



ARCS® Foundation, Inc.
UNIVERSITY RELATIONS APPROVAL FORM A

***For approval of Departments/Programs including Multidisciplinary Programs
Within an ARCS Foundation Approved Institution***

In order to receive funding from ARCS Foundation, every department/program or multidisciplinary program is required to be approved by ARCS National through the National Board University Relations review and approval process.

- If the Department/Program or Institution housing it is ranked within the top 50 in the nation (see SUGGESTED RESOURCES FOR RANKING DEPARTMENTAL SUBMISSIONS, in the Appendix of this form), please complete **Section I**
- If the Department/Program or Institution housing it is **not** ranked within the top 50 in the nation (see SUGGESTED RESOURCES FOR RANKING DEPARTMENTAL SUBMISSIONS, in the Appendix of this form), please complete **Sections I and II**
- If this is a multidisciplinary program please complete the additional questions as indicated below. Please refer to the SUGGESTED RESOURCES FOR RANKING DEPARTMENTAL SUBMISSIONS, in the Appendix of this form, and as appropriate, please complete **Sections I and II**

This completed form, along with any attachments, must be submitted to the National VP, University Relations at least six (6) weeks prior to a National Board meeting. Incomplete forms cannot be considered.

CHAPTER:

Chapter VP University Relations or President:

Elizabeth Callander, President // Leslie Van Houten and Chris Simpson Brent, Co-VP's UR

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Date Approved by Chapter Board: August 31, 2021

Date of Submission to National VP, UR: September 29, 2021

NATIONAL:

Date and Resolution by National:

SECTION I

Basic Information

Name of Institution:
(Parent organization)

University of California, Merced

Name of Division:
(School, college, division, institute, if applicable)

School of Social Sciences, Humanities and Arts

Name of Department/Program or Multidisciplinary Program:
(Indicate if multidisciplinary and explain)

Cognitive and Information Sciences

Institution Contact:

Marjorie S. Zatz

Title:

Interim Vice Chancellor for Research and Economic Development

Email:

mzatz@ucmerced.edu

Tel:

209-228-0085

Area of Study

1. Specify the ARCS approved Area(s) of Study, under which this discipline falls.

Computer/Information Sciences

2. If the department/program or primary area of the multidisciplinary program does not fall within our approved Areas of Study, please provide the following information:

A. Demonstrate how it relates to the area(s).

NA

- B. If this is an entirely new area of study confirm that the research being done in the department/program or multidisciplinary program is “hard” or “bench” science and not comparative or clinical research. Cite examples. The degree-granting department must be a “hard” science. (Refer to Appendix)

NA

- C. Explain how this area of study supports the standards of excellence essential to the ARCS mission.

NA

Overview of Department/Program or Multidisciplinary Program

Provide an overview of the department(s)/program(s)

The Cognitive and Information Sciences Program is focused on the scientific study of mind, brain, and behavior using a range of experimental, observational, mathematical, and computational techniques. A central goal of Cognitive Science is to develop theories of cognitive function that help understand and explain human and animal behavior and also inform and interact with the fields of machine learning and artificial intelligence. The cognitive science of learning and intelligence integrates phenomena at neural, behavioral, social and cultural levels of analysis.

The Cognitive and Information Sciences (CIS) PhD program trains students in cognitive science research with emphasis on computation and technology, as denoted by the word “information.” Students learn to analyze intelligent behaviors as arising from interactions between brain, body, and environment, including social interactions situated in their economic and technological milieu. The CIS program places emphasis on computational approaches and applications towards developing technologies that foster and even aspire to emulate intelligent behavior. The interdisciplinary study of cognition and information can be seen in recent trends in research funding, university faculty lines, and industry jobs across the United States, Canada, Europe, and Japan.

UC Merced's CIS program is consistently one of the most prominent programs at the annual Cognitive Science Society (CogSci) meeting among more than 300 participating universities around the world. Presentations are highly competitive (about 35% acceptance rate) and universities with the largest numbers of accepted presentations are usually Stanford, MIT, UC San Diego, Indiana University at Bloomington, and UC Merced. This year, a UC Merced graduate student won the Marr Prize for the best graduate student paper at the CogSci meeting, which is the most prestigious student award in the field.

CIS research fits within the purview of ARCS as a “hard science” because it primarily uses methods from neuroscience, computer science, and biology to study human cognition. In the past, studies of human behavior were considered to be a “soft science” because theories and methods were less formal and less repeatable compared with more traditional STEM disciplines. However, there is no reason why the study of human brain and cognition should be any less rigorous than the study of animal neuroscience, for instance, or the study of artificial intelligence. The advent of non-invasive methods for studying brain activity, application of genetic and molecular analyses to human systems, and advances in deep learning, Bayesian inference, and other computational approaches to cognition have all made theories and experiments more sophisticated to the point that we now have a “hard” science of human cognition on par with neuroscience and computer science.

The CIS program resides in the School of Social Sciences, Humanities, and Arts because of its focus on *human* cognition and behavior. The School of Natural Sciences has related research on animal models of cognition and behavior, and the School of Engineering has related research on machine learning and artificial intelligence, but all research involving humans is in the School of Social Sciences, Humanities, and Arts.

Facts, including ranking

1. How does this **institution** rank nationally among its peers? Give two rankings from different sources, including dates and names of the sources. Please reference the National Research Council and *The Chronicle of Higher Education* and other specific rankings for this multidisciplinary program application. (Refer to Appendix for other ranking sources.)

