Limited to 5 pages for NSF
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Draft Budget Justification
Duke University – PI Name
TITLE

Senior Personnel (Years 1-X)
PI NAME, Ph.D. Principal Investigator
Professor LAST NAME' s background is in XXXX. Her/His research focus is on XXXX. S/He will be primarily responsible for XXXX. S/He will devote XX months of her/his time during the summer and XX months of her/his time during the academic year to this project. S/He will also closely supervise the graduate student research assistants on all aspects of their work for the entire duration of the project. A month is equal to one-ninth of the institutional base salary (IBS). The PI IBS is currently/ projected to be $XXXXXX.

Co-PI NAME, Ph.D. Co-Principal Investigator
Professor LAST NAME' s background is in XXXX. Her/His research focus is on XXXX. S/He will be primarily responsible for XXXX. S/He will devote XX months of her/his time during the summer and XX months of her/his time during the academic year to this project. S/He will also closely supervise the graduate student research assistants on all aspects of their work for the entire duration of the project. A month is equal to one-ninth of the institutional base salary (IBS). The Co-PI IBS is currently/ projected to be $XXXXXX.

A year is defined as Duke University's fiscal year, July 1 to June 30.
[PAPPG Chapter II.C.2.g(i)(a), *Senior Personnel Salaries & Wages Policy, has been supplemented with guidance that reflects it is the proposing organization's responsibility to define and apply the term "year" and include the definition in the budget justification.*]

DHHS/ PHS/ NIH Proposals Subject to Salary Cap
January 7, 2018 - $189,600 (12-mo), or $142,200 (9-mo)
Professor LAST NAME's Institutional Base Salary (IBS) exceeds the current DHHS salary cap. Therefore, Professor LAST NAME's effort has been calculated using the Executive Level II cap of $xxx,xxx.

Effort is expressed as an average over the total award period. The actual effort of all senior personnel listed above falls within the sponsor's limits in each current and future awarded project year. In the event a pending proposal is awarded, effort will be adjusted to comply with sponsor and institutional guidelines, if necessary.

Total Senior Personnel: $XXXXX

Other Personnel
(Name or TBD) Postdoctoral Research Associate (Years 1-X)
A highly motivated and prepared postdoctoral researcher will be recruited to carry out the gene-environment interaction experiments involving neurodegeneration after genotoxin exposure in the context of gene knock-down or knockout. The postdoctoral research associate will devote XX months effort per year to this project, and may be replaced as necessary. The PD salary is currently/ projected to be $XXXXXX.

 # (Name or TBD) Other Professional - Sr. Programmer/System Architect (Years 1-X)
A portion of the funds will be used to support advanced development staff who will contribute substantially by ……. # Sr. Programmer/System Architect is budgeted and may be replaced as necessary. The annual salary for this position is set by the University based on industry norm, years of experience, field of expertise and activities performed. The Other Professional will devote XX months effort per year to this project, and may be replaced as necessary. The other professional salary is currently/ projected to be $XXXXXX.

 # (TBD) Graduate Student Research Assistant(s) (Years 1-X)
XXX Computer Science graduate student research assistants (GSRA) will work on this project in Years 1-X, and may be replaced as necessary. The GSRA(s) will be fully involved in both theoretical and implementation aspects of the proposed research. Duke University Ph.D. student wages are determined by the Graduate School in consultation with the faculty, department heads, deans, and the University administration, based on consideration of living costs and the competitive market for top-quality Ph.D. students. The GSRA rate is currently/ projected to be $XXXXXX, for AY 20XX – XX. Duke University's Graduate School caps full-time graduate student effort at 19.90 hours per week.

 # (TBD) Undergraduate Students (Years 1-X)
Funds have been budgeted for a part-time undergraduate student (approximately XX hours per week at $XX/hour during the academic semesters, plus XX hours/week during the summers). The rate is based on the current salary of a qualified undergraduate, as well as other on-campus rates for undergraduate programmer positions.

Total Other Personnel: $XXXX

Standard cost-of-living increases of 3% are budgeted in the out years for all personnel.

Total Salaries per Budget Period:

Position	Period 1	Period 2	Period 3	Period 4	Period 5
PI	$	$	$	$	$
Co-PI	$	$	$	$	$
PD	$	$	$	$	$
Other Professionals	$	$	$	$	$
GSRA, UGrad, Clerical/ Technical, etc.	$	$	$	$	$

Fringe Benefits (Years 1-X)
Fringe benefits will be applied at the negotiated Federal rates, currently proposed to be as follows:

Position	FY2020 (7/1/19 – 6/30/20)	FY2021 (7/1/20 – 6/30/21)	FY2022 (7/1/21 – 6/30/22)	FY2023 (7/1/22 – 6/30//23)	FY2024 (7/1/23 – 6/30//24)
PI	23.5%	23.9%	24.1%	24.1%	24.1%
PD	17.3%	18.3%	18.9%	18.9%	18.9%

