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


ThermoFisher
SCIENTIFIC


BD


Qualcomm


BROADCOM
FOUNDATION


SCIENCES EDUCATION FOUNDATION
GENERAL ATOMICS


WALTER J.
& BETTY C.
ZABLE
FOUNDATION


ASML


PE
CG
PROFESSIONAL ENGINEERS
IN CALIFORNIA GOVERNMENT


SOCIETY
FOR SCIENCE


Takeda


Pfizer


DRS DAYLIGHT
SOLUTIONS


Taiwanese American Foundation of San Diego
Taiwan Center Community Center


Viasat


Collins
Aerospace


San Diego Zoo
Wildlife Alliance


The City of
SAN DIEGO
Parks and Recreation Department

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 ◆ **Earl Williams**, Grand Award Judging, Tech ◆ **Rose Armour**, Screening Coord

◆ **Sejal Pabari**, Professional Societies Awards ◆ **Sam Ferguson**, Awards AV

◆ **Douglas Smith**, Hospitality ◆ **True Xiong**, Volunteers

Jessica Ullyot, Screening, Store ◆ **Donna Kritz-Silverstein**, Screening ◆ **Laura McWilliams, Parking**

William Proffer ◆ **Diane Vermeulen** ◆ **Hal Slater -**Size and Safety

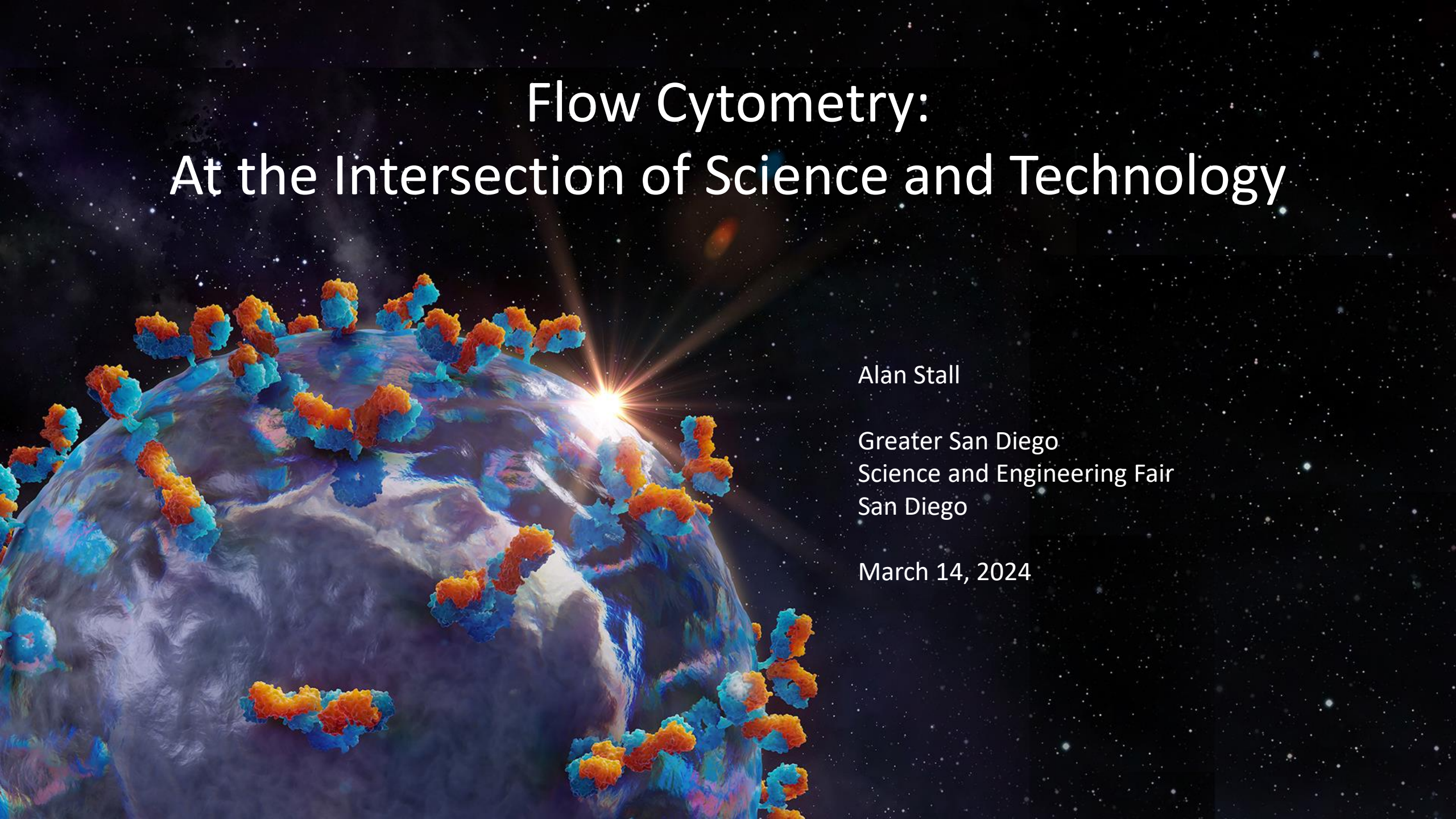
Dr. Irwin Jacobs
CEO, Qualcomm
Retired

Special Thanks and Gratitude to the Teachers


THANK YOU
PARENTS


BD

Flow Cytometry:
At the Intersection of Science and Technology



Alan Stall

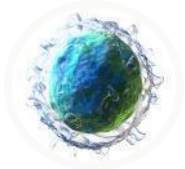
Greater San Diego
Science and Engineering Fair
San Diego

