UC Multicampus Research Programs and Initiatives

Abstracts for Active Awards

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UC Multicampus Research Programs and Initiatives

Abstracts for Active Awards

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Heat, Equity, and Integrated Resilience in Schools (HEIRS

Host Campus: Santa Barbara
Lead Investigator: Elizabeth Ackert
Award Type: Program Award
Collaborating Sites: Davis, Irvine, San Francisco
Amount: $2,281,634

Abstract:
Excessive heat is known to be deadly for exposed and vulnerable populations. Given the physiology of their bodies, children, in particular, are more sensitive to heat stress than adults. Exposure to heat can have negative effects on children including dehydration, heat exhaustion, heat cramps, and heat stroke, as well as adverse effects on cognitive performance. Nearly six million children are enrolled in California's public schools. As California experiences increasing heat due to climate change, a key question is whether the state's schools and public health officials are ready to protect children from heat effects. This project will evaluate the vulnerability of California school-aged children to extreme heat, and will work with school and public health end-users to develop action plans to mitigate this threat.

To address this issue, we will meet several key outcomes. First, we will use multiple data sources to compile a database of observed and predicted heat exposure in public schools that will be communicated with end-users and made publicly available via a data dashboard. We will assess heat observations and projections for a sample of 9 public schools within Santa Barbara County, Orange County, and Yolo County. Second, we will assess vulnerability and adaptation to heat exposure in the sample of public schools within these counties. Using a mixed methods approach, and considering multiple metrics, we will investigate vulnerability and adaptation to heat among a sample of public schools in these counties. We will also engage in primary data collection to assess heat health literacy among families, school personnel, and public health end-users. Lastly, we will engage community end-users working in schools, and public health administrators focused on children, youth, and health, in this research. We will identify end-user needs and priorities in the areas of heat exposures, vulnerabilities, and adaptations in these counties, and will provide these end-users with the capacity to develop decision making tools and action plans to meet their needs and priorities in these areas.

Our project will provide a model for conducting similar research in other regions of the state, eventually scaling up to include all public schools in California.

Reimagining Refuge: California for Just Migrant Futures

Host Campus: San Diego
Lead Investigator: Abigail Andrews
Award Type: Program Award
Collaborating Sites: Berkeley, Irvine, Santa Barbara
Amount: $1,592,974

Abstract:
Amid climate change, political upheaval, and organized crime, record numbers of migrants are arriving at the US southern border seeking asylum. Many are families and youth. In cities like San Diego, up to 1000 people have landed daily, overwhelming NGOs and service providers. Once in the US, migrants' needs intersect with enduring urban challenges, from homelessness to health disparities. The "crisis" (as dubbed by politicians like Trump and Abbott) has made immigration a key flashpoint in US politics. California, a border state that is 40% Latino and 28% foreign-born is poised to lead the way to reimagining the process of refuge.

This project brings together leading UC immigration scholars, students, and organizations across California and the US-Mexico border to 1) conduct an unprecedented, multi-sited, and multi-scalar analysis of the impacts of US treatment of asylum seekers, by and for California's immigrants, and 2) seed a just future for migrants. Funding will support two major initiatives:

The PIs will collaborate with immigrant NGOs and UC graduate and undergraduate students to conduct interviews, participant observation, and art workshops with asylum-seeking families across California, in detention, at the US-Mexico border, and in Mexico en route to the United States. Researchers co-design the study with NGOs and service providers and work with migrants to understand their lived experiences. The study will connect California's major regions and compare practices in California to other sites in the US and beyond. These data will provide a first-of-its kind understanding of the impacts of current US policies and enforcement practices for migrants, with a focus on youth and families. In addition, the study will identify, design, and test humane alternatives to border militarization, detention, and long-term urban limbo.

We will build a California-wide community of scholars and practitioners reimagining and practicing just resettlement. We will offer small grants to UC faculty, graduate students, undergraduates, community organizers, and artists, to cultivate innovation and cross-sector dialogue. And, we will hold annual two-day convenings and regular workshops to bring together these groups and reimagine refuge, intellectually, artistically, and practically.

Unraveling disease pathways for autism spectrum disorder with phenotyping of human brain organoids

Host Campus: Berkeley
Lead Investigator: Helen Bateup
Award Type: Program Award
Collaborating Sites: Santa Cruz, San Francisco
Amount: $1,800,000

Abstract:
Autism spectrum disorder (ASD) affects 1 in 22 children in California, is untreatable and characterized by social, cognitive, motor and sensory deficits. The estimated lifetime social cost is 3.6 million per patient. Individuals affected with ASD can be challenged at work because of their difficulty to balance multitasking and focus. Additionally, challenges with communication and repetitive or inflexible behaviors often result in unemployment and isolation.

