



70th Annual Greater San Diego Science & Engineering Fair

Awards Ceremony

March 14th, 2024



Welcome to the 70th Annual Greater San Diego Science & Engineering Fair

**Awards Ceremony— San Diego Air and
Space Museum**

March 14, 2024

Opening Remarks

Steve Rodecker







Welcome to the 70th Annual Greater San Diego Science & Engineering Fair Awards Ceremony

March 14th, 2024

DirFair Director's Remarks

Steve Rodecker



Special Thanks and Gratitude to the Management Committee

BOARD OF DIRECTORS:

Dr. Earl Williams, Naval Information Warfare Systems Command, GSDSEF Board President

Mrs. Vickie Driver, Zim Biosciences

Dr. Donna Kritz-Silverstein, UCSD

Mr. William Proffer, Leidos, retired

Mr. Sam Ferguson, Lockheed Martin

Mr. Sany Zakharia, Qualcomm

MANAGEMENT COMMITTEE:

Steve Rodecker, Fair Director



Sany Zakharia, Treasurer, Fundraising

Vickie Driver, Judging
Coord



Earl Williams, Grand Award Judging, Tech



Rose Armour, Screening

◆ **Sejal Pabari**, Professional Societies Awards

◆ **Sam Ferguson**, Awards AV



Douglas Smith, Hospitality



True Xiong, Volunteers

Jessica Ulliyot, Screening, Store



Donna Kritz-Silverstein, Screening



Laura McWilliams, Parking

William Proffer



Diane Vermeulen



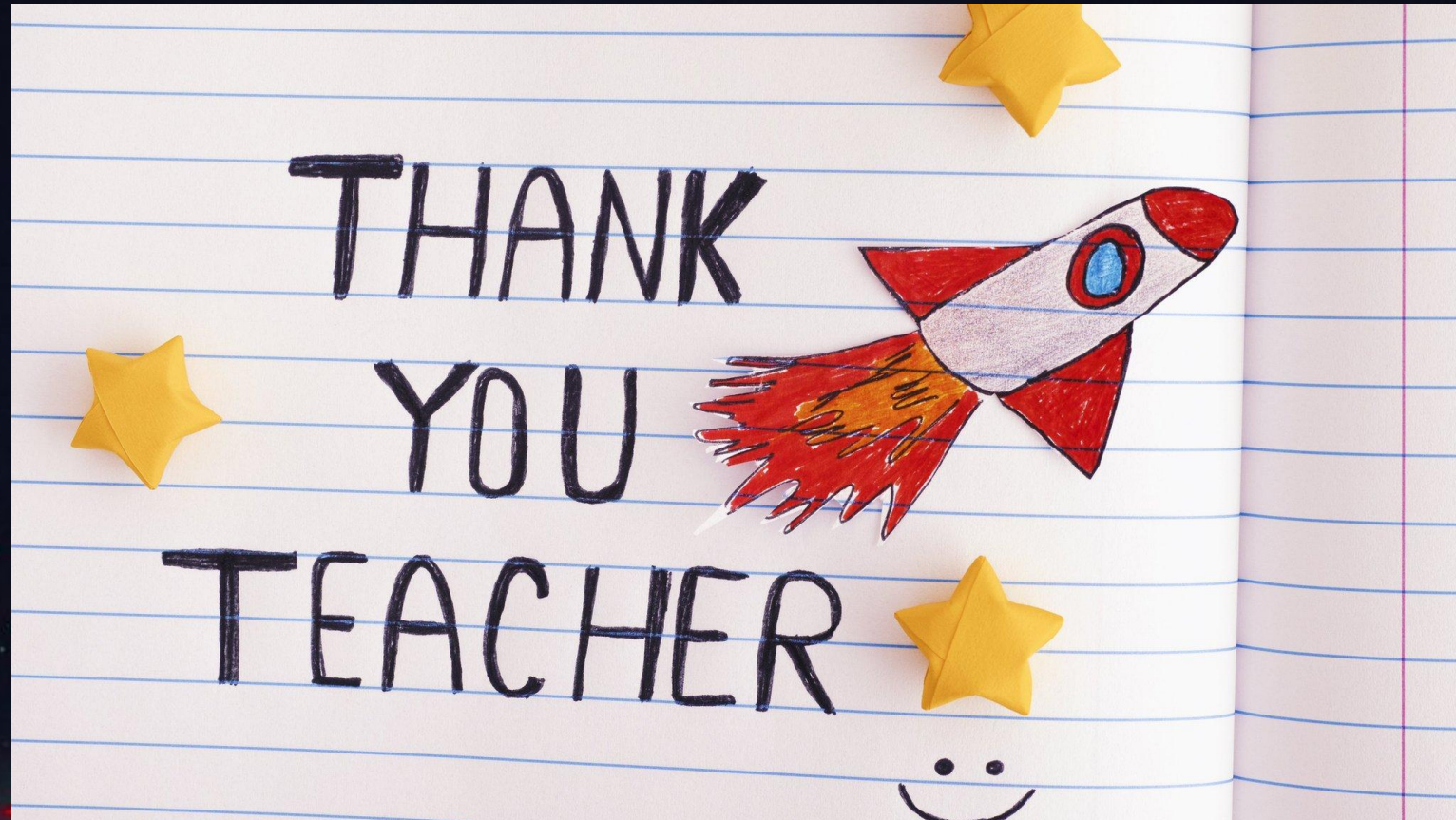
Hal Slater -Size and Safety

8

Dr. Irwin Jacobs
CEO, Qualcomm
Retired

The background of the slide is a dark, deep blue or black space. In the lower half, there are dynamic, glowing trails of particles. One trail is a bright teal or cyan color, curving from the bottom left towards the center. Another trail, composed of smaller, more numerous particles, is a vibrant red color, following a similar but slightly higher and more dispersed path. The overall effect is reminiscent of a cosmic nebula or a high-speed data visualization.