US News & World Report Rankings:

#97 overall (2021) (First time in Top 100 schools; jumped 7 spots since 2019; jumped 68 spots in the last three years)
#40 among public institutions (2021)
#1 among public universities in Outperforming Expected Graduation Rates (2021)
#5 for Social Mobility (2021)
#8 for Economic Diversity (2021)

Times Higher Education Rankings:

Times Higher Ed ranked UC Merced #3 among U.S. universities the Young Universities Rankings; #57 in the world (2021). The Times Higher Education Young University Rankings list the world's best universities that are 50 years old or younger. The ranking includes institutions that were founded between 1971 and present, UC Merced was founded in 2005.

2. How does this **department(s)/program(s)** rank nationally among its peers? Give two rankings from different sources, including dates and names of the sources. If the multidisciplinary program is not ranked, provide the rankings of the primary departments and any quantitative and qualitative comparative information for the program as a whole.

US News & World Report Rankings:

Cognitive Science is a relatively new field that does not yet have national rankings, but the department has strengths in psychological and computational science, and extensive collaborations with psychology and computer science colleagues. We therefore use the *US News & World Report's* Best Graduate Schools ranking for UC Merced Psychology at #90 in 2017, and Computer Engineering at #106 in 2021.

College Factual Rankings:

UC Merced was ranked #3 by College Factual for Colleges Most Focused on Cognitive Science in the U.S. in 2021.

3. How old is the **department/program or multidisciplinary program** and why was it established?

The Cognitive and Information Sciences program was officially launched in 2010, only the second stand-alone doctoral program to be approved at UC Merced. It began with 8 doctoral students in 2011, and has grown steadily to 32 Ph.D. students as of Fall 2020. In AY20-21, UC Merced launched a CIS Master of Science degree program that is focused on training students in human data science. The CIS graduate group was originally established because, as a new and growing UC campus, faculty members wanted to build strength and recognition in the new and growing field of cognitive science, and administrative leadership was supportive of the grassroots effort.

Cognitive Science is at the frontier of science writ large because it uses the scientific method to tackle one of the hardest problems that science has yet to address, which is a formal theory of mind and thought. Cognitive Science is at the frontier of engineering because it tackles one of the hardest problems yet to be solved, which is how to build an artificial intelligence on par with human cognition. The now-booming engineering field of deep learning originated from cognitive science, and some of its most famous researchers like Geoffrey Hinton are cognitive scientists. The CIS program was established at UC Merced to get in on the ground floor of one of the fastest growing fields in STEM.

Degrees Granted

1. Name the degrees awarded in the department/program or multidisciplinary program (e.g., Ph.D. in Chemistry).

PhD in Cognitive and Information Sciences

2. For which of the degrees named above are you seeking degrees?

PhD in Cognitive and Information Sciences

3. For each degree named in two, please indicate the number of degrees that are granted per year per faculty.

For AY20-1, 9 PhD students earned their PhD degrees with 18 core faculty members, for an average of 0.5 degrees granted per faculty member this year.

4. For each degree named in two, please indicate the non-completion rate.

7-year PhD non-completion rate (3-year average): 32%

8-year PhD non-completion rate (3-year average): 6%

These non-completion rates are well below the national average. In the 2015 Doctoral Initiative on Minority Attrition published by the Council of Graduate Schools, it is noted that 54% of all students in all PhD fields, including U.S. citizens and permanent residents and temporary residents, did not complete their doctoral programs after seven years, and even after ten years 43% still had not completed their degrees. The non-completion rates were higher for underrepresented minorities.

The campus-wide goal is to reduce our PhD 7-year non-completion rate down to 35% in five years. The CIS graduate program is already at this target.

5. For each degree named in two, what is the average length of time a student invests to receive a Doctoral degree in the department/program or multidisciplinary program being considered (using data from the past 10 years, if available)?

Average years to PhD: 5.1 years

Students

1. How many students are in the department/program or multidisciplinary program?

32 PhD students

2. Explain the student mentoring effort and/or graduate support to enhance retention in the department/program or multidisciplinary program. Explain why if none is available.

At UC Merced, student success results from collaboration and shared responsibility among students, faculty, staff and administration. With 48% of the Fall 2020 Graduate cohort being first-generation college students, the university understands that providing support, guidance, and resources that equip students to continue their educational journey is essential to their success.

Co-mentorship and team mentoring are core themes of the CIS program, and the program curriculum includes a professional development course that covers advisor/advisee relationships, mentoring, fellowship writing, and other professionalization skills. There is a CIS graduate student group financially supported by the program that organizes professional development seminars and social events. In terms of research support, students have had access to computational training and cross-program collaborations and resources through two NSF National Research Traineeship programs. Nearly all PhD students are funded by the program for summer research.

The Graduate Division provides a number of programs, mentorships and trainings including:

Academic Counseling – Graduate academic counseling is available to support students on their academic journey with in-person meetings, phone meetings and workshops. Areas of support can include: one-on-one counseling, academic and personal support, developing effective communication skills, time-management strategies and work/life balance, overcoming self-doubt and imposter syndrome and facilitating good mentoring relationships and healthy research communities.

GRAD EXCEL – The GRAD-EXCEL program is designed to promote early success in first-year doctoral students through coaching and engagement with a community of advanced doctoral peer mentors. Each incoming doctoral student is guided by a GRAD-EXCEL Peer Mentor (matched by research discipline) as they acclimate to UC Merced and their graduate studies during their first academic year.