March 14, 2024

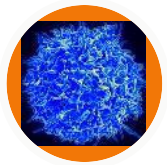
BD Biosciences – a Business Unit of BD

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

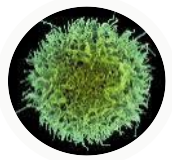
Billions of cells are present in the human blood



10 billion B-cells



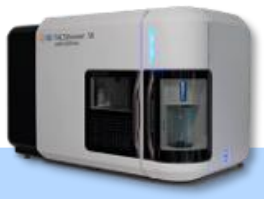
1 billion T-cells



2+ billion NK Cells

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

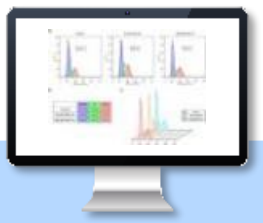
Flow Cytometers



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

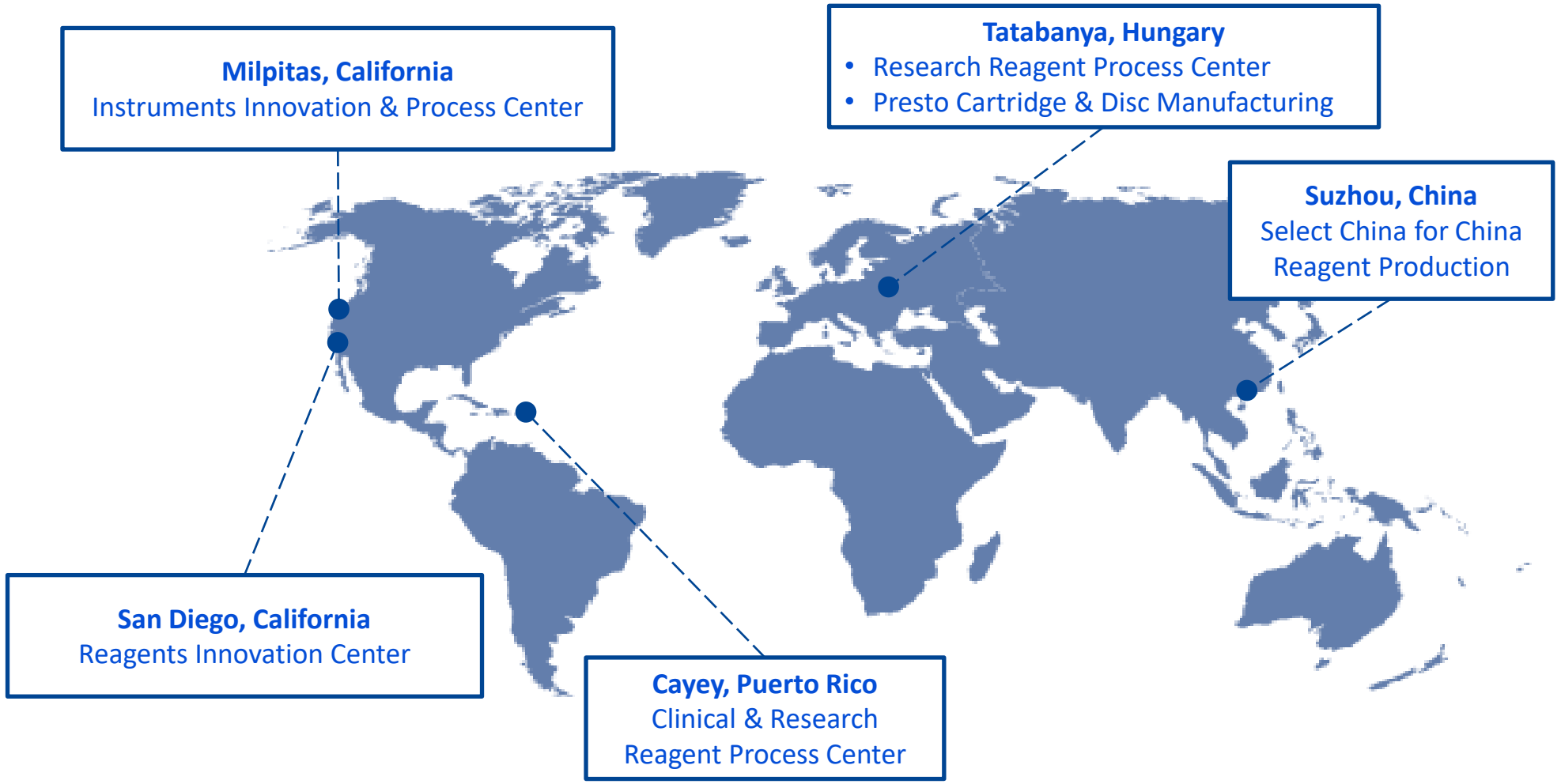
CLINICAL DX & MONITORING

- 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

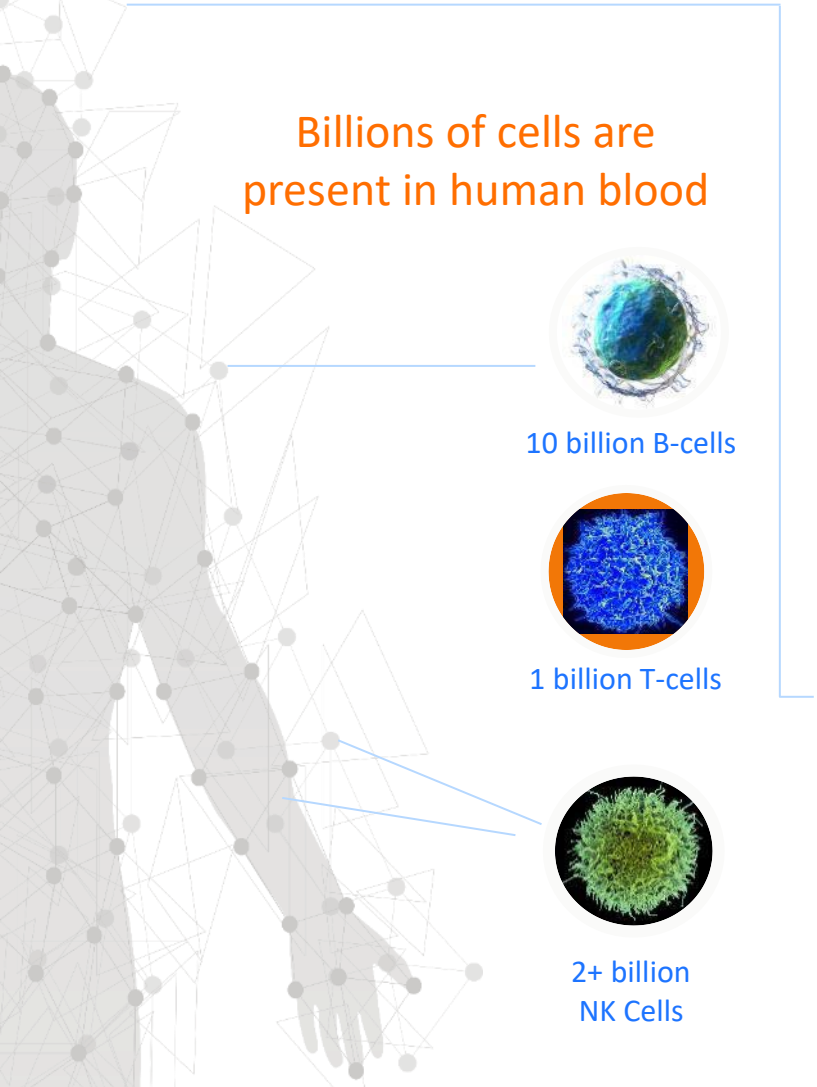


Themes – Science and Technology

- 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*