Special Thanks and Gratitude to the Teachers





**THANK YOU
PARENTS**



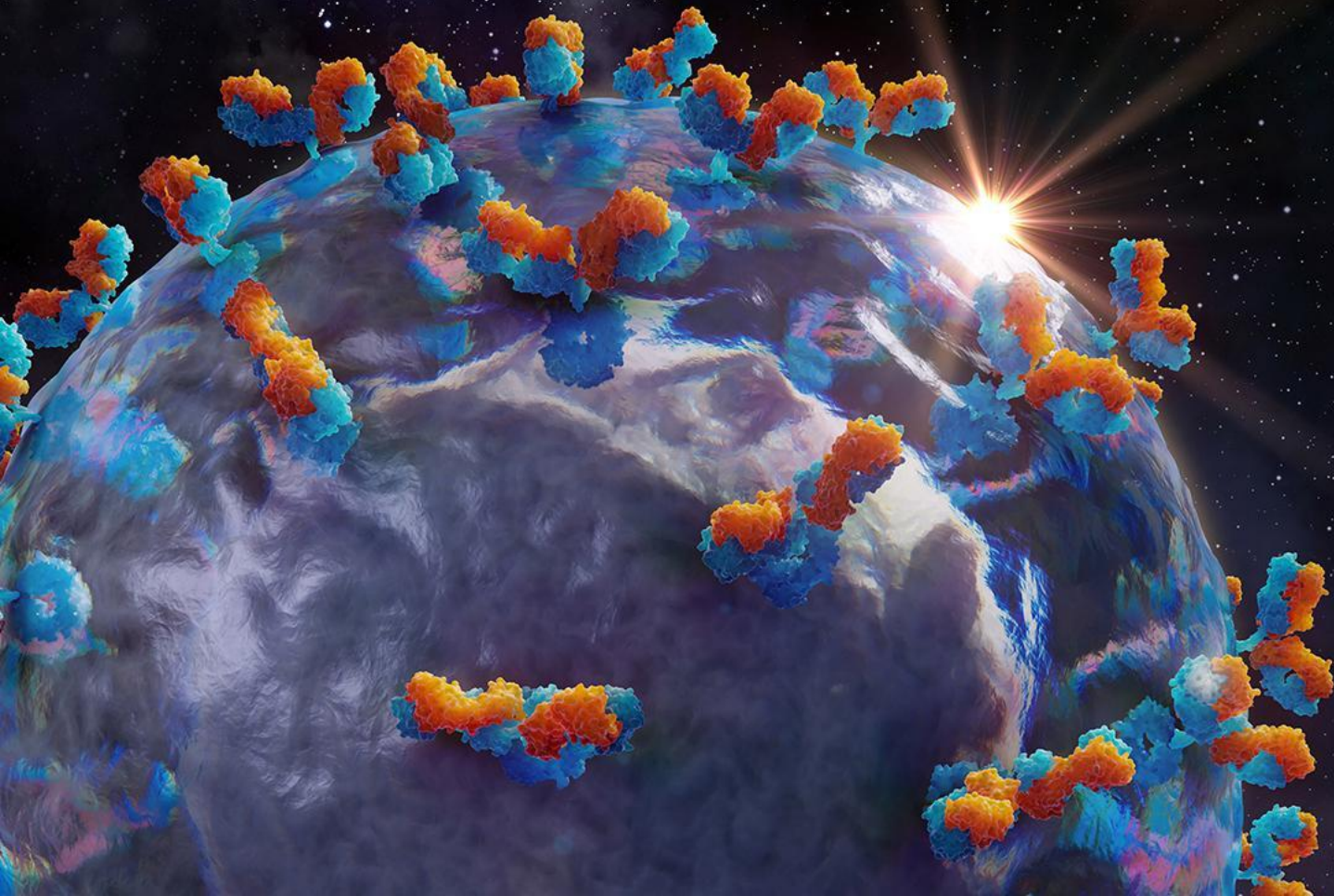
BD

Flow Cytometry: At the Intersection of Science and Technology

Alan Stall

Greater San Diego
Science and Engineering Fair
San Diego

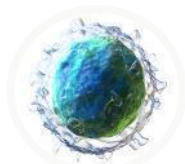
March 14, 2024



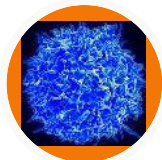
BD Biosciences – a Business Unit of BD

*Transforming **cell analysis** in discovery, translational and diagnostics through innovative and integrated solutions*

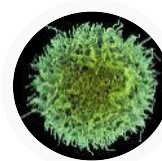
Billions of cells are
present in the human
blood



10 billion B-cells



1 billion T-cells



2+ billion
NK Cells

Our solutions enable
comprehensive characterization
'one cell at a time'

