

2020



Oak Crest Institute of Science

Research and Outreach

- The aims of this talk
 - Oak Crest and our team
 - Our research in Micro- and Nano-
 - How we use our research for education
 - *Mentored research*
 - *Near-peer mentoring*
 - Our community outreach
 - Our Biotech Incubator

- BSc (*Hons*) Zoology & Botany – Sheffield University, UK
- PhD Protozoan Cell Biology – Brunel University, UK

Bibliography: <https://www.ncbi.nlm.nih.gov/myncbi/paul.webster.1/bibliography/public/>

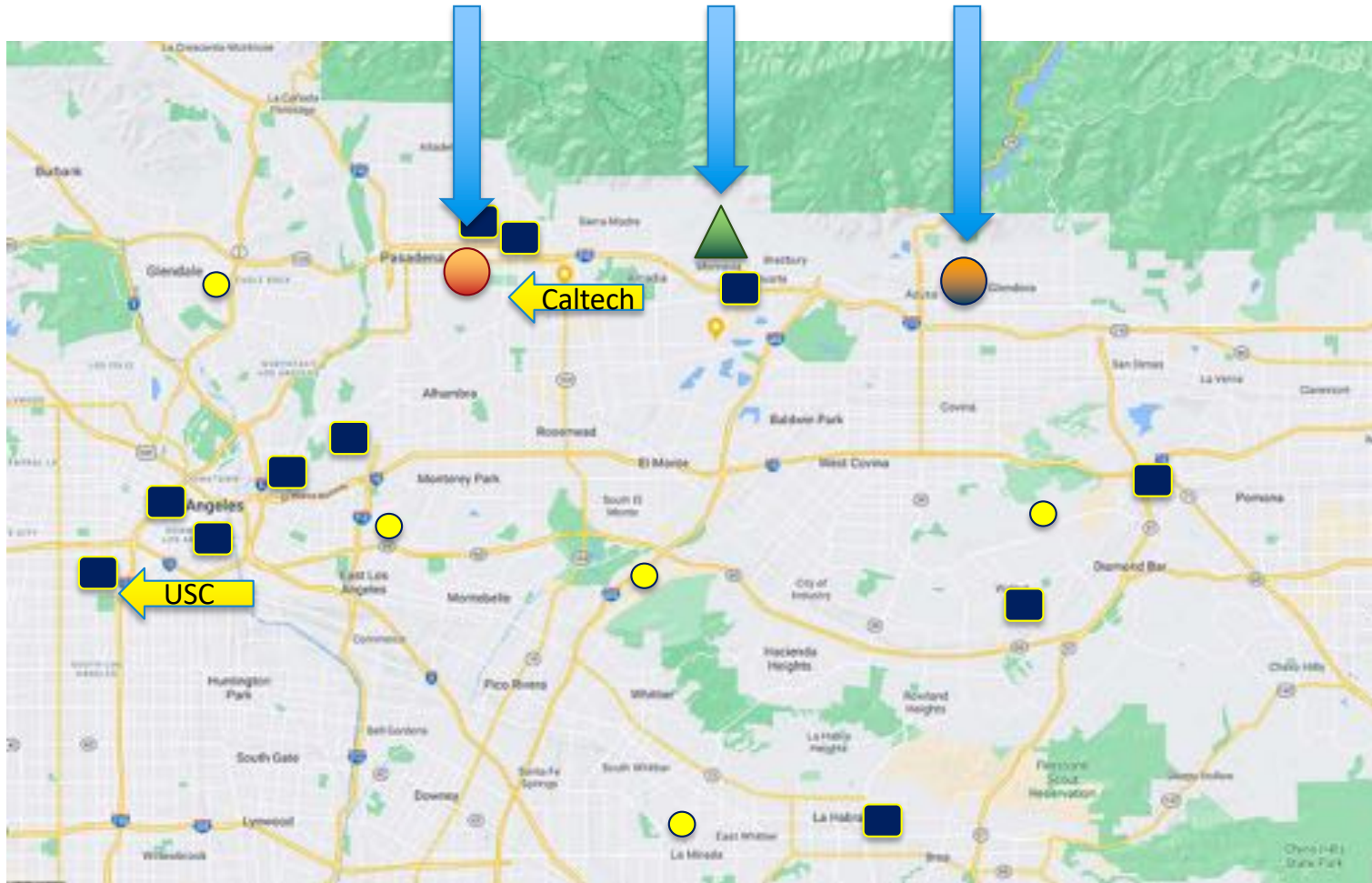


Who we are

Pasadena City College

Oak Crest

Citrus College



Other Community Colleges

Biotech Incubators

2020

Our Colleagues



2020

Who we are



Microbiology

Chemistry

Analytical Chemistry

Molecular Biology

Microscopy

Biomedical

Manufacturing

Machine Shop

Electrical Shop

Biotech Incubator

HPLC, LC-MS

qPCR, protein chemistry

Cell culture,

Electrophoresis

Anaerobic chamber

Laser photonics

Drug reformulation

XRD, EDS, NMR

- Confocal microscopy
- Transmission and scanning electron microscope
- Atomic force microscopy
- Specimen preparation