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.

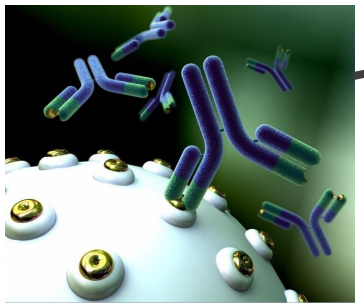
Flow cytometry is a ***technology*** that allows us to rapidly analyze 1000s of single blood cells per second as they flow past multiple lasers.

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

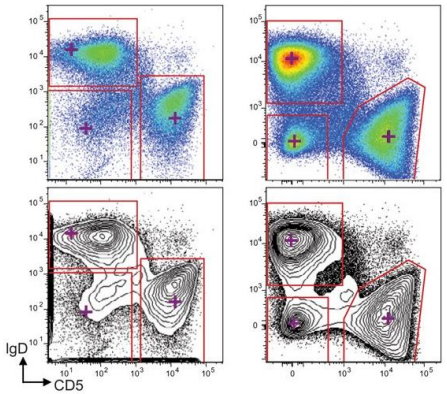
Molecules that emit light when hit with a laser

Based upon 2000 Nobel Prize in Chemistry

Flow Cytometry

Inkjet printers

Instruments (Cytometers)

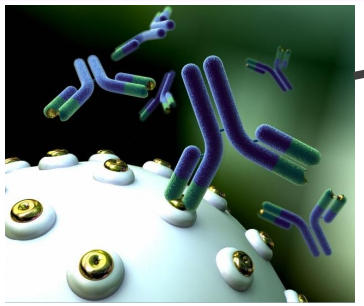


Computer Science

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

Flow Cytometry: At the Intersection of Science and Technology

Monoclonal Antibodies



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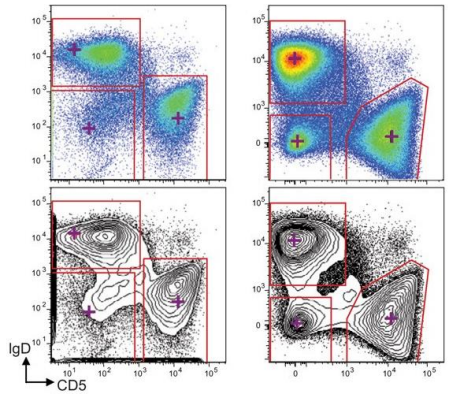