Flow
Cytometers



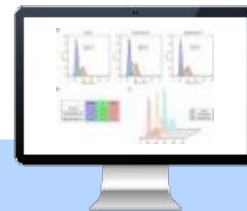
Cell Sorters



Cell
Analyzers



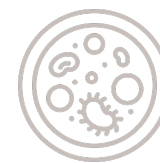
Research Reagents



Informatics

We serve doctors and scientists
from discovery to diagnostics

DISCOVERY



Immunology
Cell Biology
Genomics



TRANSLATIONAL



Immuno-Oncology
Cell Therapy
Drug Discovery



CLINICAL DX & MONITORING



HIV
COVID-19
Leukemia & Lymphoma
Minimal Residual
Disease



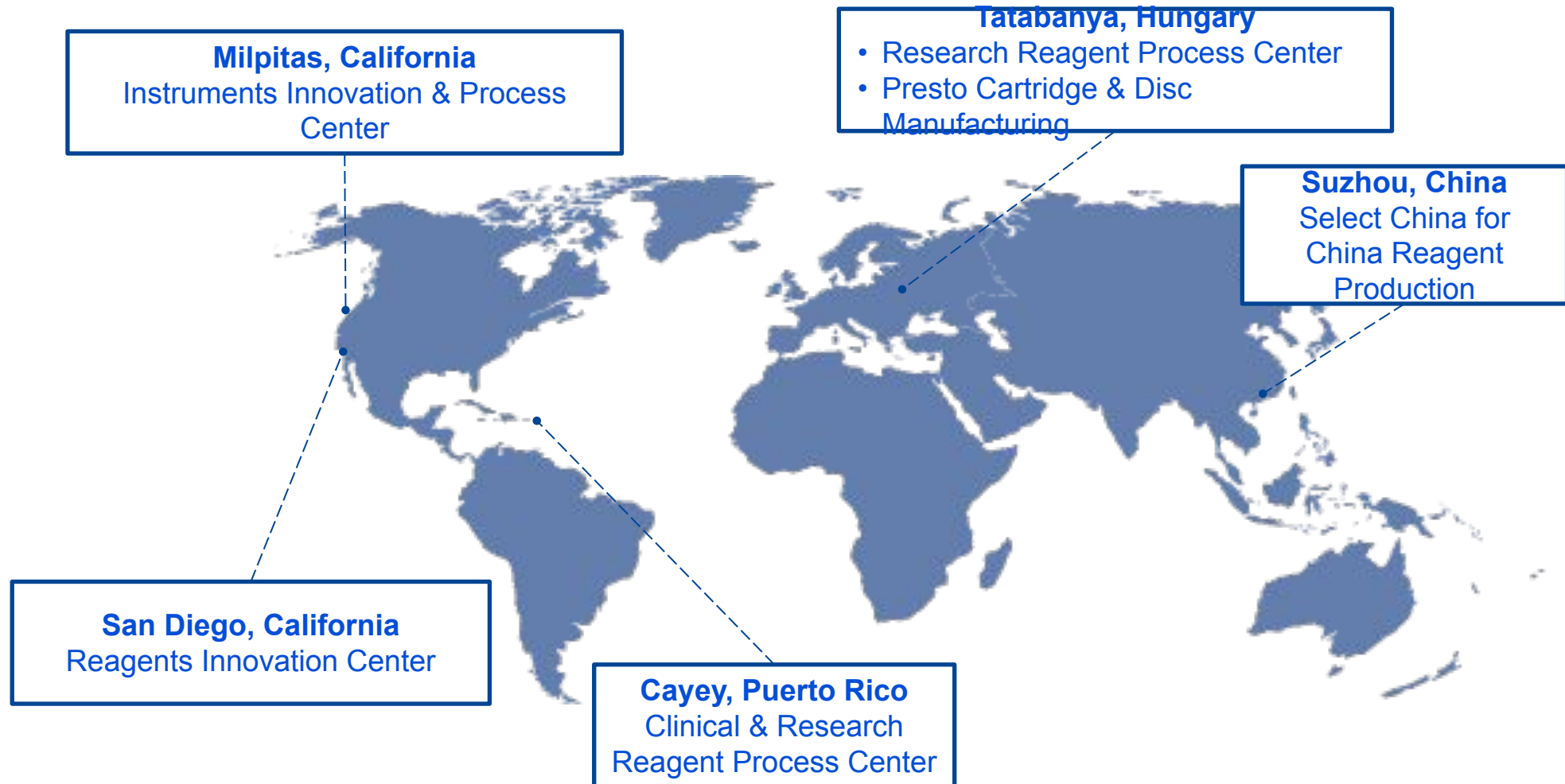
BD Biosciences has a global presence, across reagent and instrument operations



3,100+
Associates



92
Cities Globally



Themes – Science and Technology

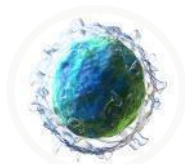
- Most advances in science are enabled by discoveries in multiple areas of technology
- Most advances in technology will have impacts on multiple areas of science
- We'll use Flow Cytometry as an example



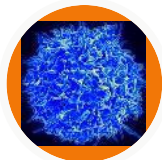
Flow Cytometry – A Technology Tool for Scientific Discovery

*Transforming **cell analysis** in discovery, translational and diagnostics through innovative and integrated solutions*

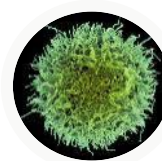
Billions of cells are
present in human blood



10 billion B-cells



1 billion T-cells



2+ billion
NK Cells

Blood is one of the most complex organs of the body. It has billions of cells with dozens of different types, each serving a different function in maintaining your immune system to fight disease.

Immunology is the **science** of how all the cells in the blood work together to fight off diseases from viruses, bacteria and cancer.

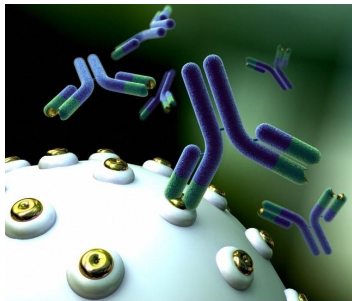
Flow cytometry is a **technology** that allows us to rapidly analyze 1000s of single blood cells per second as they flow past multiple lasers.

Each cell is analyzed for multiple fluorescence parameters to determine the type and function of the cell.

Flow Cytometry: At the Intersection of Science and Technology

Monoclonal Antibodies

Molecules that can bind and tag proteins on cell surfaces



Based upon 1984 Nobel Prize in Medicine



Fluorescent Polymer Dyes

Molecules that emit light when hit with a laser

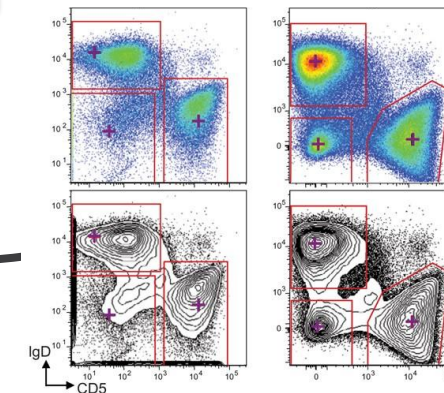
Based upon 2000 Nobel Prize in Chemistry

Flow Cytometry

Inkjet printers



Instruments (Cytometers)



Computer Science

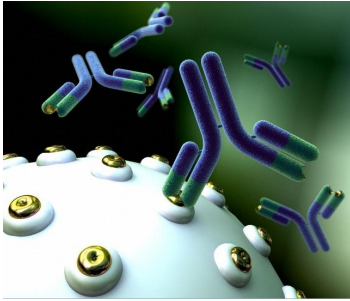
How to analyze and display 100,000s pieces of data

Flow Cytometry: At the Intersection of Science and Technology

Monoclonal Antibodies

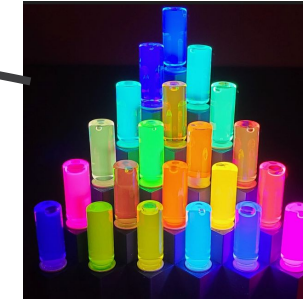
Molecules that can tag proteins on cell surfaces

Based upon 1984 Nobel Prize in Medicine



Fluorescent Polymer Dyes

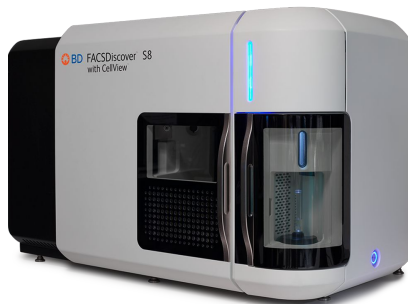
Molecules that emit light when hit with a laser