Competitive Edge Summer Bridge – This program is designed to ensure that first generation students or those from backgrounds typically underrepresented in higher education are better equipped to complete their degrees and go on to successful careers. Graduate students who participate in this program:

- Move to campus two months early for better acclimation

- Are placed in a cohort to build early support structures
- Begin work with advisors to get a head start on research techniques and projects
- Attend tailored workshops and seminars designed to give them a broad foundation of professional knowledge

Graduate Enrichment and Advancement Resources and Services (GEARS) – The Graduate Division’s multi-track professional development series is designed to prepare students for success while at UC Merced and beyond. GEARS tracks are as follows:

- Preparing Future Faculty – Topics range from how to prepare for the academic interview, discussions of post-doctoral fellowship opportunities, making the transition from graduate student to faculty and how to thrive as faculty of color or international faculty.
- Preparing Future Professionals – This series allows students to explore business, government and non-profit sectors as potential career paths after graduation. Topics include how to choose between the academy and industry, how or if a student should prepare for a postdoctoral position, the transition away from graduate school, and discussions on careers and opportunities in specific fields.
- Grant and Fellowship Workshops – Topics include preparing application materials, what specific committees may be looking for, and how students can best market themselves for particular opportunities. Appropriate for scholars working on pre-doctoral, dissertation, or post-doctoral fellowship applications or various grant applications.
- Publishing Your Research – This series of forums and workshops help scholars navigate the publication process and identify outlets for their scholarly work. Some sessions in this track are geared to specific fields, while others offer broader topics applicable to all students interested in publishing their research.
- Dissertation Boot Camp – Open to students working on dissertations, theses, articles, or grant/fellowship proposals, this intensive 4- to 6-day workshop helps to kickstart or revitalize students’ writing process. As Boot Camp participants, students work in a small cohort to support and motivate each other to meet their writing goals. In addition to lots of quiet writing time, Dissertation Boot Camp offers elective group sessions that address common pitfalls and issues that many students encounter, stress and time management, and dissertation and thesis formatting at UC Merced. Individualized writing help is also offered.
- Grad Slam – A UC-wide competition among graduate students in which students have three minutes to present their research in an interesting, informative manner. Grad Slam programming includes public-speaking workshops during the weeks leading up to the start of the multi-round competition. UC Merced’s first ever Grad Slam winner came this spring via Shayna Bennett, an applied mathematics graduate student.

Graduate Student Association (GSA) – The official student government of the graduate student population at UC Merced. Among many roles, the Association advocates on behalf of the graduate student population, organizes graduate student representation among various campus committees, encourages graduate student life, and organizes a small travel reimbursement award for graduate student presenters.

The Graduate Student Association of the University of California, Merced is established:

- To provide a forum where the matters of concern to graduate and professional students may be discussed
- Where opinions on actions and proposals of the university administration and graduate groups may be expressed
- Where proposals of the Administration and graduate groups may be initiated
- To conduct programs and services of special interest to graduate students

- On average, what financial assistance is available to each student? ARCS Scholar financial awards are unrestricted, and not to be included in the financial package awarded by the institution.

Nearly all CIS PhD students receive 12 months of funding per year, each year that they are in the program. The 12-month total stipend is about \$30,000 per student, including remission of all tuition and fees except a small amount of campus-based fees (<\$500).

Additionally, nearly all PhD students are funded by the program for summer research.

Faculty

- What is the size of the faculty? How many faculty members are in the department(s) or program(s) or will be engaging with the scholar(s) in the multidisciplinary program?

There are 18 core faculty members in the CIS graduate group, they all may have the opportunity to engage with ARCS scholars.

- What percentage of the faculty is full-time, part-time?

100% - All core faculty are full-time

- What is the faculty/student ratio for the department/program or multidisciplinary program?

With 32 graduate students currently enrolled and 18 faculty members, there are about 1.7 graduate students per faculty. Three faculty members are philosophers who help to train graduate students but do not serve as primary advisors. Discounting them, the student/faculty ratio is 2.1.

- Cite national awards received by current faculty teaching in the department(s)/program(s) or multidisciplinary programs in the past 5 years. (Additional rows should be added as needed.)

Faculty Name	Award
Michael Spivey	William Procter Prize for Scientific Achievement, Sigma Xi Scientific Research Honor Society
Teenie Matlock	Women in Tech Initiative Athena Award for Academic Leadership
Paul Maglio	Distinguished Scientist, Association for Computing Machinery
Paul Smaldino	Early Career Contribution Award from the Society for Experimental Psychology and Cognitive Science

5. Cite national offices held by current faculty teaching in this department(s)/program(s) in the past five years. (Additional rows should be added as needed.)

Faculty Name	National Organization	Office Held
Teenie Matlock	Cognitive Science Society	Governing Board Member
Michael Spivey	Cognitive Science Society	Governing Board Member
Paul Maglio	INFORMS Service Science Section	Elected Council Member
Zenaida Aguirre-Munoz	American Education Research Association	Bilingual Education Research Chair
Zenaida Aguirre-Munoz	American Education Association	Engineering & Computer Science Chair

6. How many and what percentage of current faculty in this department(s)/program(s) hold research grants from the National Institutes of Health (NIH), the National Science Foundation (NSF) and/or other nationally-recognized scientific bodies?

Of the 18 core faculty members, 11 hold national research grants, for 61%

7. How many current faculty have been elected to membership in the relevant organizations of: National Academy of Sciences; National Academy of Engineering; Institute of Medicine. (Additional rows should be added as needed.)

Faculty Name	Organization
Sarah Kurtz	National Academy of Engineering

8. List the 15 most important current grants, including amounts, dates of funding, funding agency and role of faculty member (e.g., PI or Co-PI).