Faculty



Marc M. Baum PhD



John Moss PhD



Chris Buser PhD



Manjula Gunawardana MS



Peter Anton MD

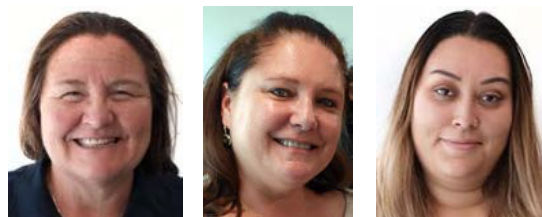


Paul Webster PhD

Research Associates



Administration



Students

- Mentored research
- Near-peer mentoring
- Early Introduction



2020

Short Movie Tour



Developing nanoparticles for therapeutic use

Non-viral gene delivery

Surface-modified DNA polyplexes

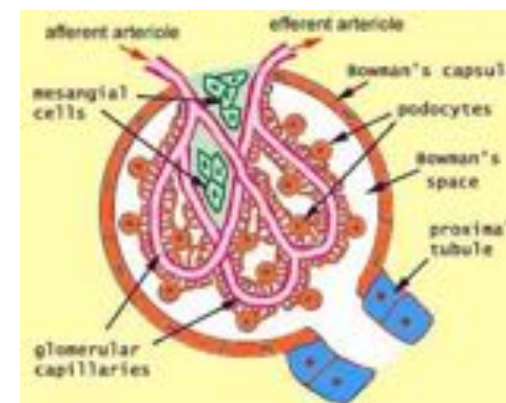
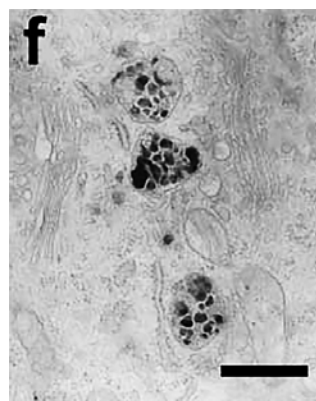
doi:10.1016/j.jconrel.2006.06.018

doi:10.1078/0171-9335-00363

Kidney

Particle size variation

doi/10.1073/pnas.1103573108



Brain

Surface transferrin

- Crossing blood-brain barrier

doi/10.1073/pnas.1307152110

Solid tumors

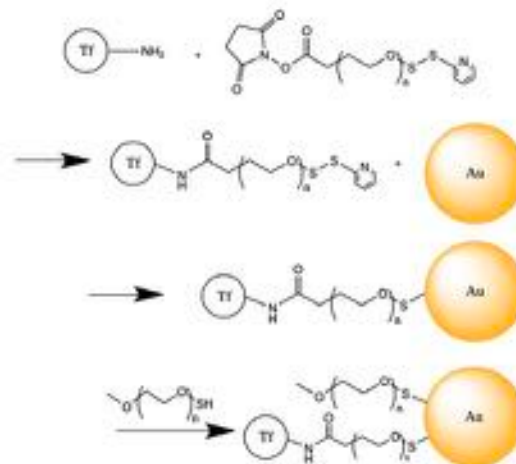
Transferrin coating

doi/10.1073/pnas.0914140107

Cyclodextrin-camptothecin

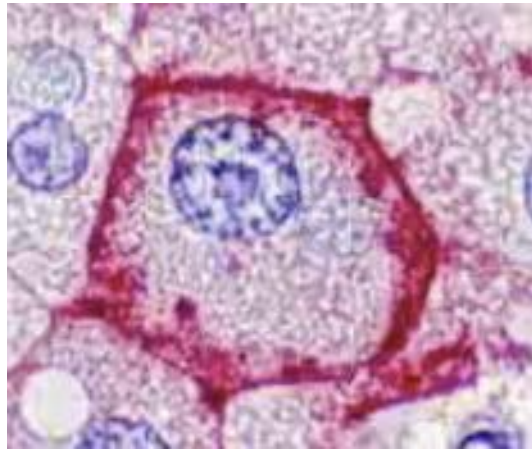
doi/10.1073/pnas.1603018113

gastric, gastroesophageal, esophageal cancer



With Mark M. Davis PhD, Caltech

Micro- and Nano- particles in the biosciences



Hepatocyte:

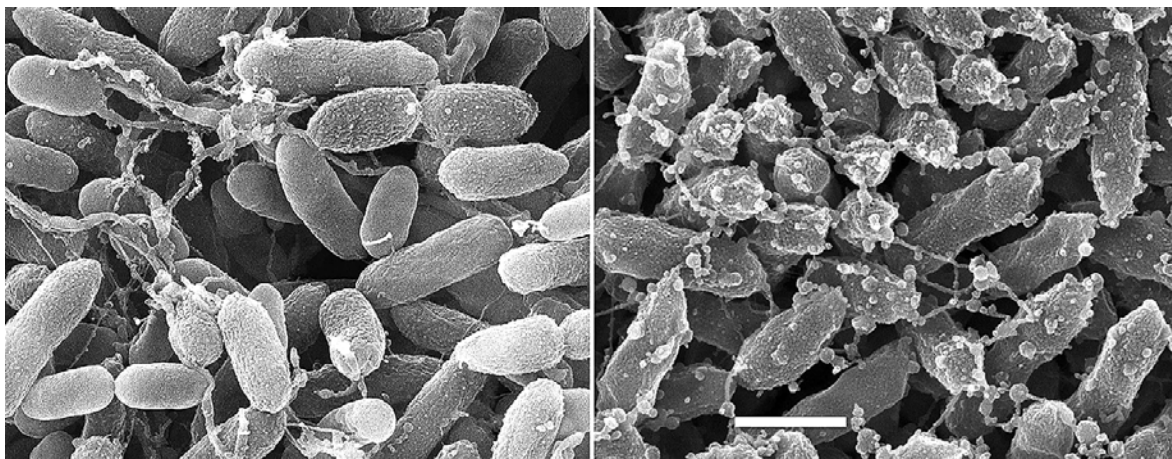
30 micro-meter diameter

8×10^9 protein molecules of nanometer size

Approx 10,000 distinct proteins

Bacteria

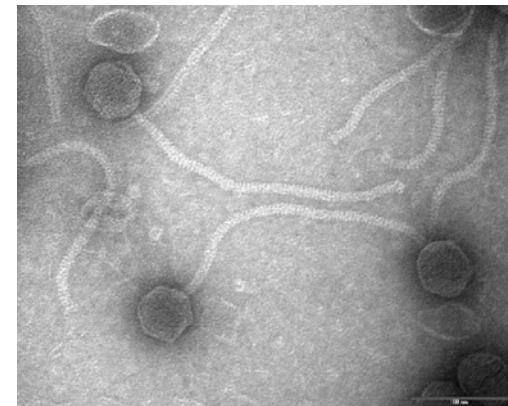
0.5 – 5 micrometer



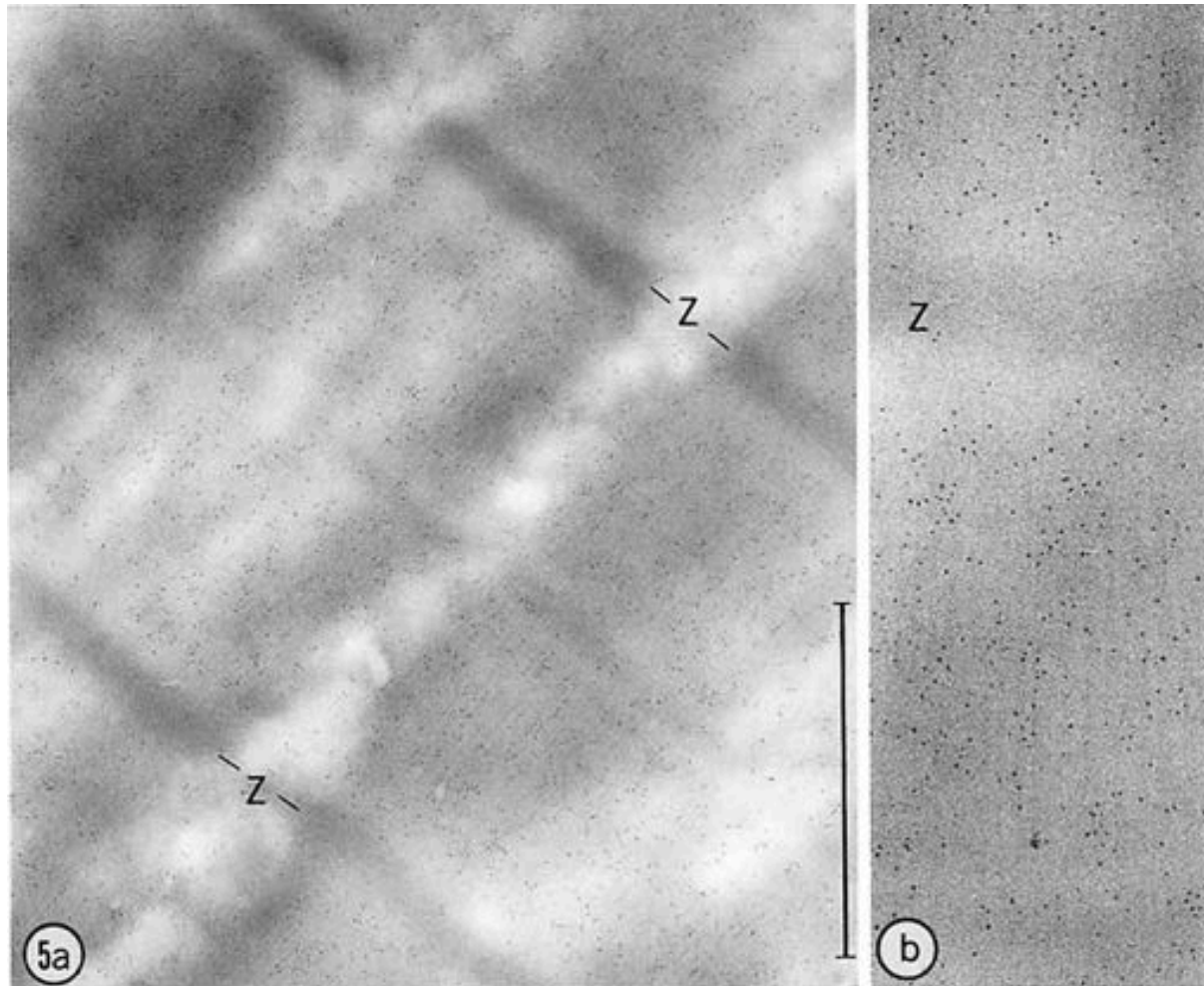
Bacteriophages – and other viruses

20 nanometer diameter viruses

2 micrometer long bacteria



Using nanoparticles for research



Tokyuasu & Singer 1976

The Journal of Cell Biology 71:894-906

Immunolabeling using ferritin, a common iron-storing globular protein.

ferritin + anti-myosin antibodies and apply to sections of skeletal muscle

Iron-Dextran (Imposil)