Based upon 2000 Nobel Prize in Chemistry

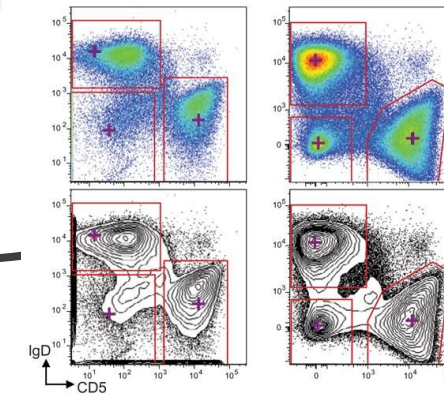
Flow Cytometry

Instruments (Cytometers)



Computer Science

How to analyze and display 100,000s pieces of data



Monoclonal Antibodies

Based upon 1984 Nobel Prize in Medicine

- Initially used for scientific research (Cytometry)
- Now the basis for over 125 approved clinical drugs

Humira- Auto-immune diseases

Enbrel- Auto-immune diseases

Skirizi- Psoriasis

Entvio- Crohn's disease

Keytruda- Multiple forms of cancer

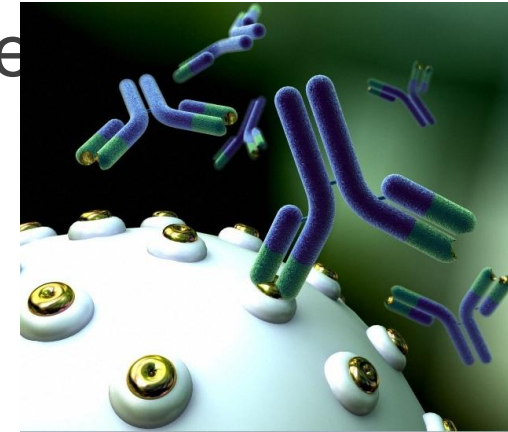
Avastin- Multiple forms of cancer

Herceptin- Breast Cancer

Prolia- Osteoporosis

Hemlibra- Hemophilia

Xevudy- Anti-Covid-19

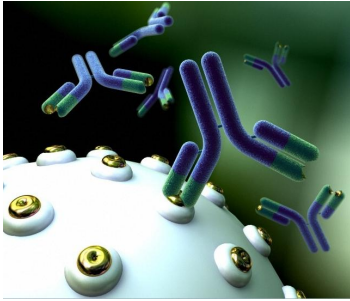


Flow Cytometry: At the Intersection of Science and Technology

Monoclonal
Antibodies

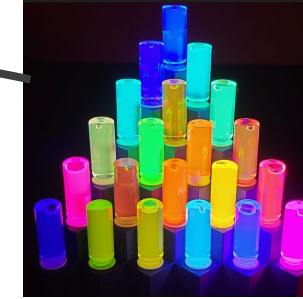
Molecules that
can tag proteins
on cell surfaces

Based upon 1984 Nobel Prize in Medicine



Fluorescent Polymer
Dyes

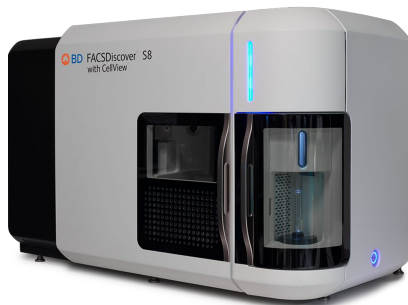
Molecules that emit light
when hit with a laser



Based upon 2000 Nobel Prize in Chemistry

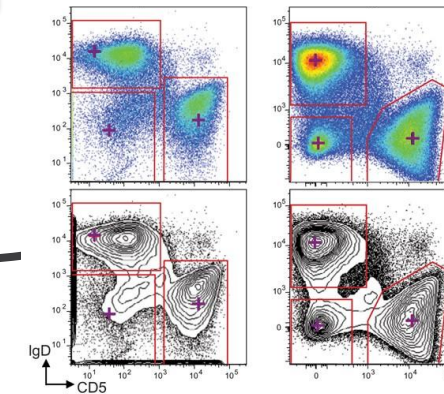
Flow Cytometry

Instruments
(Cytometers)



Computer Science

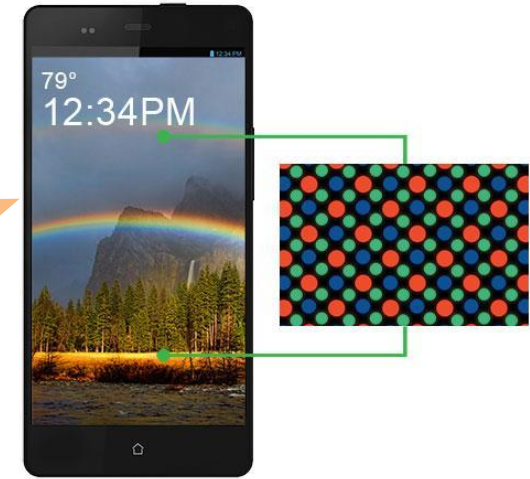
How to analyze and display
100,000s pieces of data



Organic Fluorescent Polymers Have Become Part of Everyday Life



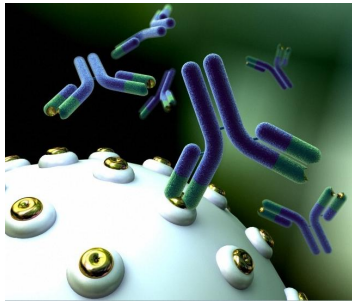
Organic Light Emitting Diodes
(OLED) Screens



Flow Cytometry: At the Intersection of Science and Technology

Monoclonal Antibodies

Molecules that can tag proteins on cell surfaces



Based upon 1984 Nobel Prize in Medicine

Fluorescent Polymer Dyes

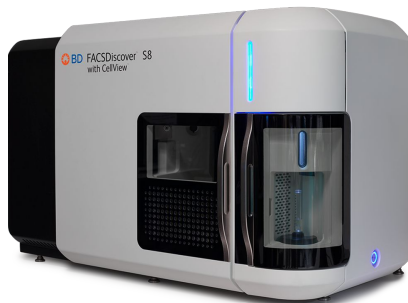
Molecules that emit light when hit with a laser



Based upon 2000 Nobel Prize in Chemistry

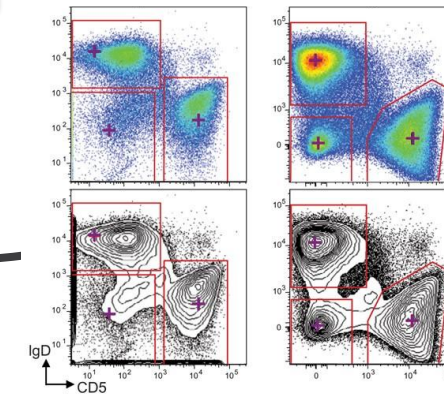
Flow Cytometry

Instruments (Cytometers)