National Science Foundation, DGE - 1633722 National Research Traineeship Award (NRT) NRT-DESE Intelligent Adaptive Systems: Training computational and data-analytic skills for academia and industry. PI: Ramesh Balasubramaniam; Co-PIs (Chris Kello, Stefano Carpin, Suzanne Sindi) \$2,921,681 (2016-2021).

National Institutes of Health: National Institute of Deafness and other Communication Disorders-R01 "Music appreciation after cochlear implantation"(1R01DC018701-01) Heather Bortfeld Co-PI (2019-2024), \$380,628.

Air Force Office of Scientific Research: Trust in Machine Agents Under Realistic Threat. PI Colin Holbrook (2020-2023), \$815,011.

Blackstone Charitable Foundation, “UC Merced Blackstone LaunchPad Program”, Paul Maglio Co-PI (2019-2022), \$550,000.

Andrew W. Mellon Foundation, “UC Merced: Pathways to a Diverse Faculty”. \$574,000, Teenie Matlock Co-PI (2018-20), to be extended and expanded through recent \$15M multi-campus award.

National Science Foundation, “EAGER: SAI: Facilitating Restoration of Natural Infrastructure Using Uncertainty Communication” 2122174, Lace Padilla PI, \$300,000 (2021-22).

Department of Energy, Visual Cognition in Support of Transmission Reliability, Lace Padilla Co-PI, \$225,000 (2021-23).

National Science Foundation, RAPID: Visualizing Epidemical Uncertainty for Personal Risk Assessment, 2122174, Lace Padilla Co-PI, \$191,696 (2020-21).

National Science Foundation, “RAPID: Coupled Contagion, Behavior-Change, and the Dynamics of Pro-and Anti-Social Behavior During the COVID-19 Pandemic”. Paul Smaldino Co-PI, \$200,000 (2020-2022).

Army Research Office, “Hiding Radical Speech in Plain Sight: Covert Identity Signaling on Social Media”. Paul Smaldino PI, \$300,000 (2020-2023).

National Science Foundation, “CC* Networking Infrastructure: Building a Science DMZ Network for University of California Merced” 1659210. Michael Spivey Co-PI, \$422,460 (2017-2021).

National Science Foundation, “Collaborative Research: The AGEP California Hispanic Serving Institutions (HSI) alliance to increase underrepresented minority faculty in STEM”. Chris Kello PI, \$621,039 (2018-2023).

National Science Foundation, Collaborative Research: The AGEP California Hispanic Serving Institutions (HSI) alliance to increase underrepresented minority faculty in STEM. Chris Kello PI, \$621,039 (2018-2023).

National Science Foundation, INCLUDES Alliance: Computing Alliance of Hispanic-Serving Institutions, Chris Kello PI, \$480,829 (collaborative with UT-EI Paso), 2019-2023.

US Department of Education. *Region 14 Comprehensive Centers Program*. Zenaida Aguirre Munoz Co-PI, \$1,000,000 (2019-2025).

9. State the number of published articles per faculty attributed to the department(s)/program(s) under consideration during the past two years (provide full citations for 10 examples, underlining and bolding faculty names) as well as the number of articles published by the department/program’s faculty in the journals “Nature”, “Science” and the journals that constitute the top three peer reviewed publications in your field/s during the past two years. Cite 10 examples.

CIS faculty members published about 3.5 articles per year per member, for the past two years. They also have three publications in *Nature*, *Science*, or the top three journals in their fields in the last two years. Ten examples are as follows, including those from top journals.

Balasubramaniam, R., Haegens, S., Jazayeri, M., Merchant, H., Sternad, D., & Song, J. H. (2021). Neural encoding and representation of time for sensorimotor control and learning. *Journal of Neuroscience*, 41(5), 866-872.

Falandays, J. B., Nguyen, B., & **Spivey**, M. J. (2021). Is Prediction Nothing More than Multi-Scale Pattern Completion of the Future? *Brain Research*, 147578.

Smaldino, P. E. (2020). How to build a strong theoretical foundation. *Psychological Inquiry*, 31(4), 297-301.

Garg, K., & **Kello**, C. T. (2021). Efficient Lévy walks in virtual human foraging. *Scientific Reports*, 11(1), 1-12.

Pouw W, Proksch S, Drijvers L, Gamba M, Holler J, **Kello** C, Schaefer RS, Wiggins GA. 2021 Multilevel rhythms in multimodal communication. *Phil. Trans. R. Soc. B*, 20200334.

Holbrook, C., Iacoboni, M., Gordon, C., Proksch, S., & Balasubramaniam, R. (2020). Posterior medial frontal cortex and threat-enhanced religious belief: a replication and extension. *Social Cognitive and Affective Neuroscience*, 15(12), 1350-1356.

Backer, K. C., & **Bortfeld**, H. (2021). Characterizing Bilingual Effects on Cognition: The Search for Meaningful Individual Differences. *Brain Sciences*, 11(1), 81.

Ritwika, V. P. S., Pretzer, G. M., Mendoza, S., Shedd, C., **Kello**, C. T., Gopinathan, A., & Warlaumont, A. S. (2020). Exploratory dynamics of vocal foraging during infant-caregiver communication. *Scientific Reports*, 10(1), 1-14.

Schloesser, D. S., Hollenbeck, D., & **Kello**, C. T. (2021). Individual and collective foraging in autonomous search agents with human intervention. *Scientific Reports*, 11(1), 1-13.

Ryskin, R., Levy, R. P., & Fedorenko, E. (2020). Do domain-general executive resources play a role in linguistic prediction? Re-evaluation of the evidence and a path forward. *Neuropsychologia*, 136, 107258.