Dutton et al 1979 *PNAS* 76:3392-

– a rod-shaped iron-containing proteins



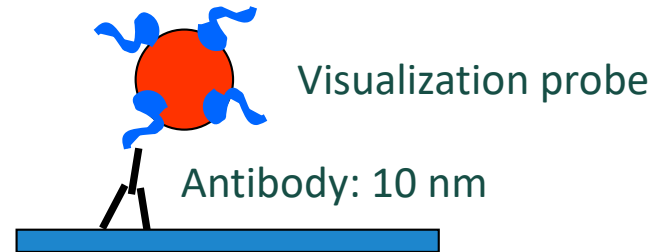
Using nanoparticles for research

Antibodies

IgGs

Polyclonal/Monoclonal

Fluorescent dyes

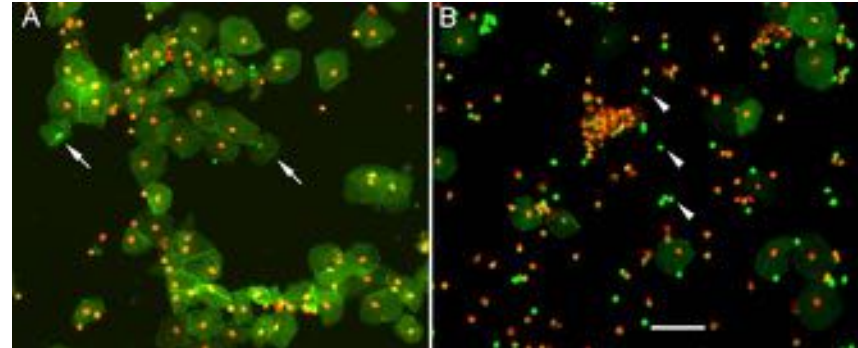


Colloidal Gold

nm sizes

Bind to proteins

Protein A gold

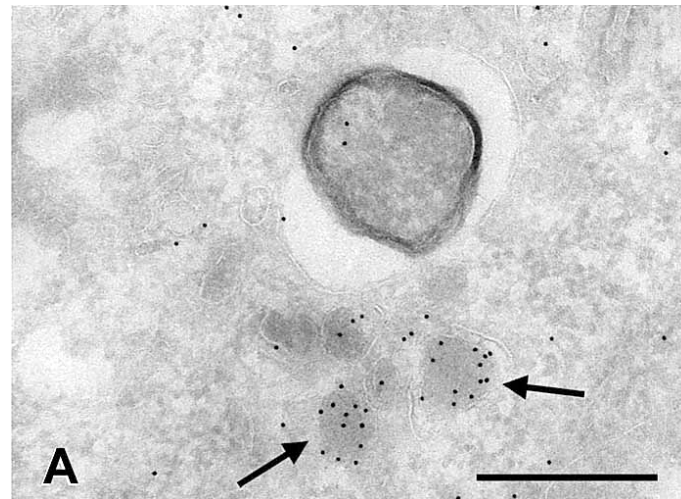


Proteins

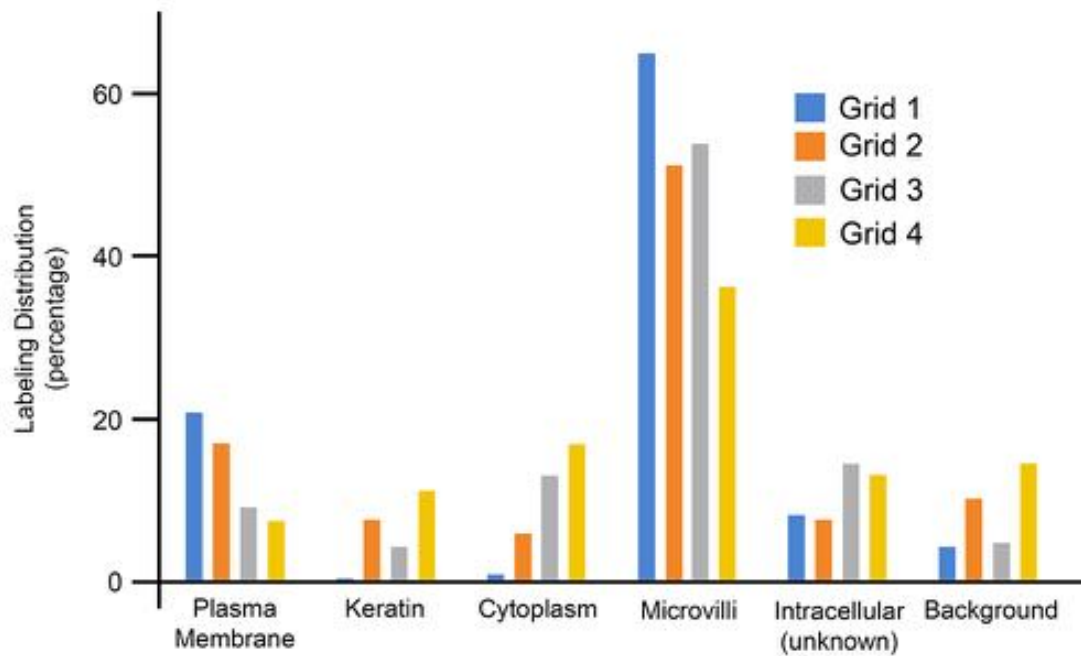
