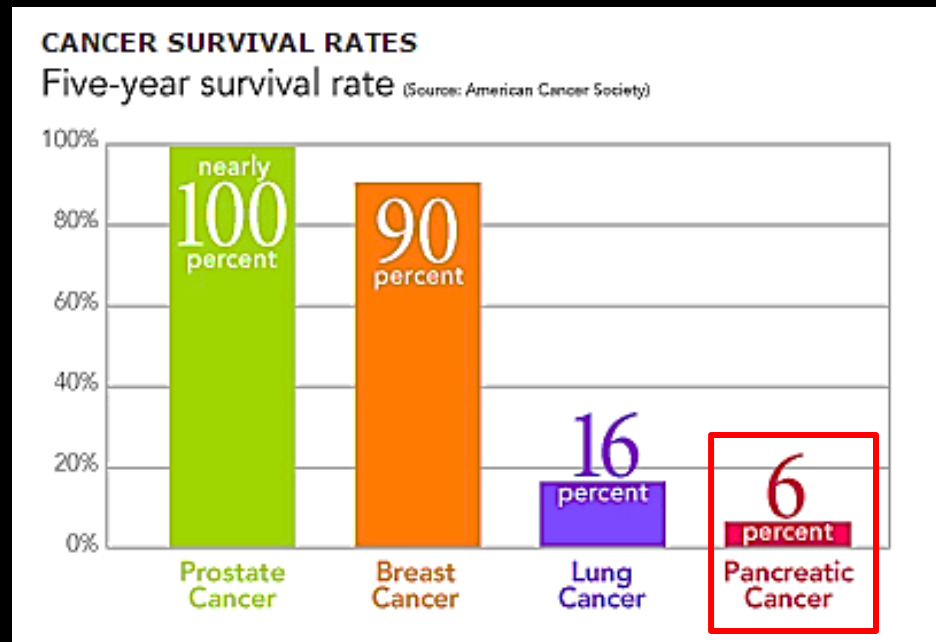
Holder for 6 population ("6-way") sorting



How can we use this
technology for
cancer research?

Pancreatic cancer

3rd leading cause of cancer related deaths in the US



Lowest
survival rate

Better treatments are needed

Cancer MOONSHOT

US Cancer Moonshot Initiative..

"... coalition formed to accelerate next generation immunotherapy"

using patient's own Cancer Supporting

in what **cells** immune system are present?
to attack cancer

cancer?

their

roles?

what is the

significance

of each cell?

ies

environment

"immunosuppressive"

are they

interacting?