Computer Science

How to analyze and display 100,000s pieces of data



Instruments- Improvements in Technology Never Stops

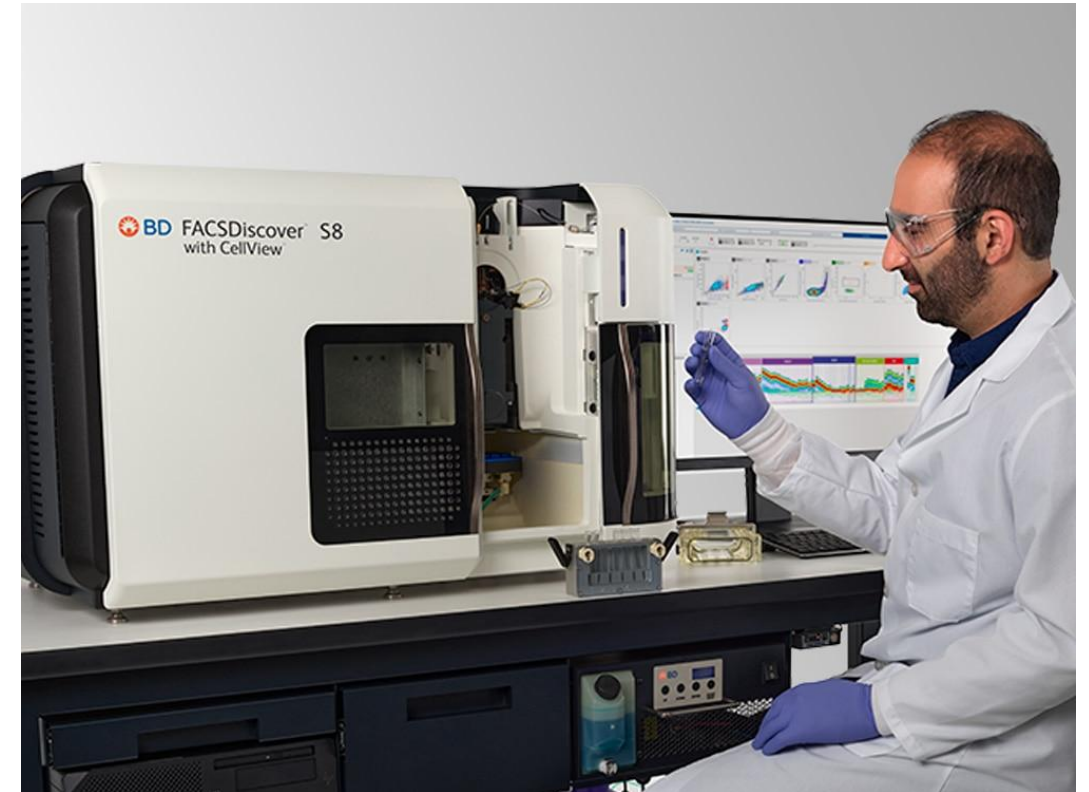
1974

Size of a room
One laser – 1 color

50 Years

Tabletop
Five lasers – 50 colors- 10X more sensitive

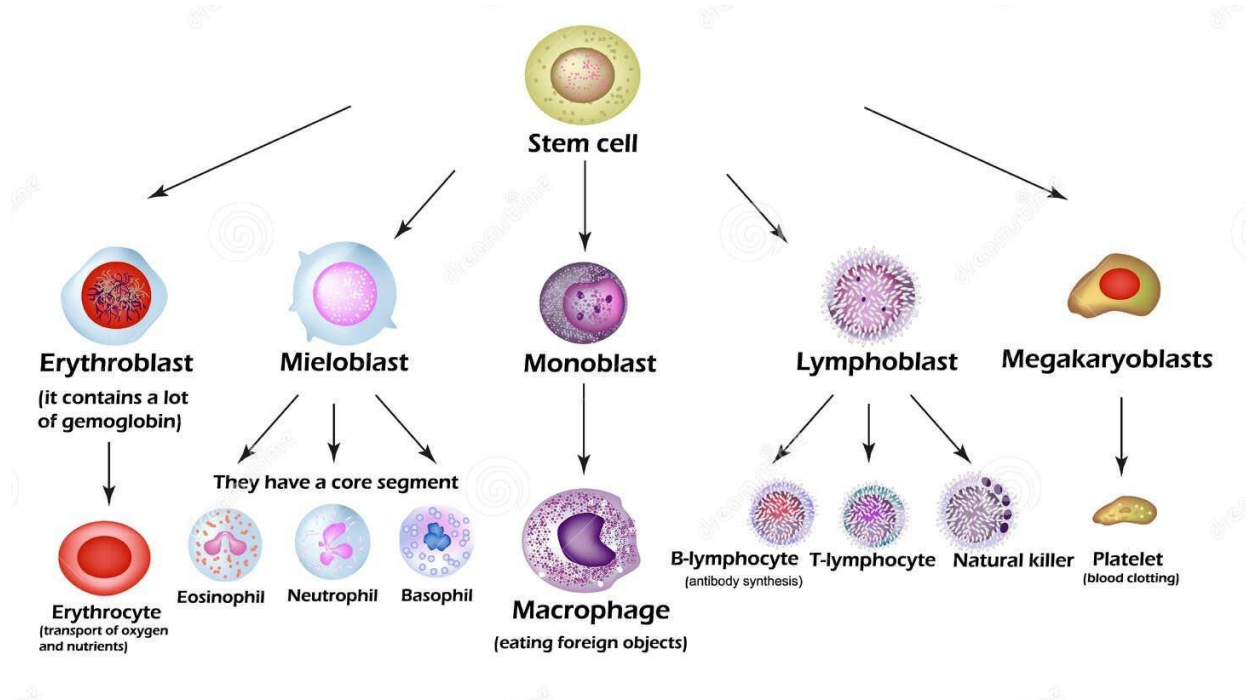
2024



Every person has an immune repertoire fingerprint

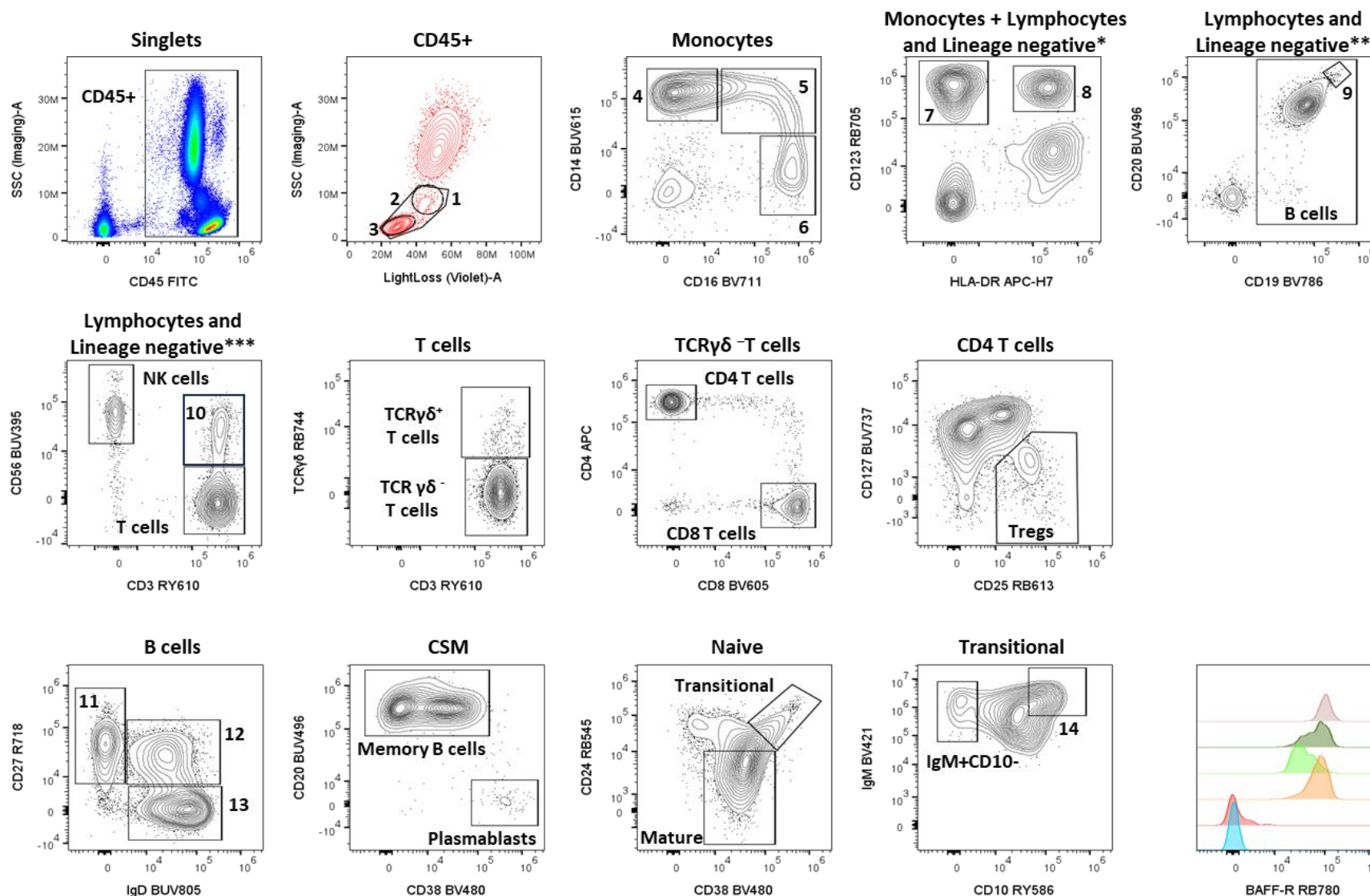


Blood
Samples



Proteomic or
Receptor
Signature

Flow Cytometry Can Look at That Fingerprint



