

Andreas E. Vasdekis, Ph.D.

Budget Justification for NSF proposal:

Collaborative Research: Multidimensional single-cell phenotyping for elucidating genome to phenome relationships

A. Senior Personnel

A.1 The PI Andreas E. Vasdekis (base salary \$79,342 for 2020-2021) will devote 1 calendar month in years 1, 2 and 3 to the project to perform laboratory research, education, student training, administrative, and project directing tasks. A 3% increase has been calculated for years 2, and 3 to account for inflation. The PI is an expert in single-cell phenotyping, microfluidics, microfabrication and microscopy. The University of Idaho has determined the salary year for senior personnel to be based on the calendar year. His active participation to the project is critical to ensure continuous progress. Requested amount: \$27,249 (for three years).

B. Other Personnel

B.3 Graduate Student: One graduate student will be hired full time for years 1, 2, and 3 to support research, including performing experiments, data collection/analysis, and publication writing, as described in the Research Plan. The graduate student will be affiliated with the Department of Physics and the Department of Bioengineering and will work full time on this project. Requested amount: \$78,000 (for three years).

B.4 Undergraduate Student: Three undergraduate students will be hired during the project's duration to work part-time on the proposed research, as described in the Education plan (Section 5.3). One undergraduate student will be hired per academic year, for approximately 300 hours in Years 1, 2, and 3. The undergraduate students will support the research needs during the project duration, by performing experiments and data collection, and contributing to manuscript preparation for publication. Requested amount: \$12,960 (for three years).

B.6 Other: Two weeks of support per annum (\$2,044) are requested for the director of the STEM Access program, Kirsten LaPaglia, to: (1) organize the high school visits; (2) recruit and register the high school and undergraduate interns; (3) train the UI PI and graduate student on how to supervise minors from diverse backgrounds (e.g., disabilities, ethnic, et al.), as well as best practices to prevent risk situations; and (4) organize tours of college resources on the UI campus, including the visits to the career center and the financial aid office. The participation of the STEM Access director is crucial to the success of the proposed Educational plan and draws from her ten years of experience delivering STEM curriculum to high school students and serving low-income and first college generation populations. Requested amount: \$6,132 (for three years).

C. Fringe Benefits

The benefits of the PI are calculated at 30.7% rate. Fringe rates for graduate, and undergraduate students is calculated at 2.1%. Fringe rates for the STEM Access director is calculated at 30.7%. Requested amount: \$12,839 (for three years).

D. Permanent Equipment

D.1 The below-listed pieces of permanent equipment are requested (\$28,800 for three years):

Type	Year 1	Year 2	Year 3
permanent equipment over \$5k	18,500	0	0
optics for custom additions to an existing microscope (Thorlabs)	7,000	0	0
photomultiplier tube (Newport Corporation)	6,000	0	0
workstation for data and image processing (Lenovo)	5,500	0	0
permanent equipment under \$5k	10,300	0	0
data acquisition card (PCIe-7842R, National Instruments)	2,200	0	0

Frequency Generator (HAMEG® HMF2550)	4,000	0	0
AC Power Amplifier (Trek Model 677B)	4,100	0	0

This research equipment will be purchased in Year 1 to expand our existing dark-field microscope and enable the construction and assembly of the imaging-sorting cell and droplet system equipped with: (1) custom optical microscope equipped with a long-working distance 40x magnification objective lens and quasi-motorized stages; (2) a photomultiplier tube for quantifying laser transmission through cells and droplets with high temporal resolution; (3) a workstation for analyzing data and microscope control; (4) a frequency generator; (5) an AC power amplifier, and (6) a data acquisition card.

E. Travel

E.1 Domestic Travel:

(a) One international travel is requested for Year 1 to enable an international visit from our non-paid consultant, Prof. Andrew deMello to visit the UI and MIT PIs to discuss the project and related approaches (\$3,047). Further, one domestic travel is requested in Years 2 and 3 of the project for the graduate student to attend two conferences (\$4,564). The individual travel cost is \$2,282, including: airfare and ground transportation, hotel room for five nights, conference registration, per-diem costs and mileage to and from the airport. This funding is requested for dissemination of project results.

(b) Two additional domestic travels are requested in year 2 to enable the graduate student exchange plan, which includes the MIT student visit at UI and the UI student visit at MIT (\$4,600). The cost per individual student is \$2,300, including airfare and ground transportation, as well as accommodation for approximately 1 month.

F. Participant Support Costs

F.1 Stipends: Overall, six high-school interns will be hired during the project to contribute to the proposed research for 1 month each during the summer, as described in the Education plan (Section 5.3). Two high school students will be hired per year, each receiving a support stipend of \$1,920. The high-school students will support research by performing experiments and data collection, as detailed in the Activity Description for Research Assistantships for High School Students.

F.4 Other: The PI requests funding to accomplish the proposed Educational Plan (Sections 5.2 and 5.3). This includes instructional supplies and camp insurance for the high school students (\$369 for three years).

G. Other Direct Costs

G.1 Materials and Supplies: Material and supplies costs are described in the table below per year (\$18,134 for three years):

Type	Year 1	Year 2	Year 3
research consumables	4,033	6,967	6,967
cleanroom	900	900	900
polymers (PDMS)	900	900	900
photolithography masks	1,433	717	717
fluorinated oil and surfactants (Raindance Technologies)	0	3,650	3,650
tubes, connectors	300	300	300
cells and media	500	500	500
education costs	168	0	0
first aid CPR training of supervisor	80	0	0
background check of supervisor	88	0	0

The supplies for research include the use of the facilities described in the Facilities section, namely the University of Idaho Cleanroom, and the Flow Cytometer core at the Institute of Bioinformatics and Evolutionary Biology (University of Idaho). In addition, the PI requests funding for the purchase of: (1) photolithography masks, polymers and tubes for microfluidic assembly; (2) surfactants and fluorinated oil for microfluidic droplet generation; and (3) cells and growth media. Further, the PI requests funding to accomplish the proposed Educational Plan (Sections 5.2 and 5.3), including CPR training and background check of both the UI PI and graduate student (\$168 for three years).

G.2 Publication Costs: The amount of \$1,200 is requested for publication costs for Year 2 and \$3,000 for Year 3. Requested amount: \$2,400 (for three years).

G.4 Computer Services: The amount of \$200 is requested for Years 1, 2, and 3 to support the proposed Data Management Plan. This amount of funding will contribute to the data server maintenance and long-term data archiving. Requested amount: \$600 (for three years).

G.6 Other: The cost of Tuition and Fees is requested for one full-time graduate student for Years 1, 2, and 3. The fees cost for one graduate student in Year 1 are \$12,500 and an annual increase of 5% has been included for Years 2, and 3. Requested amount: \$39,406 (for three years).

I. Indirect Costs

Indirect costs are calculated at the University of Idaho's Modified Total Direct Cost rate of 47.5%. Requested amount \$85,892 (for three years).