Ligands

Receptors

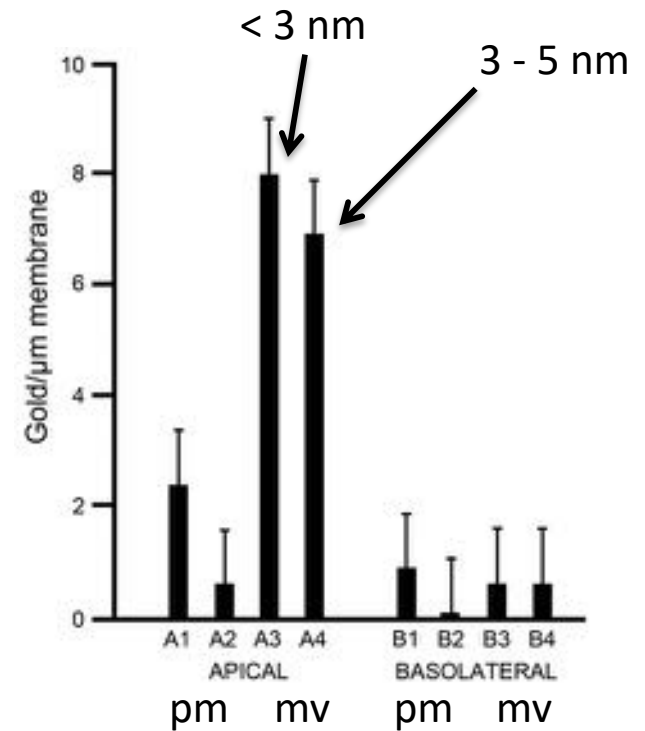
Lectins



Gold particles can be quantified



*Method of Lucocq et al 2004
Histochem Cytochem 52: 991*

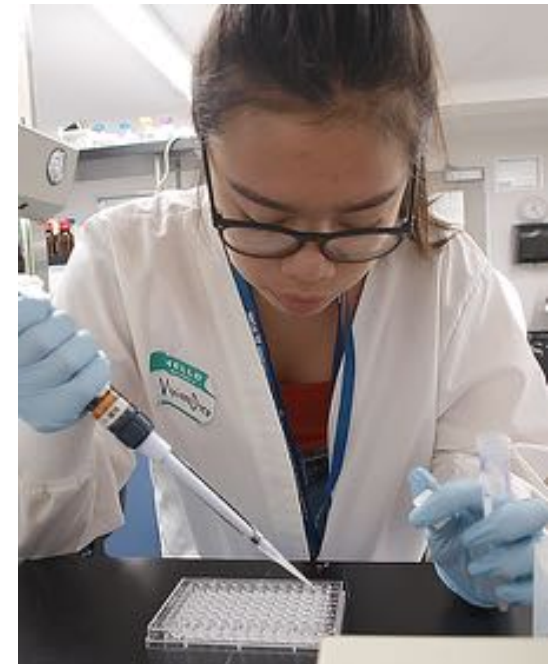


Distance of PAG10
from membrane
Obtained using overlay grids

2020

Mentored Research

- **Summer Internships: 8 – 10 weeks**
- **Interns & Fellows: 6 months - 1 year**
- **Long-term part-time employment**