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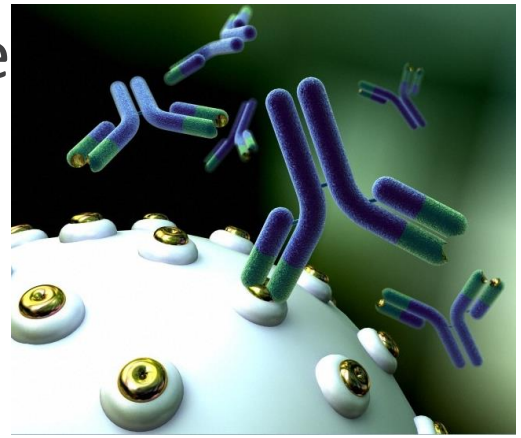
Monoclonal Antibodie



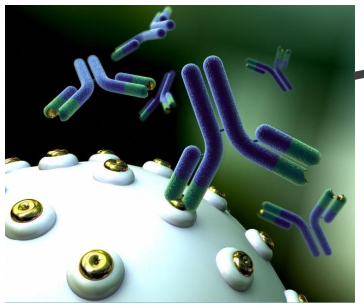
Based upon 1984 Nobel Prize in Medicine

- 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
Entivio- 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



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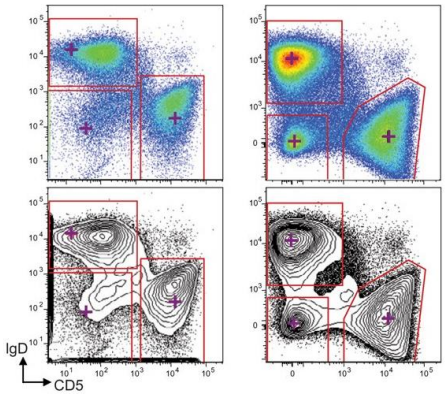

Computer Science

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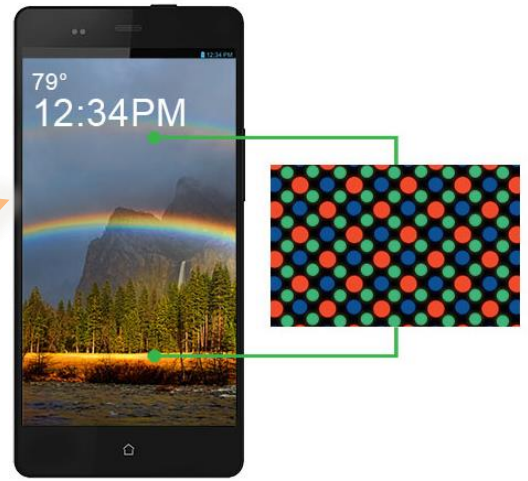
Organic Fluorescent Polymers Have Become Part of Everyday Life

Organic Light Emitting Diodes (OLED) Screens



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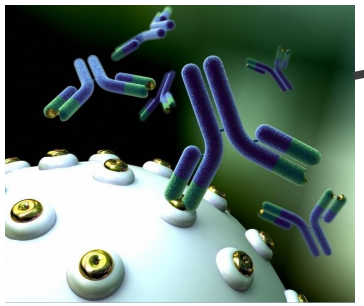

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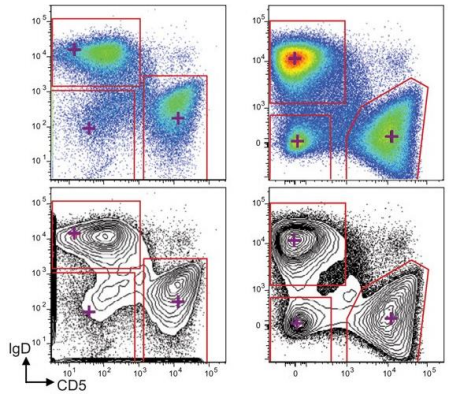