If this is a Multidisciplinary Program, please complete the following:

1. Provide a listing of multi-investigator grants and their size and source of funding relating to this department(s)/program(s).

While Cognitive Science is a multi-disciplinary field, the program is not multi-disciplinary in the sense that it is one graduate aligned with one department.

2. What entity gives the degree? (What does the diploma say?)

NA

3. Are there recruitment efforts in common between the multidisciplinary program and related departments/programs? If so, what are they?

NA

4. If the Multidisciplinary Program involves more than one university or institute, please name all participating entities.

NA

- a. Are all institutions participating approved by ARCS?

NA

- b. Please confirm that the degree-granting university is approved by ARCS.

NA

SECTION II

Additional questions to be completed if the department(s)/program(s) or Institution housing it is/ are **not** ranked within the top 50 in the nation. Many of these questions are answered in regard to the institution.

1. Is the doctoral degree regularly awarded from this institution in the sciences, engineering, and/or medicine? Please state the number of degrees granted for each area, what degrees they are, and from what departments for the past 3 years.

Yes. Total PhDs Awarded from 17-18, 18-19, and 19-20

Cognitive and Information Sciences: 12
Applied Mathematics: 9
Chemistry and Biochemistry: 7
Physics: 23
Quantitative and Systems Biology: 25
Bioengineering: 4
Electrical Engineering and Computer Science: 18
Materials and Biomaterials Science and Engineering: 6
Mechanical Engineering: 11
Environmental Systems: 18

2. What are the top three science, engineering and/or medical research departments at the institution?

Environmental Systems, Cognitive & Information Sciences, Physics

3. Indicate the total expenditures at the institution for research activities in fields relevant to the department(s).

FY 2020 - \$1,906,000. This includes UC Merced federal and non-federal expenditures in the fields of computer & information sciences and psychology for FY 2020, as reported by the University of California Office of the President in the National Science Foundation's Higher Education Research and Development Survey FY 2020.

4. Indicate the total expenditures in the department(s)/programs for research activities in the fields of science, engineering, and medicine.

FY 2020 - \$43,421,000 (for institution in fields of sciences, engineering and medicine). This includes federal and non-federal research expenditures in all fields except “non-S&E fields” for FY 2020, as reported by the University of California Office of the President in the National Science Foundation’s Higher Education Research and Development Survey FY 2020.

Attachments

Please list attachments

Appendix 1. List of Program Faculty

Appendix 2. Description of Library, Laboratories, Institutes and Centers

Appendix 1

List of Program Faculty

Listing of Cognitive and Information Sciences Graduate Core Faculty 2020-21

Zenaida Aguirre-Munoz, Professor
Kristina Carol Backer, Assistant Professor
Ramesh Balasubramaniam, Professor
Heather Bortfeld, Professor
Carolyn Dicey Jennings, Associate Professor
Hanna Gunn, Assistant Professor
Daniel Hicks, Assistant Professor
Collin Holbrook, Assistant Professor
Christopher Kello, Professor
Paul P. Maglio, Professor
Tyler Marghetis, Assistant Professor
Teenie Matlock, Professor
David Noelle, Associate Professor
Lace Padilla, Assistant Professor
Rachel Ryskin, Assistant Professor
Paul Smaldino, Associate professor
Michael Spivey, Professor
Jeffrey Yoshimi, Associate Professor

Appendix 2

Description of Library, Laboratories, Institutes and Research Centers

Campus Buildings, Offices and Research Space

Classroom & Office Building 1

Classroom & Office Building 1 is a 3-story, 105,435 gross square-foot building with classrooms, offices, and laboratories. COB was awarded LEED Gold Certification in March of 2008. The building is located in the core section of campus. The COB also houses a performance auditorium with high-quality acoustic features, a system for state-of-the-art sound and lighting equipment and backstage rooms for performers, musical and performance equipment and general storage.

Classroom & Office Building 2

Classroom & Office Building 2 is a 3-story, 88,505 gross square-foot building located in the core section of campus. COB2 has LEED Platinum certification. COB2 provides approximately 51,000 assignable square feet of flexible classroom, academic support, research and office space.

Science & Engineering Building 1

SE1 is a 4-story plus basement, 212,344 gross square-foot building located in the core section of campus. The SE1 building was awarded LEED Gold certification in February of 2009. The building includes laboratories, laboratory support space, teaching laboratories and offices and administrative office space for the PI and named senior personnel. Faculty members are assigned space in modern collaborative inter-disciplinary suites equipped with state of the art equipment. Sophisticated shared equipment is located in dedicated rooms within a suite with similar research needs or across-suites to encourage efficient utilization of resources and foster inter-disciplinary interactions.

Science & Engineering Building 2

Science & Engineering Building 2 is a 3-story plus basement and roof, 131,279 gross square-foot facility overlooking the next phase of campus development. The building opened in 2014. It provides space for the School of Engineering Dean suite, School of Natural Sciences and School of Engineering faculty offices, graduate student and trainee offices, research and instructional laboratories, and core facilities. Architectural features include several significant outdoor spaces, such as a pedestrian plaza; a solar-panel shaded promontory that can serve as an event venue; and a porch for outdoor learning opportunities. In addition to offices and labs on the upper levels, breakout rooms with adjacent balconies will provide collaboration space featuring sweeping vistas of the undeveloped landscape and future campus expansion.