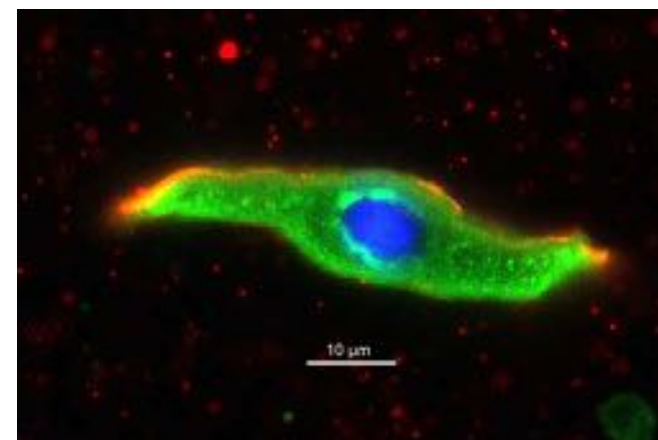
Concentrative Nucleoside Transporter 3 is located on microvilli of vaginal epithelial cells

Paul Webster, Kaori Saito, John Cortez, Christina Ramirez¹ and Marc Baum

ACS Omega

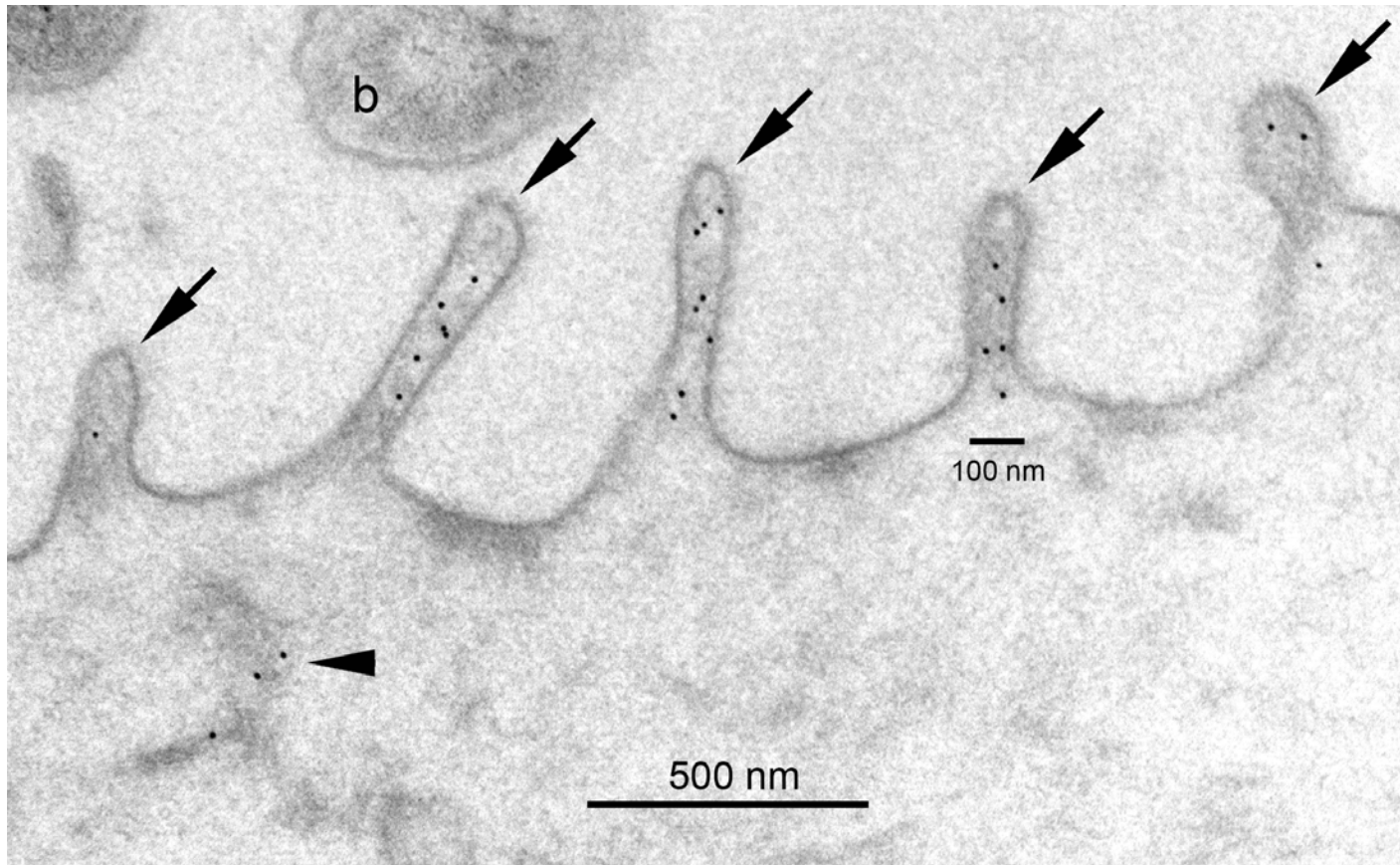
Oak Crest Institute of Science and

¹University of California, Los Angeles (UCLA)

