Dr. James J. Harber: Application for Sabbatical for Spring 2021
Submitted to the OC Sabbatical Review Committee Fall 2019

1. Purpose, Rationale and Professional Development Detail for the Spring 2021 Sabbatical:

The purpose of this one semester sabbatical is consistent with the 8.6.C articles of the AFT contract for pursuing an approved teaching and research fellowship. The sabbatical that I am proposing is for the spring semester 2021. It would be located at the Molecular Cellular Developmental Biology (MCDB) department at the University of California, Santa Barbara (UCSB) under the direction of Dr. Dennis Clegg. Dr. Clegg currently produces a specific eye cell type (RPE) at UCSB using FDA approved protocols and advanced methods such as Fluorescent Activated Cell Sorting (FACS) and CRISPR. I would have an opportunity to observe and learn some aspects of the production of the human eye cells for human therapy at UCSB. RPE cell therapy is used in human clinical trials at several medical school hospitals in southern California to cure a specific blindness due to macular degeneration in humans. The main purpose of my sabbatical is to work in the laboratory on a daily basis to perform research intended to be adapted for curriculum at Oxnard College. This will involve updating my research skills set and observing the curriculum as it is implemented in the undergraduate biology sciences majors. I intend to audit a contemporary course on cell-based therapies at UCSB. Additionally I would like to finalize three research publications I have prepared from work with Oxnard College students for undergraduate research.

The sabbatical provides the opportunity to renew the knowledge and used for teaching undergraduates at UCSB from within the MCDB department over the course of two university nine week "quarters". To keep current, I need to teach the same knowledge and skills to our Oxnard College students. At UCSB, I will seek further mastery of include a classroom-based model exercise for understanding human cardiac function and disease. This exercise was begun under Dr. Clegg's direction in 2014 at Oxnard College and has since provided a platform for our students to achieve awards at undergraduate research conferences. Since 2014, seven awards (including five at first place) were achieved by Oxnard College students (see "Central Coast Biotech" on YouTube for these presentations and posters). A total of three research project areas currently are being incrementally advanced each year by Oxnard College students for cardiogenesis, dental microbiome and ocean harmful algae blooms. Each of these projects was

planned and implemented with input from the MCDB department faculty over the past eight years in conjunction with funding from the Oxnard College STEM grants and donations from the biotech industry.

The opportunity to work in the MCDB department also helps to understand how best to facilitate a transfer student's use of work study funds. The goal is to teach specific contemporary lab skills in DNA methods and cell culture at Oxnard College in regular courses. Students who are transferring to the university have been able to work in the summers at Oxnard College to work out the difficulties with the protocols (recipes) for the experiments. This has allowed the transfer student to use this experience to be placed in a higher level research internship at the university. Additionally, the OC experience also satisfies the entrance requirement for undergraduate research for an applicant to a medical school or graduate research program. In my research internship, I will be able to observe how Dr. Dennis Clegg advances his research for the RPE cell therapy in clinical trials while maintaining a teaching load and advising students. This behavior I model in my work at OC.

2. Alignment with Oxnard College Mission, Vision and Statewide Goals:

"Oxnard College is a learning-centered institution that embraces academic excellence by providing multiple pathways to student success". The sabbatical offers a time to look over the program we offer in the OC biological sciences department as a whole and make incremental upgrades. Although we want to advance students through capstone courses such as the microbiology course I teach, the fact is that there is much work reinforcing the curriculum of courses in the prerequisite pathway at Oxnard College. My specific focus class (Microbiology) is mainly composed of two student cohorts (nursing and dental hygiene) and a significant number of health and science-based majors. Addressing the wide diversity of student needs in the course has prompted me to build support for special curriculum for each of the areas within the microbiology course. At Oxnard College we have the challenge of operating a small program that addresses a variety of student needs in the program areas that we specialize in, namely Dental Hygiene, Marine Sciences and Health Sciences. Community College transfer students are only granted ten days from their arrival to find a job on campus to use the work study funds. The sabbatical provides the opportunity to acquire skills to advance these three

pathways. An example of this would be the OC laboratory exercise to study the human microbiome, which was transferred from Stanford University to OC during my last sabbatical in 2014.

The proposed sabbatical is also intended to provide access to good collaborative editors from the MCDB department to further consolidate the student research work over the past decade at Oxnard College into three curriculum-based publications (Cardiac project, Ocean Harmful Algae Blooms project and Dental microbiome project). Additionally, I intend to learn new methods such as CRISPR as they are applied in the new cellular based therapies. CRISPR is now being applied (clinicaltrials.gov) to solve ancient inherited problems of the blood cell lineages such as Sickle Cell Anemia, SCID, certain leukemias and HIV infection. Inclusion of these methods and publications in a comprehensive undergraduate laboratory text is my long-term goal and the sabbatical will help considerably in advancing this effort.