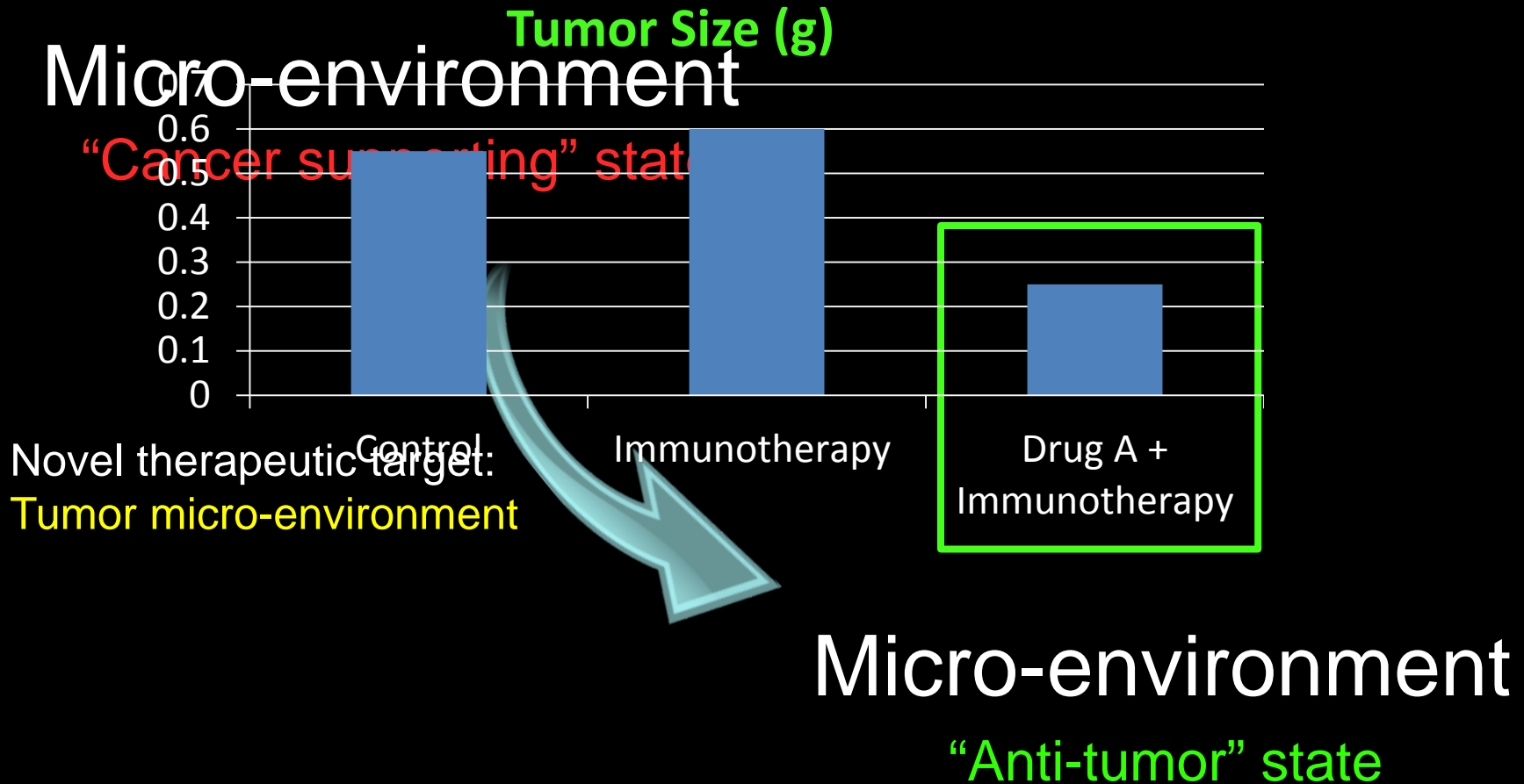
Cells of the tumor micro-environment



Informing novel therapy design

Novel therapies for pancreatic cancer

Morgan Truitt, PhD – Laboratory of Dr. Ronald Evans



Unraveling complex biology

Disease model

e.g. pancreatic cancer

Dissected complexity

e.g. why can't the immune system attack?

Develop novel strategies

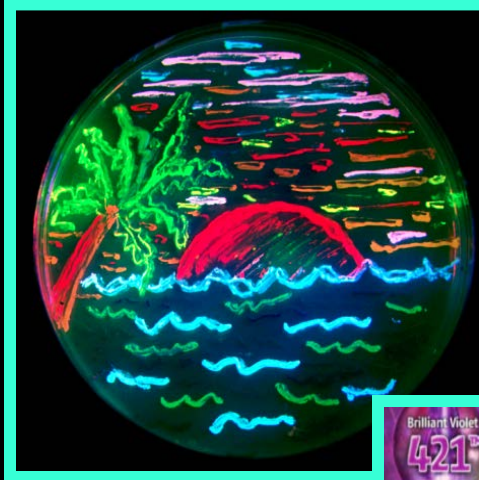
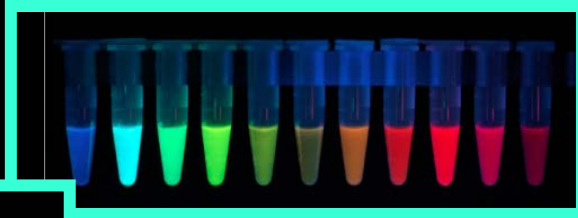
e.g. target the tumor micro-environment



