MIMG Laboratory Requirements
Path 2 Research Project Proposal Guidelines

- Proposals should be one-page, typed with 1-inch margins, single-spaced, and 11-pt Arial font

- Proposals should have a heading that lists the following information:
  - Title of proposed project
  - Student name, UID, and email address (same one on file with the Registrar)
  - Faculty research mentor's full name, department, and email address

- The proposal should be written in your own words, reflecting your understanding of the project. If you utilize materials written by someone else, such as sections of a grant proposal or research article, make sure you cite them appropriately (include in-text citations plus a bibliography). It is a form of academic dishonesty to turn in material written by someone else without giving them proper credit.

- The intent in writing a research project proposal is to convince a review panel such as the undergraduate curriculum committee that the topic and approach are sound and have a clear relationship to previous work in the same field. Students should spend considerable time thinking about their projects, discussing their projects with their research mentors, and producing multiple drafts of the proposal since the quality of this document influences whether or not the Path 2 application is approved.

- The proposed project should be appropriate in scope for a 20-week project (10 weeks in 196A plus 10 weeks in 196B) and reflect accomplishments expected by both student and faculty advisor.

- A proposal should begin with a problem statement – a clear description of the larger problem within which the research project is situated.

- A description of the project should follow. This should include a rationale for the project that incorporates existing bodies of literature (published works) that will set the project into context, showing how the proposed work builds upon previous studies. This discussion should set the stage for the hypothesis(es) to be tested. The description should incorporate specific aims explaining what you plan to accomplish and how. This section should include a succinct account of methods that will be used to generate data (how will the data be collected and subsequently analyzed?) as well as a justification for why this approach is appropriate (how does it address your hypothesis or address the research question?).

- The proposal must make clear the precise role that **the student** will play in the lab, including how much and what part of the data collection will be completed.

- The project should reasonably fit the research and writing components within a two-quarter framework imposed by 196A and 196B and require no less than 12 hours per week in the lab. The faculty advisor should provide an estimate of approximately how many hours per week (for the duration of one quarter) the proposed project is expected to involve. That estimate should be included in the project proposal.

- Append the project proposal to the **undergraduate research acknowledgement form**, and **faculty mentor agreement** with signatures from both student and faculty advisor, and submit materials to the MIMG Undergraduate Office by 5:00 PM on Friday of 5th week.

- Project proposals will be reviewed by departmental curriculum committee. Students will be informed of their decision within 3 weeks of submitting application.
- To help applicants understand the expectations for the project proposal, sample documents written by past applicants are available for student viewing, upon request (please ask SAO for copies).

MCDB/MIMG Laboratory Requirements
Plan 2 Research Project Proposal Sample

[ACKNOWLEDGEMENTS]

Many thanks to UCLA undergraduate Benjamin Emert, his faculty research mentors Professor Aldons J. Lusis and Professor Judith A. Berliner, and his post-doctoral research supervisor Dr. Yehudit Hasin for sharing this research project proposal with prospective Plan 2 students in MCDB and MIMG. Benjamin was a student in the second Plan 2 cohort, beginning his research and seminar courses in spring quarter 2011. He plans to graduate in spring 2012 with a B.S. in MIMG.

[SAMPLE PROPOSAL]

The effects of high-density lipoprotein on the OxPAPC response in human endothelial cells

Benjamin Emert
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[*insert email address*]
Research Mentor: Aldons J. Lusis
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Atherosclerosis is a chronic and progressive inflammatory disorder and the principal contributor to cardiovascular disease (Lusis 2000; WHO 2001). Atherogenesis is the process by which lipids, inflammatory cells, and smooth muscle cells accumulate in the intima of an arterial wall, changing the normal physiology of the tissue and eventually resulting in the formation of atherosclerotic plaques. The plaques, composed of lipids, fibrous elements, and at later stages calcium salts, may grow and inhibit the flow of blood in the artery or, more significantly, the plaques may rupture triggering the formation and enlargement of a thrombus (Libby 2002). Over time and after numerous rupture events, stenosis of the artery may occur causing ischemia in the surrounding tissue.