Computer Science

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

BD

Instruments- Improvements in Technology Never Stops

1974

Size of a room

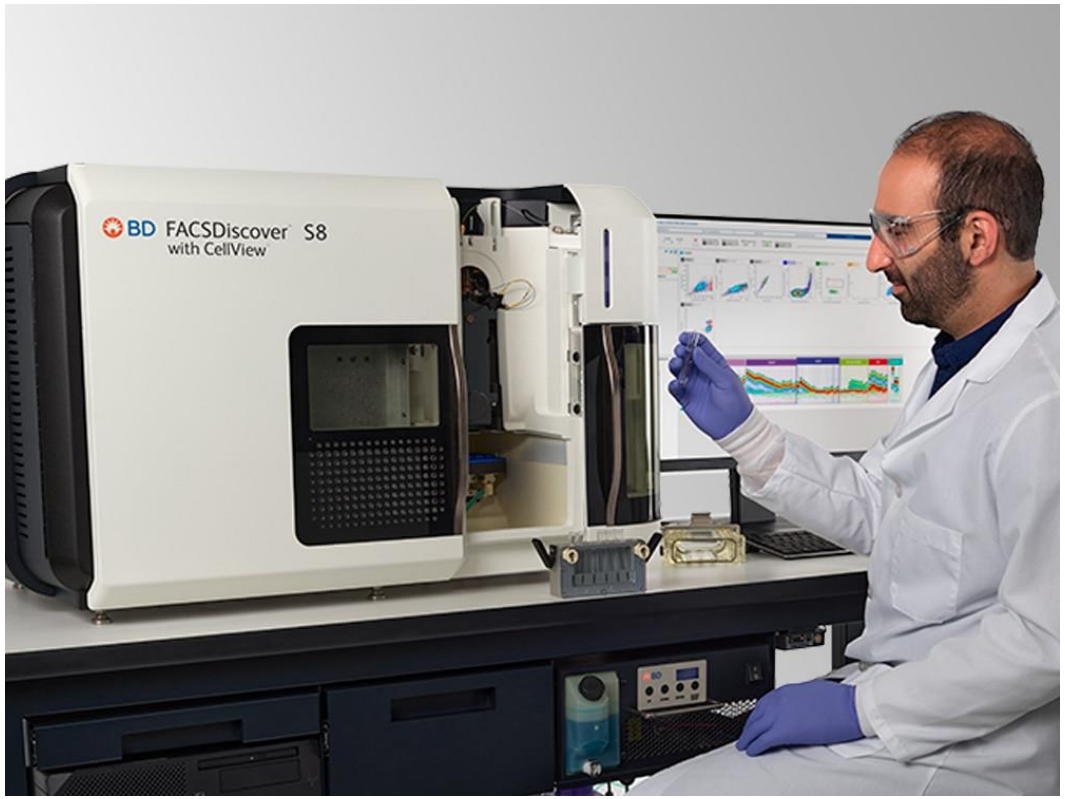
One laser – 1 color

50 Years

2024

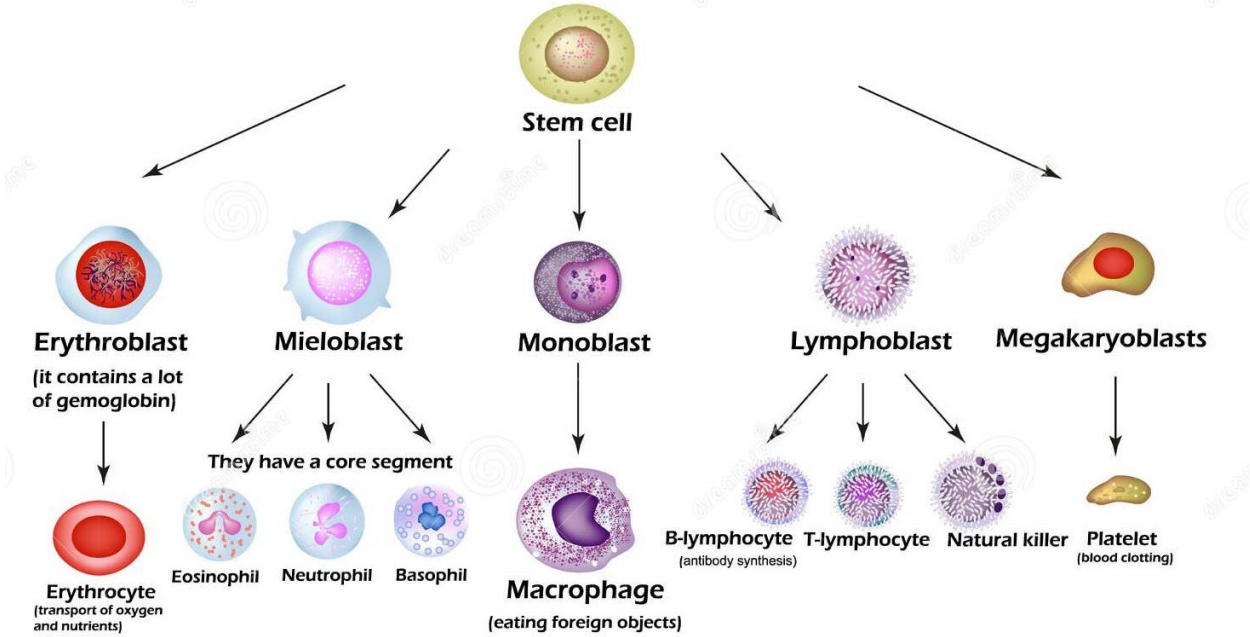
Tabletop

Five lasers – 50 colors- 10X more sensitive



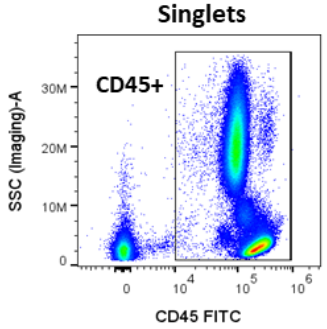
Every person has an immune repertoire fingerprint