Hourly	21.8%	22.6%	23.5%	23.5%	23.5%
GSRA	14.3%	14.7%	15.0%	15.0%	15.0%
URA	7.7%	7.7%	7.7%	7.7%	7.7%

Total Fringe Benefits: $XXXX

Other Direct Costs

- **Equipment** (Year 1)

The equipment budget includes two Dell PCs with the following specifications: Xeon processor 5120, 4MB Cache, 18.6GHZ, 1066MHz FSB, 4GB RAM, nVidia FX4600 GPU, along with two storage arrays with a total of 6TB storage. The machines will be placed in the applied geometry lab of the Department of Computer Science. They will be used as a cluster, along with two other existing machines, and they will be used for the computer simulation described in the proposed research.

Total Equipment: $XXXX

- **Travel** (Years 1-X)

Travel has been budgeted for the PI, Postdoc, and/ or GSRA(s) to attend relevant meetings and scientific conferences at which ideas and information are exchanged with colleagues, to submit papers for presentation, to work directly with research collaborators, and to conduct educational business relating to this research effort. Conferences may include XXXX, XXXX, and/ or XXXX. Travel to the conference(s) will be determined by an assessment of the most likely opportunities for collaborations with various researchers on topics relevant to this project. It is also anticipated that these are the conferences to which papers resulting from the research done through this project will be submitted for presentation. Conference trips are projected to last three to five days. We estimate that domestic conference person-trips will cost approximately $3,000 each and international conference person-trips will cost approximately $4,000 each. These estimates include ground transportation, fully-refundable-price-capped air fares, lodging costs, subsistence, visa costs when applicable, and registration expenses, with standard cost-of-living increases of 3% in the out years. We also include support for travel to project meetings, estimated to cost approximately $2,000 each.

Total Travel: $XXXX

- **Participant Support** (Years 1-X) [*Required for Human Subjects Research*]

XXXXXX

Total Participant Support: $XXXX

- **Materials and Supplies** (Years 1-X)

Funds have been budgeted for approximately $11,000 in experimental lab supplies in Years XX - XX. A major cost is oligonucleotide (oligo) synthesis and purification. DNA synthesis costs approximately $1/base for the scale required, therefore the oligos for a single tile cost approximately $250 - $300, testing a variant of an oligo costs range from $50 - $90 depending on the length. Modified DNA (-amino,-thiol, -fluorescent label) costs an additional $40 - $60 per oligo.

Other budgeted supplies include restriction enzymes and other reagents, including radioactive labels, typical cost $80 - $100 per tube; membrane filters; organic chemicals and biochemical; AFM tips, typical cost $10 - $40 each and one experiment typically consumes 3 - 10 tips; Eppendorf tubes; glassware; disposable pipets; acrylamide and bisacrylamide; tris and urea; electrophoretic plates and chambers; and electroelution membranes.

Total Materials and Supplies: $XXXX

- **Fee-for Service (ex. Amazon Web Services)** (Years 1-X)

Funds have been budgeted for $20,000 in Year 1 with a 3% inflation increase in the two subsequent years of the project, totaling $61,818 over the duration of the project. This increase reflects our better understanding of costs for running large-scale experiments on the Cloud over an extended period of time.
The pay-as-you-go nature of the Cloud will enable us, with zero upfront cost, to create realistic workload scenarios like those faced by government agencies and companies like Facebook, Google, Twitter, and Yahoo.
The estimate of $20,000 per year is based on our observations over XX months. The average per month charge that we incurred over the first five months of 2012 for running experiments similar to those described in Sections 1.2.1 and 4 is $2,147.

Total Fee-for-Service: $XXXX

- **Interdepartmental Services: SMIF, LMCF, CoreResearch** (Years 1-X)