3. Timeline of Activities for the Sabbatical:

From January 2021 to June 2021 I plan to take up residence in Goleta and bike to UCSB four days a week. I own a home in Goleta on the bike path to the University and this approach saves money for parking fees. I plan to spend approximately six hours per day on campus in the MCDB laboratory, which is similar to the amount of time I spend daily at Oxnard College. There will be additional time spent at UCSB working in the library or home office writing and editing the manuscripts from the three projects for publication. There is an opportunity for collaborative writing as UCSB graduate students routinely publish similar work in journals such as JBE (Journal of Biological Education). To maintain continuity with Oxnard College, the students I work with for summer undergraduate research will be sidelined for one semester until I return to Oxnard College in the summer of 2021. These Oxnard College students recently won a poster competition (judged by Amgen and other industry representatives) at the UCSB 3rd Annual Bioengineering Symposium (see Central Coast Biotech). The sabbatical is an important time that I will use to upgrade my knowledge at UCSB and apply this knowledge at OC.

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11-20-19

To Whom It May Concern:
Re: Regenerative Medicine Sabbatical Visit by Prof. Jim Harber

It is a pleasure to write in support of a sabbatical for Jim Harber. I am happy to offer space and resources in my laboratory in the Center for Stem Cell Biology and Engineering at UC Santa Barbara. Jim spent a previous sabbatical in my lab and was extremely productive, and we would welcome him back for a return stay.

My lab is an active center of stem cell research, with a focus on deriving ocular cells from pluripotent stem cells for the analysis and treatment of eye disease. In particular, we have investigated the molecular mechanisms of the development of the retinal pigment epithelium (RPE) and devised methods to direct the differentiation of human embryonic stem cells to become RPE. The RPE cells are crucial support cells for photoreceptors in the retina, and their death leads to age-related macular degeneration. Our group teamed up with USC, Caltech, City of Hope, and industry partners to form The California Project to Cure Blindness to move this work to clinical trials. With funding from the California Institute for Regenerative Medicine, we have now treated 15 patients with the dry form of age-related macular degeneration, and results are promising. We developed a surgical procedure whereby a sheet of RPE cells is cultured on a scaffold, which is implanted in the back of the eye. Other groups are following our lead, with 2 patients implanted in London, and one in Japan. The National Eye Institute will soon start clinical trials with a similar approach. Results from our first 5 patients were published in Science Translational Medicine last year, and our work was featured in a cover story in National Geographic in 2016.

The Clegg lab (https://labs.mcdb.ucsb.edu/clegg/dennis/) consists of a lab manager, two postdoctoral fellows, two PhD students, a Masters student, two research associates, and 3 undergraduates. Jim will interact with these researchers and students, as well as others in the Center for Stem Cell Biology and Engineering (https://www.stemcell.ucsb.edu), whose mission is the education of the next generation of stem cell researchers. Our Center, established in 2008, has 33 faculty members pursuing a variety of research programs ranging from deciphering the molecular mechanisms of stem cell proliferation and differentiation in model organisms to bioengineering of novel scaffolds to translational medicine. Our Center has established many collaborations with universities and research institutions throughout the world, including not only USC, Caltech, City of Hope, but also The Univ of Wisconsin, Harvard, Scripps, UCLA, Univ Colorado, University College London, and others. Ours is a vibrant research community, offering many lectures by visiting scientists, one on one training in stem cell culture methods, and a variety of interactive workshops and courses. We are proud of the fact that UCSB was ranked #7 among public universities by U.S. News & World Report in its 2020 rankings. Among “Best National Universities,” which includes both public and private institutions, UC Santa Barbara placed No. 34.

The Clegg lab often welcomes visiting scholars and students. We have hosted CIRM Bridges program MA students from CSUCI, Young Mentorship program high school students, and (last summer) undergraduates

from UCLA and SDSU. We also host visits from community groups, and from local community colleges and K-12 schools. We have had visiting scholars from research labs in Portugal, China, and the Netherlands, as well as the University of Minnesota, Harvard, We particularly look forward to working with Jim to expand our collaborations to the community college level and look forward to welcoming visiting students from Oxnard Community College.

Jim is interactive and personable, and gets along with people from all different backgrounds. He is very knowledgeable about the field of regenerative medicine and will be an asset in the lab. We are happy to offer him a desk and lab bench. Further, he is welcome to use our state of the art stem cell and microscopy core facilities. Jim has considerable experience in stem cell culture and made excellent progress in his last sabbatical visit. In fact, he was able to involve his students in new research he started here at UCSB, thus sharing his expertise and exposing them to cutting edge methods.

The main focus of his work at UCSB for the sabbatical would be optimizing the stem cell differentiation to produce and characterize cardiac cells, with a goal of publishing this work. We have experience with cardiomyocyte differentiation in my laboratory and are happy to help. We look forward to welcoming Jim to the lab for a sabbatical visit.

Sincerely,

Dennis O. Clegg
Professor and Co-Director