1. Monocytes
2. Monocytes + Lymphocytes
3. Lymphocytes
4. Classical Monocytes
5. Intermediate Monocytes
6. Non-classical Monocytes
7. Basophils
8. Plasmacytoid Dendritic Cells (pDCs)
9. CD20^{bright}CD19^{bright}
10. CD56+ CD3+ cells
11. Class-switched memory B cells (CSM)
12. IgM memory B cells
13. Naïve B cells
14. IgM^{high}CD10^{high}

*Lineage negative: CD14, CD16, CD3, CD56, CD19, CD20.

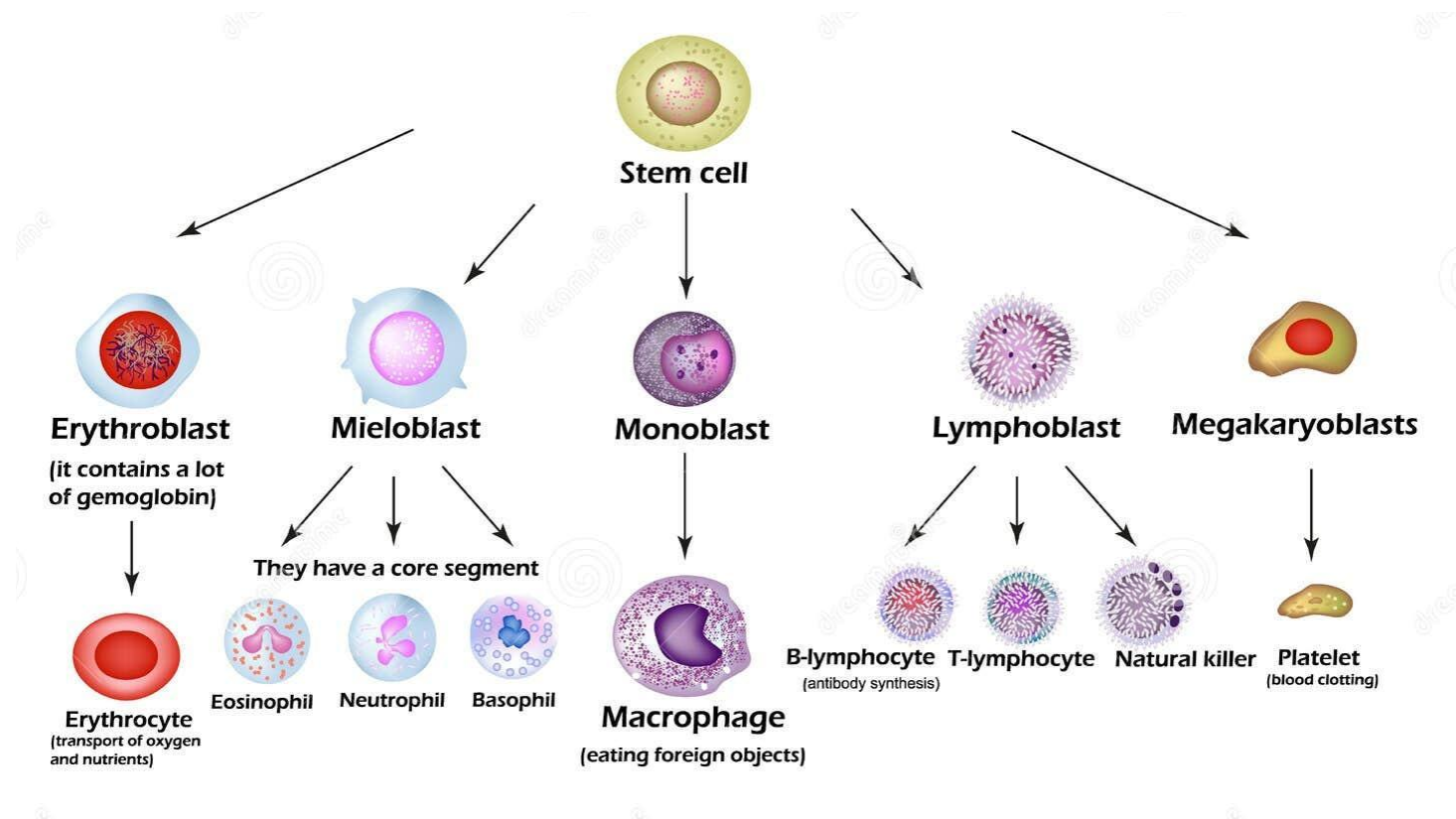
**Lineage negative: CD3, CD56.