The *Shared Materials Instrumentation Facility (SMIF)* at Duke University operates as an interdisciplinary shared use facility with a full-time director and technical engineer. The SMIF was established in 2002 as part of Duke University's Materials Initiative with funding from the Duke University Provost's office. The SMIF is available for use by Duke University researchers from the various schools and departments as well by external users from other universities, government laboratories, or industry. The facility enables shared access to a fabrication laboratory (plasma asher, photoresist coater, ion etch, acid etch, spin coater, etc.) and to the following instrumentation equipment:
E-Beam Lithography (rate is in addition to Clean Room fee); XL30 High Res SEM; XL30 Environmental SEM with EDS; Apreo High Res SEM with EDS; Tecani TEM; Krios Cryo-TEM; Micro X-Ray Computed Tomography Scanner; Analysis workstation for MICROCT1; FormLabs SLA 3D Printer; UV-Vis-NIR; FTIR; Raman/PL; DI3100 Scanning Probe Microscope; Cypher Scanning Probe Microscope; Micro Strain Analyser; Optical 3-D Profiler; Small Angle X-Ray Scattering - Line Source and Point Source; X-Ray Diffractometer and X-Ray Photospectrometer. Hourly user fees range from $11.45 to $70.00 and are charged as a means of recovering the direct costs associated with operating the facility.
The *Light Microscopy Core Facility (LMCF)* at Duke University also operates as an interdisciplinary shared use facility and provides many types of Light Microscopy instrumentation, including the following: Laser scanning confocals (510 SP5 SP8 780s 710 880); Lightsheet; Spinning disk confocal; 2-Photon; STED - super-resolution; Fluorescence microscopes; Live cell stations, VivaView and DeltaVision; TIRF system; Lumar Stereoscope and Laser capture microdissection. Hourly user-fees range from $17.20 to $55 and are charges as a means of recovering the direct costs associated with operating the facility.

Total Interdepartmental Services: $XXXX

- **Publication/ Dissemination Costs** (Years 1-X)

Funds have been budgeted in Years 1 - X for publication costs including, but not limited to, the production of posters, flyers, and other material associated with the dissemination of information regarding this project.

Total Publication/ Dissemination: $XXXX

- **Consultant Services** (Years 1-X)

There are XX consultants on this project. Consultant One, currently a postdoctoral associated at Duke, will join University of Michigan as an Assistant Professor. Because of his transition, we have currently listed him as a consultant. Once he joins Michigan, he will be included as

co-PI and a subcontract will be issued to University of Michigan. An expert in statistical modeling, machine learning, and optimization, he will play a critical role in this project by being at the interface of computation and stochastic modeling. He will contribute to both stochastic modeling and learning algorithms. S/He will be compensated, at approximately $XX/ month for XX month(s) in the first year and XX month(s) in each of the following years.
Funds have also been budgeted to support his travel to Duke and to the conferences listed above.

Consultant Two worked with the PI as a postdoctoral associate at Duke, and played an important role in development of SLIP. We will need his expertise in integrating SLIP into this project. In particular, he will contribute to the development of emulator and its connection with the SLIP simulator. He is currently at the Smithsonian Institute in Washington DC. S/He will be compensated, at approximately $XX/ month, for a total of XX month(s) in Year(s) X and X.

Total Consultant Services: $XXXX

- **Tuition Remission** (Years 1-X)

Duke uses an Average Rate Basis (ARB) calculation of tuition remission for PhD GSRAs. The rate is 37.3% for AY 2019-20, 37.7% for AY2020-21, and 38.4% for AY2021-22. This rate is applied to all graduate students. These rates are set by the Graduate School and are applied consistently across the University, regardless of funding source. Tuition remission is budgeted for each GSRA per year. Standard increases of 0.7% are budgeted for the tuition remission ARB on September 1, in each of the out years after AY 2019-20. Although included in direct costs, tuition remission is excluded from Facilities and Administrative calculations.

Total Tuition Remission: $XXXX

- **External Sub-award** (Years 1-X)

XXXXX

Total External Sub-award: $XXXX

Total Other Direct Costs: $XXXX

Total Direct Costs: $XXXX

Facilities and Administrative (F&A) Costs (Years 1-X)
Duke University relies heavily on the F&A costs from its investigators' research projects to support its research infrastructure, including maintaining the essential facilities, equipment, and supplies that the project team will use to carry out the research.
In accordance with Duke's negotiated rates, facilities and administrative costs have been charged as follows: 61.0% of the Modified Total Direct Costs (MTDC = total direct costs minus tuition remission, participant and equipment costs, if any, and to only the first $25,000 of any external sub-awards).

	Period 1	Period 2	Period 3	Period 4	Period 5
Total F&A	$	$	$	$	$

Total Facilities and Administrative: $XXXX

Total Project: $XXXX

REU Supplement Costs (Year 1) **[NSF Only]**

REU Stipend

The REU stipend will support XXXX undergraduate researcher(s) on this project. The stipend has been budgeted to be not more than $600 per person per week, per NSF Program Solicitation 19-582 for XXXX weeks.

Total REU Supplement Stipend Costs: $XXXX

REU Travel

The REU Supplement includes $XXXX in funds to be used for travel to allow the REU student(s) to present research results at scientific conferences.

Total REU Supplement Travel Costs: $XXXX

All undergraduate researchers are supervised closely by the PI, and collaborate extensively with the Graduate Student Research Assistants on the project team. The Duke research team meets on a weekly basis.

Total REU Supplement Costs: $XXXX

REU Facilities and Administrative Costs

No F&A costs are allowed or budgeted for REU supplements, per the sponsor's guidelines.

Total REU Facilities and Administrative Costs: $0