Lab 2A: Sustainability Research & Engineering

Lab 2A: Sustainability Research & Engineering is a 4-story plus basement, 179,937 gross square-foot building. It is one of three teaching and research buildings that anchors the new

Academic Quad as part of the 2020 Project campus expansion initiative. The building consists of four floors above grade with a partial basement. This basement nestles into UC Merced's existing topography and links the laboratory to the shaded loading dock.

Within the building, the wet/dry laboratories are organized around modular planning principles that will enable the configuration of the building to evolve over time. At the intersection between research and class laboratories, building users will find conference rooms, break rooms, and colloquy spaces arranged to bring people together across divisions and departments to create dynamic learning environments.

The architectural expression of the building builds on the contextual legacy of UC Merced's initial buildings with the use of materials familiar to the Valley, but employed in service of the functional needs of the building. Primary exterior building materials consist of cast-in-place architectural concrete, corrugated metal, and high-performance glazing—all materials that can be found throughout existing University buildings. Colored cement plaster is used as a highlight in select locations at the ground floor and exterior stairs.

Lab 2B: Arts & Computational Sciences

Lab 2B: Arts & Computational Sciences is a 3-story plus basement, 113,364 gross square-foot building. This building creates a relationship between the Academic Quad on its northern side and the natural landscape to the south.

Active program is clustered around activity nodes and interconnected outdoor spaces. These features ease wayfinding, and foster impromptu meetings and collaboration for students, faculty and staff. Exterior circulation articulates the pedestrian experience at the ground and upper levels facing the Academic Quad. This allows all levels of the building to participate in the campus experience, and helps the building display its function. Balconies and exterior gathering spaces denote major pedestrian pathways.

Lab 3A: Biomedical Sciences and Physics

Lab 3A is a 302,173 gross square-foot building. It is one of three teaching and research buildings that anchor the new Academic Quad as part of the 2020 Project campus expansion initiative. The building consists of five floors above grade with a partial basement. This basement nestles into UC Merced's existing topography and links the laboratory to the shared loading dock.

3A BSL-3/ABSL-3

The BSL-3/ABSL-3 facility occupies the new Lab 3A-Biomedical Sciences and Physics building (part of the Merced 2020 initiative).

The facility contains three laboratory rooms and two animal holding rooms with adjoining procedure rooms. Each lab room contains a Class II A2 and Class II B2 safety cabinet. One lab room has a glove box. The animal holding rooms contain two biocontainment rodent racks and a Class II A2 in the procedure space.

The facility contains the necessary equipment to perform animal infections, process tissues and cells, and prepare samples for analysis, prior to fixation and/or storage. Shakers and incubators are available for fungal growth and longer-term cellular stimulation experiments.

3A2: Greenhouse

The Greenhouse is a 2,560 gross square-foot research greenhouse adjacent to the Lab 3A building. Designed by Skidmore, Owings and Merrill, it was completed in Fall 2020 as part of the campus expansion. The building has been sited in a location well-suited for future expansion as funding becomes available.

Access to plant-growth facilities is essential for the controlled, hands-on research carried out by many UC Merced faculty members and students. The potential for research performed in this facility includes areas such as food and water security, biodiversity, climate change, renewable energy, and ecosystems.

Kolligian Library

Kolligian Library is a 4-story, 215,961 gross square-foot building that houses the campus library and meeting rooms in the four-story east wing, and administrative offices and student services space in the three-story west wing. Additionally, executive campus leadership and administration, a large public gathering space and common dining area, and the campus bookstore are located within the building. The library has 17 group meeting rooms, and dedicated study space as well as library instructional space. As part of the University of California, UC Merced Library shares resources with other campuses and has developed much of its electronic collection in conjunction with the California Digital Library (CDL). The library offers 48 laptops for instruction, 10 public workstations that visitors can use to access library information online, and two high resolution book scanners.

Major Equipment

Students, researchers, and faculty have access to major equipment at UC Merced in the following shared, centralized facilities:

Imaging and Microscopy Facility

The Image and Microscopy Facility is a laboratory that provides essential resources around the clock for faculty members, students and researchers in the area of light and electron microscopy. This laboratory provides an infrastructure that can serve campus researchers in the physical sciences, biological sciences and engineering, with a particular focus on nanotechnology. The IMG hosts optical, Scanning and Transmission Electron Microscopes, Wide Angle X-ray Diffraction, X-ray Photoelectron Spectroscopy, in addition to equipment for preparing specimens for examination. The objective is to provide high-end, state-of-the-art instrumentation to campus members at a modest cost.

Stable Isotope Laboratory

The Stable Isotope Laboratory at UC Merced includes two ThermoFisher Delta V Plus isotope ratio mass spectrometers (purchased in 2014) each with Conflo IV interfaces. Both have collectors for measuring hydrogen, oxygen, carbon, nitrogen, and sulfur isotopes; one of the instruments includes the collectors for measuring ³³S and ³⁶S. Peripheral devices include the TCEA and a GC Isolink with RSH autosampler equipped for carbon, nitrogen, and hydrogen isotope measurements, along with a Costech elemental analyzer with a zero blank autosampler. In addition, the laboratory includes a Sartorius microbalance, freeze drier, muffle furnace, ovens, solvent storage freezer, refrigerator, standard gases, Labconco drying system, and analytical balances.

Natural Reserve System

The UC Natural Reserve System is a library of ecosystems throughout California. Most of the state's major habitat types are represented, from coastal tidepools to inland deserts, and lush wetlands to redwood forests. No other network of field sites can match its size, scope, and ecological diversity. The NRS offers outdoor laboratories to field scientists, classrooms without walls for students, and nature's inspiration to all.