***Lineage negative: CD19, CD20

Subset Name	
IgM+CD10-	
IgM ^{high} CD10 ^{high}	
CD20 ^{bright} CD19 ^{bright}	
Memory B cells	
Plasmablasts	
NK cells	

How Has Flow Cytometry Affected Health and Medicine

- For the past 50 years it has been central to our understanding of all of the components of the immune system and how it works
- Flow cytometers are now virtually every hospital and university research center



How Has Flow Cytometry Affected Health and Medicine

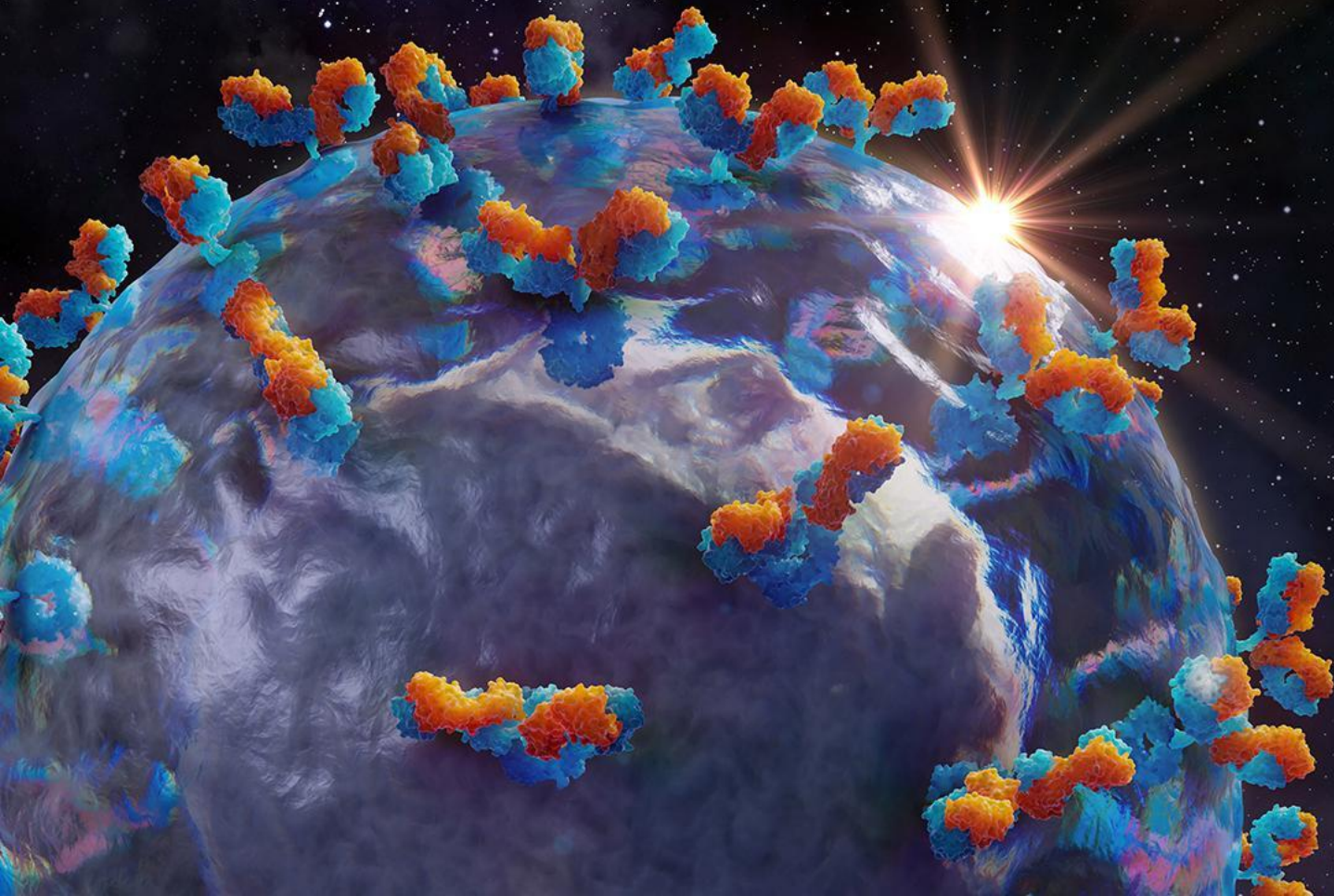
- For the past 50 years it has been central to our understanding of all of the components of the immune system and how it works
- Flow cytometers are now virtually every hospital and university research center
- For 1000s of patients, flow cytometry is a major tool for diagnosing and monitoring
 - HIV/AIDS
 - Leukemia /Lymphomas treatment (MRD)
helps in determining treatment
 - Auto-immune disease (RA, Crohn's etc.)
- Key in the development of new clinical drugs for cancer treatment
- Measuring Air pollution
- Measuring water contamination