Multi-color flow cytometry

A technology paradigm

Fluorescent protein engineering



Fluorescence Technology

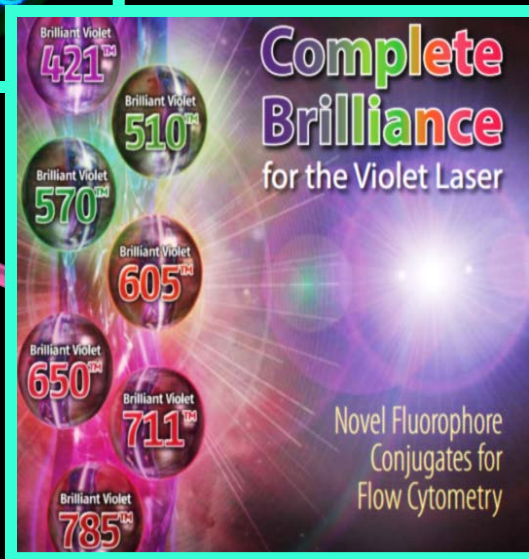
Instrumentation

Accelerated discovery

20 channels: cell sorter



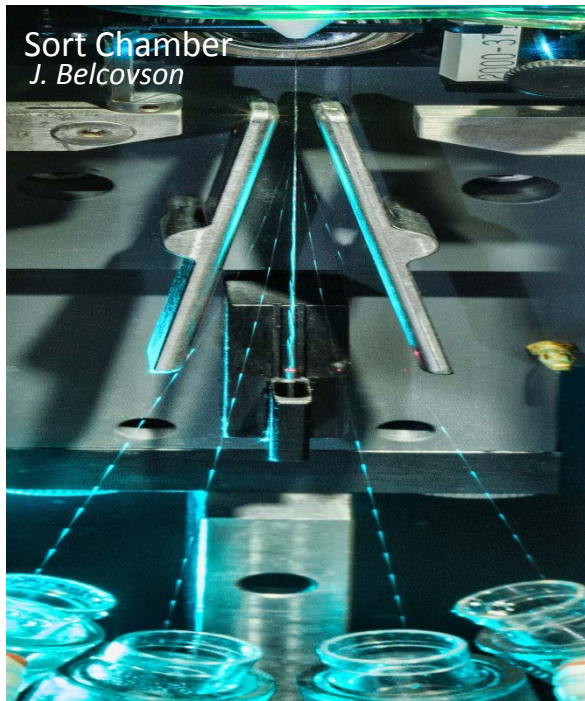
Novel Fluorescent Polymers: Nobel Prize winning technology (2000)



50 channels: analytical cytometer

col
ata

Acknowledgements



Flow Cytometry Core Facility

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Angelee Ferber

Pancreatic Cancer Project

Morgan Truitt, Evans Laboratory

We are supported by:





Carolyn O'Connor

Managing Director
Flow Cytometry Core

In her role at the Flow Cytometry Core facility, Carolyn aims to foster a collaborative and educational environment dedicated to supporting Salk scientists in their efforts to realize research goals through the use of analytical and sorting technologies. Carolyn has extensive flow cytometry experience to leverage, from time spent working in both academic and industrial settings. Prior to moving to California, Carolyn worked in London for leading UK cancer research and awareness charity, Cancer Research UK (CRUK), at their London Research Institute's Fluorescence Activated Cell Sorting (FACS) Laboratory. Here she assisted scientists with a diverse range of sample types and analytical flow techniques including cell cycle, proliferation, apoptosis and multi-colour flow assays, offering training and support on experimental design and execution, data analysis, as well as running cell-sorting experiments. Most recently, Carolyn managed the 11 cytometer-equipped Flow Core at local San Diego biotech company, BioLegend Inc., where she directed all aspects of the core's operations. Following her beliefs that sustainable high productivity requires a safe, and harmonious work environment with reliable instrumentation, she focused on identifying and resolving productivity impacting bottlenecks, whilst implementing SOPs and providing user training and support in current methodologies. It is also with the users in mind that Carolyn designed the company's new Flow Core facility in Mira Mesa, which opened in January 2012. In addition to her key responsibilities, Carolyn provided technical expertise to Sales and Marketing colleagues, and played a key role in R&D where she participated in novel flow cytometry reagent development and Custom Solutions Team projects.



NW Australia



..with my BFF!



Beer signs @ Thorn St Brewery

ROAD DAY



Central Australia



...family photo!



Galicia, Spain

Carolyn O'Connor
Managing Director, Flow Cytometry Core