Environmental Analytical Laboratory

The Environmental Analytical Laboratory (EAL) is one of core facilities supported by the Office of Research and Economic Development. The EAL is equipped with an array of state-of-the-art instrumentation and sample preparation equipment located at S&E I Room 201 (partial space) at the UC Merced main campus. It offers rapid and accurate measurements in environmental materials—including water, soil and biological samples—for major and trace elements, selected chemical species, nutrients and stable isotopes to meet a wide range of analytical needs in support of diverse research and education programs in environmental, chemical, biological, the Earth systems, ecological sciences and engineering. A list of major instruments and their capabilities is included below:

Environmental Analytical Laboratory (EAL) Instrument Capabilities
Office of Research & Economic Development, UC Merced

Instruments Available	Compounds or Elements Analyzed	Sample Types	Concentration Range
ICP-OES	Typical metals: K, Na, Ca, Mg, Fe, Mn, Al, Cu, Zn, As, S, P, Si, and more	multi-element capabilities and high dynamic ranges	mid-ppb to ppm level
ICP-MS	Typical metals: K, Na, Ca, Mg, Fe, Mn, Al, Pb, Cu, Zn, As, Sr, Se, Cs, U, Hg and more	multi-element speed with high sensitivity and dynamic ranges	sub-ppt to ppm level
GF-AA	Typical Elements: Na, K, Ca, Mg, Fe, Mn, Cu, Zn, As	single element analysis, relatively high sensitivity, small sample size required	sub-ppb level
Multiwave digestion	Acid digestion of solid samples for metal analysis	soil, sediments, biological samples	
Ion Chromatography	Major cations: Li, Na, K, Ca, Mg, NH ₄	Lake, river, snow, drinking, & wastewater, soil extracts	sub-ppb to ppm level
Ion Chromatography	Major anions: F, Cl, Br, NO ₃ , SO ₄ , PO ₄ . Small organic acids including acetate, formate, MSA	Lake, river, snow, drinking, & wastewater, soil extracts	sub-ppb to ppm level
Flow Injection Analyzer	Nutrients: NO ₃ , NH ₄ , orth-PO ₄ , SO ₄ , SiO ₄ , TKP and TKN	river, snow, drinking, wastewater, soil extracts	sub-ppb to ppm level
TOC Analyzer	DOC or NPOC, TN and IC in solution samples	river, snow, drinking, wastewater, soil extracts, sediments, soils	mid-ppb to ppm level
Water isotope analyzer	² H and ¹⁸ O isotopes in liquid samples	any water-based samples	
Mercury Analyzer	Total Hg & Methyl-Hg	Liquid and solid samples for total Hg; Liquid samples for Methyl-Hg.	sub-ppt to ppm level

Please contact Dr. Liying Zhao for any inquiry at 209 233 1728 or via Email: lzha04@ucmerced.edu
Physical address: Science & Engineering Building I, Room 201, University of California, Merced, 5200 North Lake Road, Merced, CA 95343

Rapid Prototyping Lab

It includes Replicator Z18 3D Printer capable of creating objects as large as 12×12×18 inches out of ABS/PLA plastic, Form 2 3D Printers capable of creating features as fine as 25 microns out of a variety of material properties (e.g., high-temperature, tough, flexible), and 1,000 DPI 30 Watt Laser Cutters that can accommodate objects up to 12×16" and cut through and engrave upon a variety of materials (e.g., paper, plastics, acrylic, leather, wood). The lab has many

smaller Afinia, Creator Pro, MakerGear 3D Printers; Logitech, MakerBot 3D Scanners; Othermill CNC Mills. It also has soldering workstations equipped with 21 Velleman soldering irons, test equipment and electronics tools. This facility is located in the main campus and open to all School of Engineering faculty and students, providing that they compensate for the materials used in the project (\$0.15-0.50 per gram) and pay an hourly rate of \$10.00 for prepping 3D Printers and post-processing 3D printed parts.

Machine Shop

The machine shop is located on the 1st floor of the SRE building. It has a HAAS VF2 CNC milling machine, HAAS TL1 CNC Lathe, and two Tormach PCNC1100 CNC Milling Machine. The new SRE machine shop is expected to be up and running soon. The machine shop has a manual machine shop located in SE 1 Rm #143. There are also three Bridgeport manual mills, three Leblonde Manual lathes, a Vertical Band saw, a Horizontal band saw, a Drill Press, a Belt sander, a Mini CNC Machine, a Pedestal Grinder, one MIG welder, one TIG welder, and various types of precision Measuring devices.

Illumina MiSeq

With support from the University of California Office of the President, UC Merced's School of Natural Sciences has invested in an Illumina MiSeq to facilitate Next-Generation Sequencing as a shared faculty resource. This instrument is currently overseen by Prof. Carolin Frank, with day-to-day management and support provided by Lolo Cardenas.

In collaboration with individual labs, the core provides sequencing for smaller scale projects (i.e. on an Illumina MiSeq) as well as quality control and library preparation for larger-scale sequencing projects at other UC core facilities (i.e. on the Illumina HiSeq). The core has developed expertise in targeted gene sequencing, metagenomics, small genome sequencing, targeted gene expression, and amplicon sequencing, and maintains the following equipment; an Illumina MiSeq, a 2100 Agilent BioAnalyzer, a Qubit fluorometer, and a Covaris M220 focused ultrasonicator.