Final Remarks

- Flow cytometry is just one of thousands of examples of how together science and technology work together to improve our lives.
- Your opportunities are unlimited
- The advancements in technology and science are rapidly expanding
- There are hundreds of fields in both science and technology where you can have an impact on the quality of life for the future.
- Continue developing the education, knowledge, and learnings you have shown in this Science Fair

Thank You

The Next Generation
of
*Scientific and
Technology
Innovators*





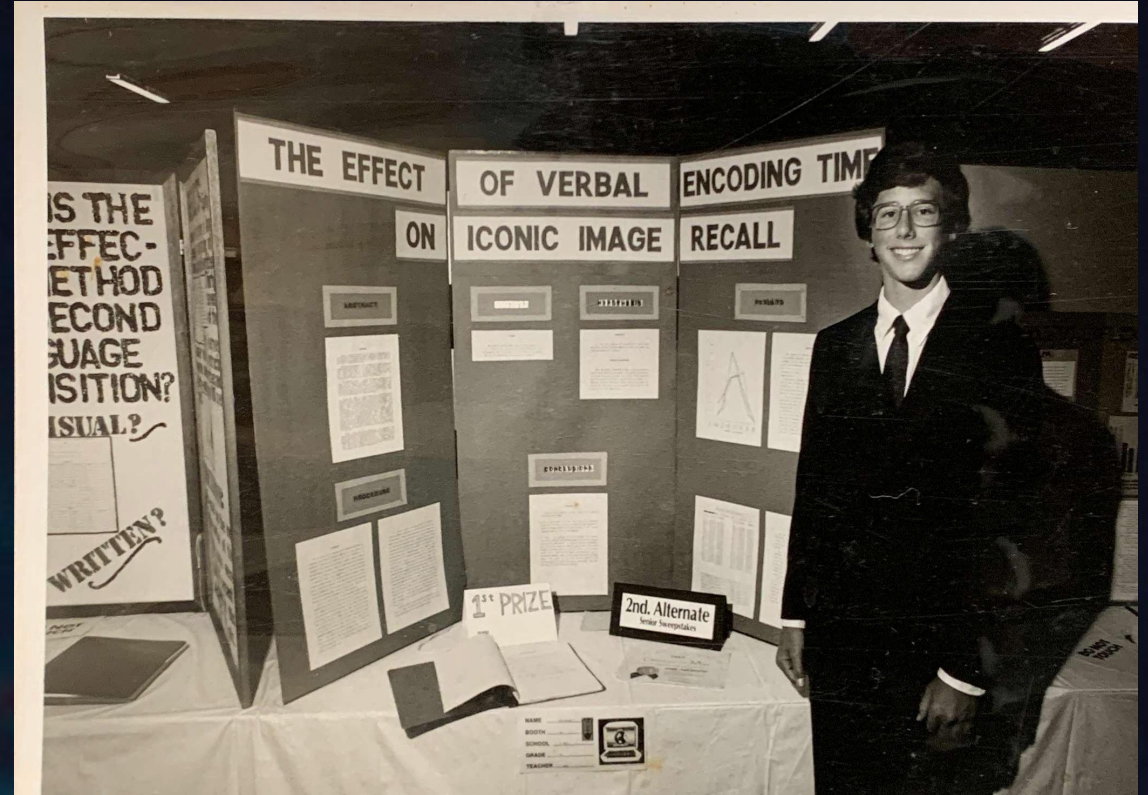
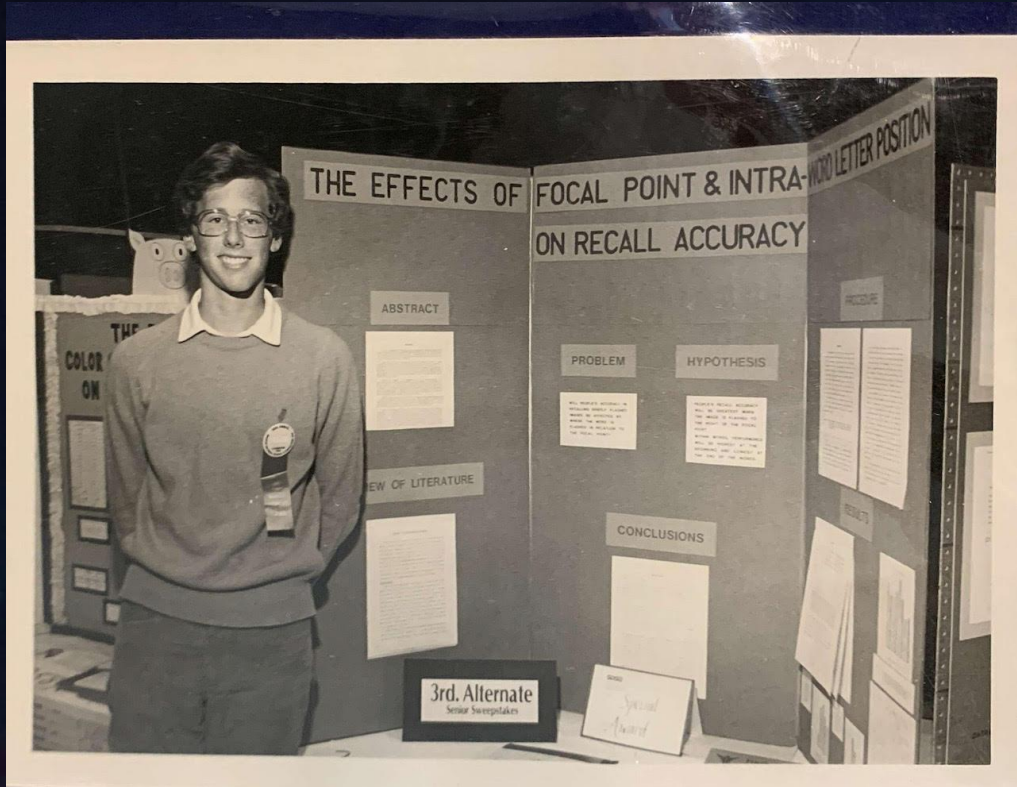
Saturday and Sunday Schedule

- Saturday 10:00am – 1:00pm, Open House – Bring the Family!
- Saturday, 1pm -3pm- Projects can be removed.
- Sunday, 10am-1pm– Projects can be removed.
- Pre-ordered T-Shirts can still be picked; gift shop available
- Showcase is available on zFairs starting next week.

Dr. Earl Williams

GSDSEF Board of Directors, President

Naval Information Warfare Systems Command





Introduction of Awards