Researchers in Dr. Jake Lusis' lab have previously used a systems genetics analysis approach to better understand the underlying processes linking lipids with atherosclerosis and the complex role genetics play in this ubiquitous disorder (Gargalovic et al. 2006; Romanoski et al. 2010). Utilizing natural genetic variation in their biological system (HAECs) and the resulting variable responses to environmental factors associated with the disease (OxPAPC), the researchers were able to generate expression network modules of co-regulated genes. The modules were then used to formulate hypotheses regarding pathways involved in cellular pathologies, genomic regulation, and likely functions of previously un-annotated genes. Experimental validation of these hypotheses revealed greater insight into the dynamic processes involved in atherosclerosis.

I will be addressing the question of how HDL can inhibit the inflammatory responses of HAECs treated with Ox-PAPC. Alongside its role in reverse cholesterol transport (RCT), studies have shown that HDL possesses various anti-oxidant, anti-inflammatory and anti-atherogenic properties (Podrez 2010). In addition, research by my supervisor Dr. Yehudit Hasin indicates (unpublished results) that HDL cholesterol is an inhibitor of numerous pro-inflammatory genes induced in HAECs by Ox-PAPC. The mechanism by which HDL cholesterol does this has yet to be revealed. In continuation of her research, I will begin my project by testing how inhibition of particular genes (using siRNA) affects the inflammatory response in HAECs treated with Ox-PAPC. My choice of gene targets will be guided by the results of Dr Hasin's work as well as the networks developed by the lab. In doing so I hope to isolate the effect of specific pathways on HAEC responses to Ox-PAPC, and potentially identify key intermediates involved in atherogenesis. Furthermore, I will look at cellular responses to co-treatment with OxPAPC and HDL and attempt to identify and describe pathways involved in mediating HDL's atheroprotective qualities.

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Plan 2 Research Project Proposal Sample

Working twelve hours a week, I will attempt to perform approximately 1 transfection and treatment per week and spend approximately three weeks analyzing data, summarizing results and re-performing experiments when needed. Transfection and treatment includes preparation of HeLa cell cultures, transfection with siRNA and treatment with Ox-PAPC and or HDL. I will then extract RNA from cells, and quantify the relative expression levels of my target genes with real-time qPCR. Allowing four weeks to prepare progress and final reports in Spring and Fall respectively, I will have time to run approximately four experiments in twenty weeks. Should time and resources permit, I will use microarray analysis in addition to real time qPCR to study the regulation of a much larger number of genes. My research will provide greater insight into the atheroprotective properties of HDL and better our understanding of the processes involved in atherosclerosis development and progression.

BIBLIOGRAPHY:

1. Gargalovic, P.S., Imura, M., Zhang, B., Gharavi, N.M., Clark, M.J., Pagnon, J., Yang, W.P., He, A., Truong, A., Patel, S., et al. (2006) Identification of inflammatory gene modules based on variations of human endothelial cell responses to oxidized lipids. PNAS. 103(34), 12741-12746.
2. Libby, P. (2002). Inflammation in atherosclerosis. Nature. 420(6917), 868-874. doi:10.1038/nature01323.
3. Lusis, A.J. (2000). Atherosclerosis. Nature. 407(6801), 233-241. doi:10.1038/35025203.
4. Podrez, E.A. (2010) Anti-oxidant properties of high-density lipoprotein and atherosclerosis. Clinical and Experimental Pharmacology and Physiology. 37(7), 719-725. doi: 10.1111/j.1440-1681.2010.05380.x.
5. Romanoski, C.A., Lee, S., Kim, M.J., Ingram-Drake, L., Plaisier, C.L., Yordanova, R., Tilford, C., Guan, B., He, A., Gargalovic, P.S., et al. (2010) Systems genetics analysis of gene-by-environment interactions in human cells. The American Journal of Human Genetics. 86, 399-410. doi: 10.1016/j.ajhg.2010.02.002.
6. WHO: media centre, cardiovascular diseases facts sheet [Internet]. World Health Organization: c2011 [cited 2011 May 17]. Available from: http://www.who.int/mediacentre/factsheets/fs317/en/index.html.