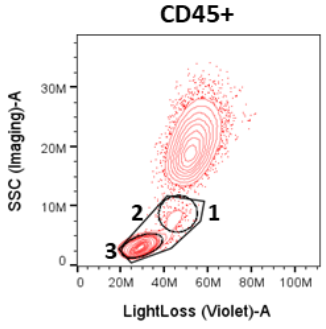
Blood Samples

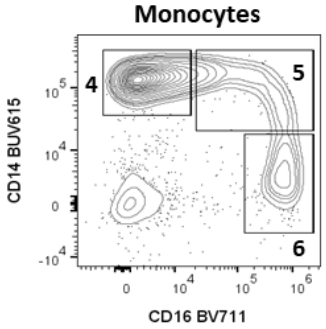


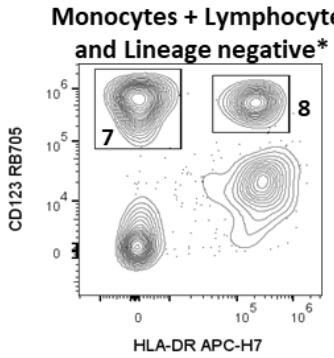
Proteomic or Receptor Signature

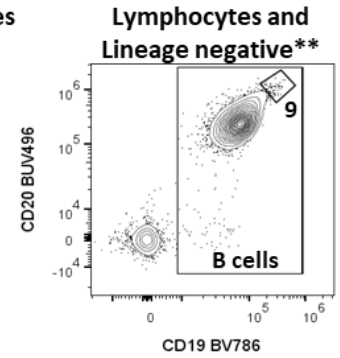
Flow Cytometry Can Look at That Fingerprint