Nuclear Magnetic Resonance (NMR) Facility

The facility provides access to Nuclear Magnetic Resonance Experiments for the UC Merced community and others and houses several major NMR instruments at two sites, on-campus and at Castle, including 400 MHz, 500 MHz and 600 MHz NMR spectrometers, a Horiba Fluorolog 3 fluorimeter, a Bruker Vertex 70 FT-IR spectrometer with a diamond crystal ATR accessory, a high resolution Thermo Electron Exactive Plus LC-MS for detecting small molecules, and a Q Exactive quadrupole Orbitrap LC-MS for high resolution detection of macromolecules.

Sierra Nevada Research Institute

The mission of the Sierra Nevada Research Institute (SNRI) is to discover and disseminate new knowledge that contributes to sustaining natural resources and promoting social well-being in the San Joaquin Valley and Sierra Nevada regions of California, and related regions worldwide, through integrated research in the natural, social and engineering sciences.

The mission of the Sierra Nevada Research Institute is accomplished through:

- Collaborative, multidisciplinary, fundamental research conducted by faculty, students, staff and affiliated scientists in natural sciences, engineering, and social sciences.
- Strong interactions with related research units within the UC system and close collaborative relations with scientists and managers at national laboratories, and local, state and federal agencies, including the National Park Service.

- Connecting objective, science-based data and information with public and private stakeholders.

The Sierra Nevada Research Institute is organized around an Environmental Systems model. A particular emphasis is on the physical and biological connections that exist between the Central Valley and Sierra ecosystems. Through these balanced research efforts, the Sierra Nevada Research Institute serves as a source of objective scientific information for public policy makers as California faces the growing challenge of sustaining the integrity and quality of its resources into the future.

Through the Sierra Nevada Research Institute our students and faculty have access to a variety of biological field stations in Yosemite, Sequoia, and Kings Canyon National Parks. In May 2004, Yosemite National Park and the Sierra Nevada Research Institute dedicated the first of these stations, located in Wawona. The Wawona station gives logistical support for academic field research and outreach activities in Yosemite National Park. In addition, the Virginia Smith Trust Reserve adjacent to the UC Merced campus provides additional sites for research.

UC Merced faculty currently affiliated with the Sierra Nevada Research Institute are working on climate change and ecosystem health, contaminant transformations in soils and aquatic systems, development of environmental sensors, hydrologic processes in the Sierra Nevada, nutrient transport in agricultural and natural systems, water and air quality in the Valley basin and Sierra Nevada Range, and computational ecology and biodiversity.

Health Sciences Research Institute

The Health Sciences Research Institute (HSRI) was established in June 2012 as UC Merced's second Organized Research Unit, with the aim of fostering world-renowned research with student involvement and community engagement.

San Joaquin Valley regional health issues include asthma, obesity, diabetes, cancer, hypertension, heart disease, risky teen behaviors, teen tobacco use, sexually transmitted diseases, hepatitis, and many others.

HSRI has more than one hundred affiliated faculty members across UC Merced's three schools (Engineering, Natural Sciences, and Social Sciences, Humanities & Arts) covering a range of health and medical research. HSRI also allows Graduate Student Members, Clinical Affiliate Members and Community Affiliate Members as part of its commitment to diversity and inclusiveness. The opportunities to address the growing and complex health issues of the San Joaquin Valley and beyond require inter- and multidisciplinary team and, as such, HSRI members are organized by primary research interest:

- Health Disparities
- Environmental Health
- Biomolecular Research
- Biosimulation and Modeling
- Cancer Control and Prevention
- Immunity and Infectious Diseases
- Basic & Behavioral Neuroscience, Learning and Development
- Health Decision Making

HSRI members are also engaged in research on evaluation and effectiveness research, and public health systems and services research.

HSRI's collaborative multidisciplinary research clusters and community emphasis provide an opportunity to rapidly develop, test, and disseminate new ways of improving health and delivering healthcare. This will help establish UC Merced as a world-renowned research university while improving the health of the people in the San Joaquin Valley.

University of California Advanced Solar Technologies Institute

The University of California Advanced Solar Technologies Institute (UC Solar) is a multi-campus, multidisciplinary research institute made up of faculty from the University of California's Merced, Berkeley, and Santa Barbara campuses. Headquartered at UC Merced, UC Solar creates technologies that make solar energy systems more efficient, more affordable, and the best choice for the people of California and the world. In addition, UC Solar educates and develops tomorrow's solar energy leaders and entrepreneurs.

Initial UC Solar research areas include advancing the state-of-the-art in solar concentration (for photovoltaic and thermal systems), employing nanotechnology in both collector/concentrator and device structures, and developing new devices that capture usable energy in the UV portion of the solar spectrum.

Through collaboration with industry and other stakeholders, UC Solar researchers are challenged to create solar technologies that can be brought to the marketplace quickly. UC Solar researchers partner with industry participants through the UC Solar Industry Consortium, which attracts companies that design, produce, implement, manage and invest in solar technologies.

Spatial Analysis Research Center

The goal of the Spatial Analysis Research Center (SpARC) Centralized Research Center is to add value and capabilities to UC Merced's existing and planned research, teaching, administrative, and community outreach efforts in the area of spatial analysis and spatial science. Many UC Merced faculty are engaged in spatial sciences including historians and archaeologists, social and cognitive scientists, engineers, computer scientists, environmental scientists, and biologists. SpARC's mission extends across all three academic Schools and has connections with the Sierra Nevada Research Institute, the Great Valley Center, Yosemite National Park, the Center for the Study of Health Disparities, and the Division of Administration. SpARC aims to foster new intellectual collaboration, stimulate new sources of funding, further innovative and original research, supply research techniques and services to faculty groups, perform services and outreach to the public and support student learning.