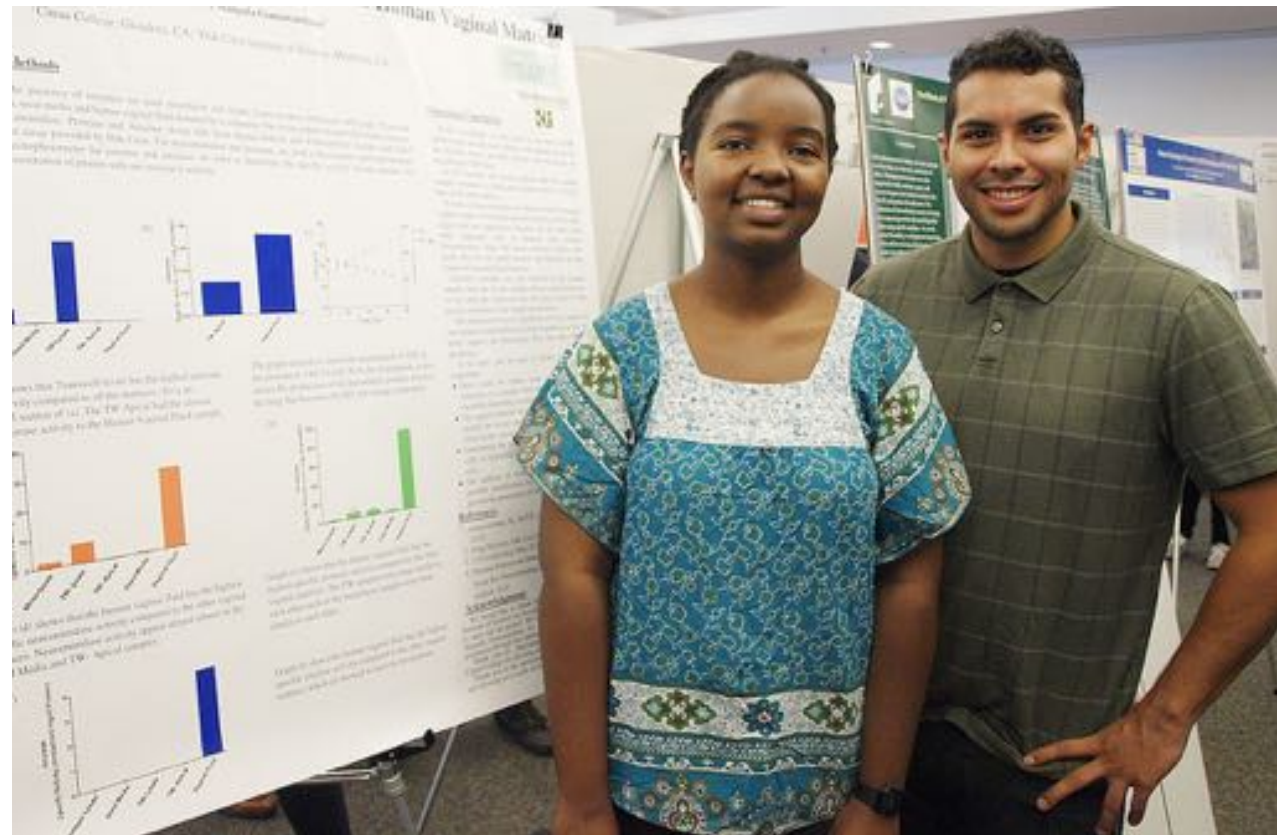


DOI: [10.1021/acsomega.0c02329](https://doi.org/10.1021/acsomega.0c02329)

Immuno-EM



Taking Ownership



Improving Undergraduate STEM Education (I-USE)

Pathways in STEM: Cross-Sector Partnerships, Experiential Learning, and Professional Development

PI:

Marianne Smith, PhD Citrus College

Co-PI's:

Laurie Barge, PhD Jet Propulsion Laboratory

Paul Webster, PhD Oak Crest Institute of Science

AIMS:

Improve STEM experience

Solidify student STEM identity

Build Science Communication Skills

Build a network of prospective employers

Cultivate relationships between employer organizations

Assess the benefits of cross-sector partnerships

Embed community college faculty in the program



Partners

Aerospace: Jet Propulsion Lab

Biotech: Oak Crest

Marine Biology: USC Wrigley Center

Environmental: Univ. Colorado

Gravitational Waves/Physics: CSUF

Engineering: Honeybee Robotics

Computer Tech: EquinixMetal

Biomedical: City of Hope Cancer Center

Botanical: California Botanical Garden

Food Science: MillerCoors

Critical Thinking/Questioning: The Right Question Institute

Science Communication: The Explainables

Near-peer mentoring



Early introduction of STEM concepts

schools, colleges, events, our labs



Early introduction of STEM concepts

Halloween in Monrovia



2020

Outreach

Early introduction of STEM concepts

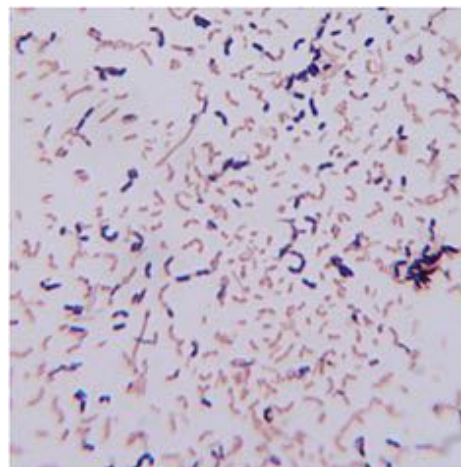
Sci-Lab



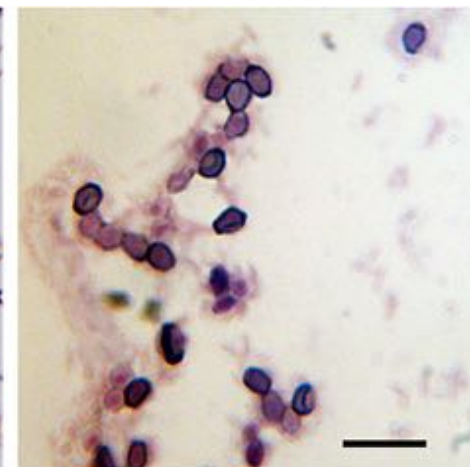
Early introduction of STEM concepts



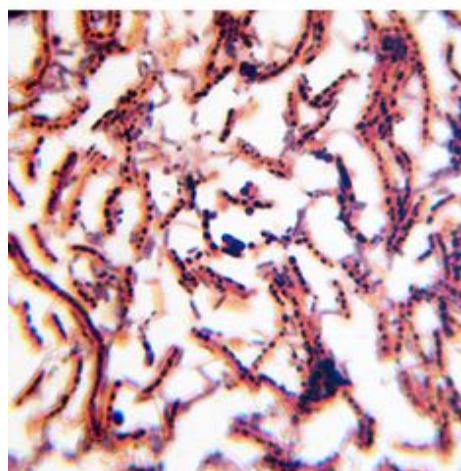
Sci-Lab
Gram staining



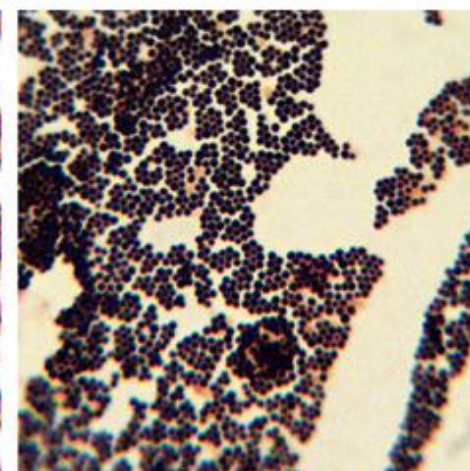
Faucet



TV Remote



Door Handle



iPhone

2020

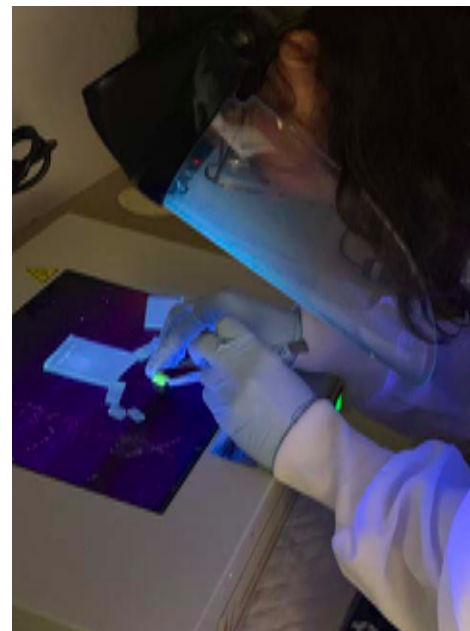
Outreach

Early introduction of STEM concepts

Parents join in!



- **Basic research**
 - *Chemistry*
 - *Biology*
 - *Biomedical*
 - *Microbiology*
 - *Drug delivery*
- **Student mentoring**
 - *Mentored research*
 - *Near-peer mentoring*
 - *Early introduction of STEM*
- **STEM Outreach**
 - *Schools*
 - *Colleges*
 - *Social organizations*
 - *Community*





Monrovia - Oak Crest Science and Technology Incubator Program (MOST-IP)

- **Collaboration with**
 - City of Monrovia (local government & economy)
 - Newton World Enterprises (commercialization)
 - U.S. Economic Development Administration (funded through EDA i6 challenge grant)
- **Goals**
 - Early-stage technology development & commercialization
 - Internal & external technologies
 - Scientific infrastructure & expertise
 - Business services & expertise
 - Link to workforce development programs with community colleges

- **We think and operate like a startup**

- Minimal red tape
- Short turnaround times
- Creative, low-cost solutions

- **Links to**

- Academia (cutting-edge science)
- Industry (network)
- Education (talent pipeline)