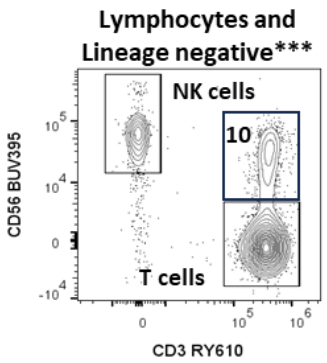


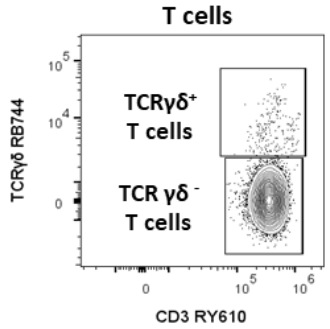


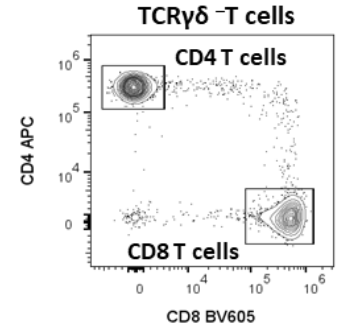


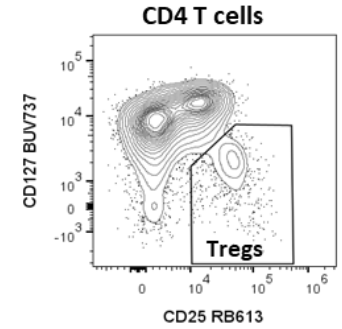


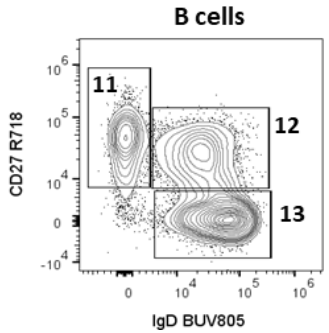


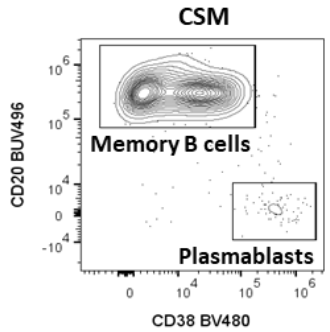


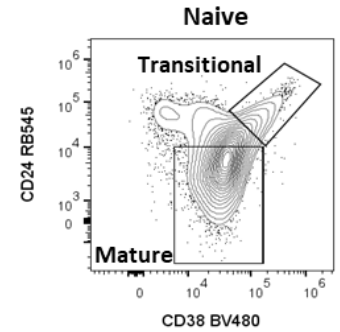


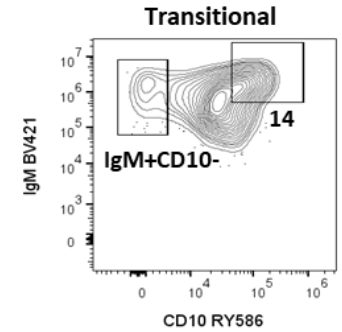


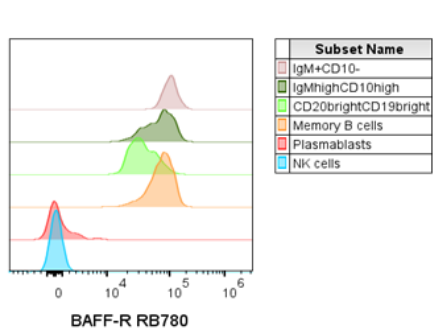












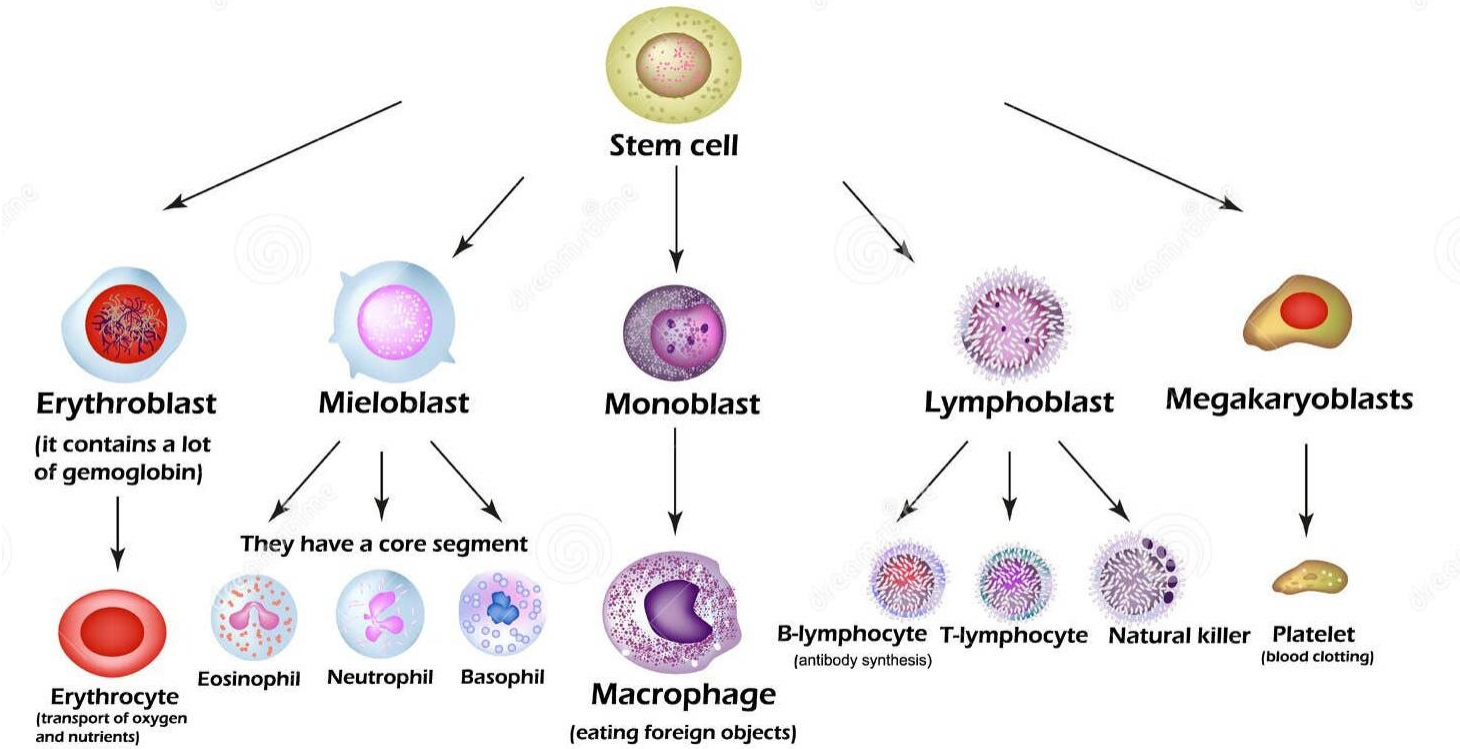
1. Monocytes
2. Monocytes + Lymphocytes
3. Lymphocytes
4. Classical Monocytes
5. Intermediate Monocytes
6. Non-classical Monocytes
7. Basophils
8. Plasmacytoid Dendritic Cells (pDCs)
9. $CD20^{bright}CD19^{bright}$
10. CD56+ CD3+ cells
11. Class-switched memory B cells (CSM)
12. IgM memory B cells
13.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

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

BD

How Has Flow Cytometry Affected Heath 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



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- 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

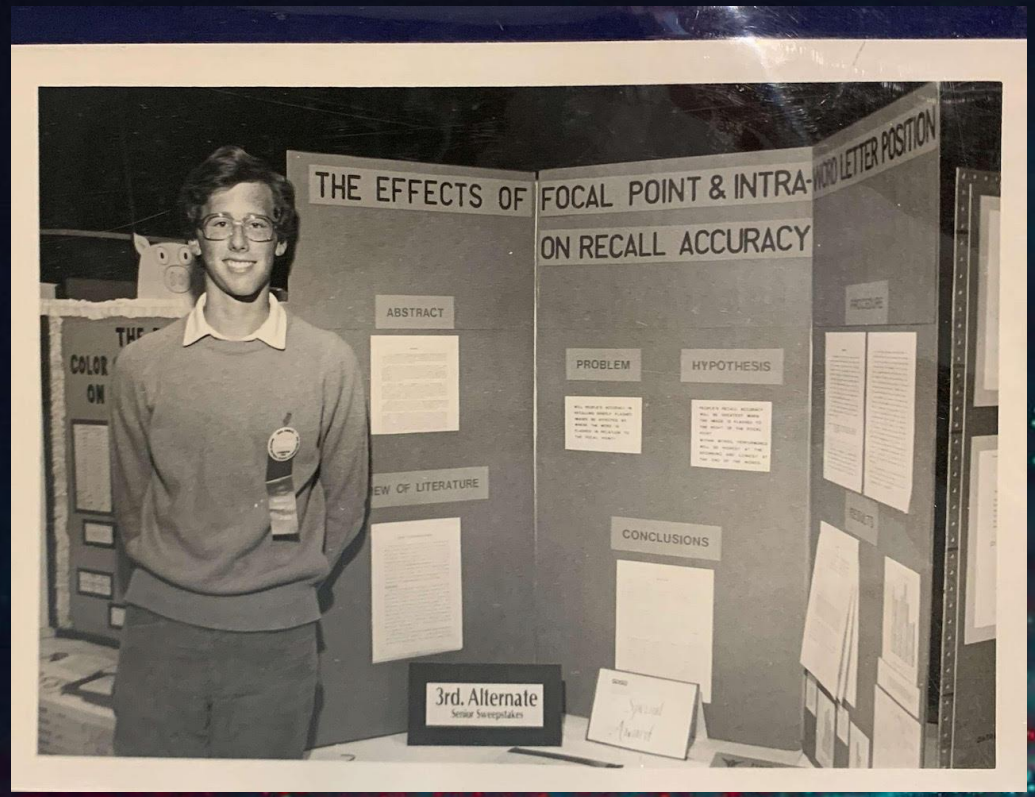
Saturday and Sunday Schedule

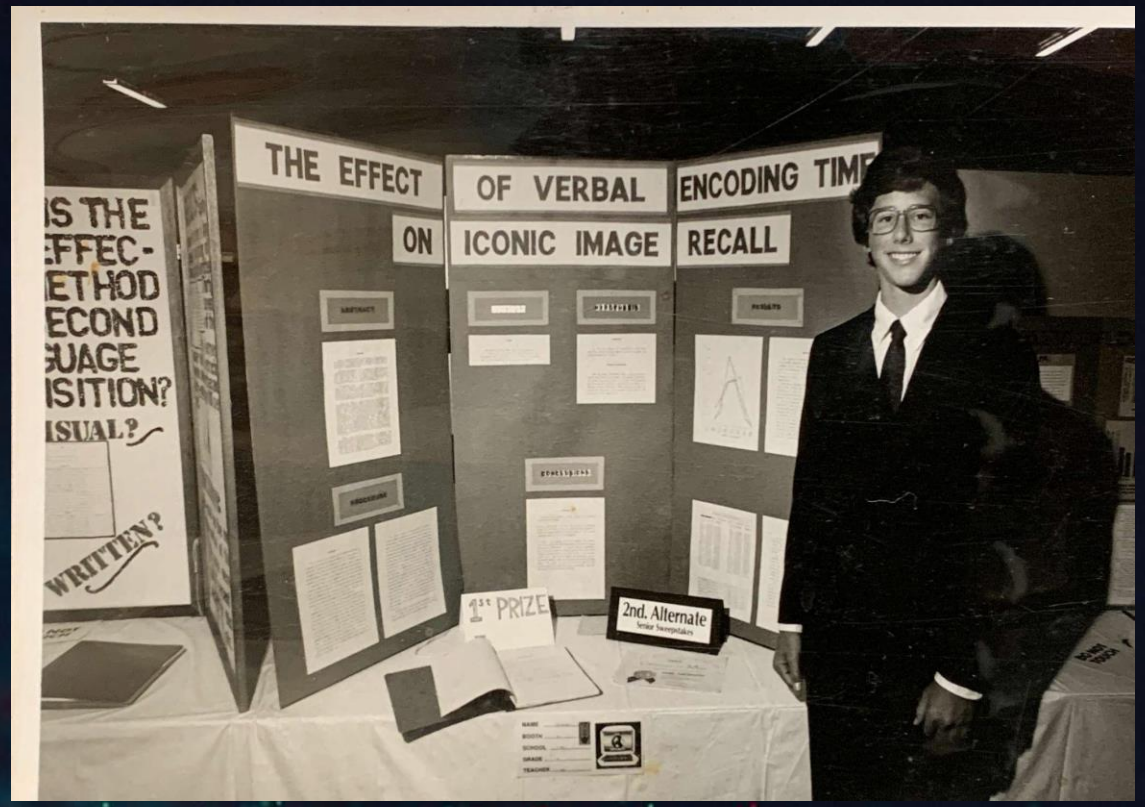
- Saturday 10:00am – 1:00pm,Open House –Bring the Family!
- Saturday, 1pm -3pm- Projects can be removed.
- Sunday, 10am-1pm– Projects can be removed.
- Pre-ordered T-Shirts can still be picked; gift shop available
- Showcase is available on zFairs starting next week.

Dr. Earl Williams

GSDSEF Board of Directors, President

Naval Information Warfare Systems Command





Introduction of Awards