The neurobiology of ASD remains unresolved. Animal models indicate alterations in the development, activity and plasticity of neural circuits. These processes can be studied in a human cellular context using neurons differentiated from human stem cells, including from patients. 2D neuronal cultures often oversimplify disease mechanisms and lack the complexity of organs. By contrast, brain organoids self-organize into 3D structures, represent fetal-like maturity and often more accurately model neurodevelopmental diseases. We will employ human brain organoids to study ASD mechanisms.

Hundreds of ASD mutations have been identified. However, the mechanisms by which these mutations drive disease remain unclear. Here, we will uncover molecular, cellular, and developmental phenotypes driven by ASD-related mutations using brain organoids generated from ASD patient-derived cells as well as from ASD-gene CRISPR knockout cell lines from those same patient mutations. We will uncover the disease pathways through which ASD mutations act by analyzing neuronal differentiation and development, gene expression patterns, neuron structure and function, and neuronal activity. We will establish clinical relevance of disease mechanisms by relating them to patient brain imaging and clinical data. Understanding the pathways through which these ASD mutations cause disease will uncover new drug targets that can be pursued for ASD treatment and symptom relief.

Our studies are significant because we will use patient-derived 3D disease models that represent human neurodevelopment, and we will assign clinical relevance to disease phenotypes discovered in a dish using the same patient's imaging and clinical data.

Our studies are impactful because the data we derive linking mutations to pathways will highlight therapeutic avenues for ASD treatment, which will increase employment of ASD individuals and lower the economic burden.

Leveraging Coherent Quantum Electrodynamics for Attosecond X-ray Sciences

Host Campus: Los Angeles
Lead Investigator: Sergio Carbajo
Award Type: Planning Award
Collaborating Sites: Irvine, San Diego
Amount: $300,000

Abstract:
"Many scientific breakthroughs are enabled by investigating the laws of nature using photons. From the heat of supernovae to ultracold atoms and from gravitational waves to the wave function of a single photon, experiments reaching higher degrees of control of photon sources beyond previously accessible parameters have revealed fundamental facts about the universe from the smallest to the largest scales. One commonality amongst these phenomena is the necessity of well-crafted control over photonic and electronic wavepackets to either drive processes in matter or conduct (quantum) measurements and computation with unprecedented precision in both time and space at fundamental atomic scales.

At the intersection between photon and free electrons, intriguing physics in quantum electrodynamics (QED) presents new opportunities to upend the paradigm of X-ray science and engineering and circumvent traditional cost-accessibility tradeoffs in basic sciences, and commercial and medical applications. Emerging QED theory has revived interest in studying new X-ray production regimes, namely quantum X-ray emission, promising to unveil new quantum physical phenomena relevant in life and energy sciences, quantum computation, and metrology. Technologically, quantum X-ray emission can enable a dramatic cost reduction and portability of integrated (on-chip) X-ray sources to affect their application and upend their limited accessibility. This proposal presents two specific near-term objectives for future ultracompact and portable, high-brightness X-ray sources and novel QED photon-electron technologies: (Objective 1) a first-time demonstration of quantum X-ray emission, i.e., coherent multi-state X-ray radiation via electron waveshaping, and (Objective 2) its extension to pulsed and time-domain tailored X-ray emission via laser-based modulation of multi-state electron wavepackets.

The quantum wave nature of electrons provides new degrees of freedom for controlling light emission via electron waveshaping and could lead to the emergence of more versatile and powerful light sources, opening the door to ultrabright and ultracompact radiation sources such as portable and mode-locked (attosecond) X-ray free-electron lasers (XFELs), compact (on-chip) accelerators, and QED integrated computational devices.

California Organic, Agroecology, and Regenerative (COAR) Transitions

Host Campus: Davis
Lead Investigator: Ryan Galt
Award Type: Program Award
Collaborating Sites: Berkeley, Merced, Riverside, Santa Cruz, ANR
Amount: $2,699,994

Abstract:
The California Organic, Agroecological, and Regenerative (COAR) Transitions project aims to strengthen UC as an internationally recognized leader in facilitating Equitable Agroecological Transitions (EATs) by coordinating and using UC resources to adapt to and mitigate climate change by advancing knowledge, policy, and action toward equitable transformations in agriculture, working lands, and food system to heal our damaged and damaging socio-ecological relationships. Considerable research exists on land management practices that increase farm-level climate resilience, biodiversity, and economic viability but the implementation of equitable transitions is thus far insufficient to meet California and UC climate action goals and the needs of historically underserved communities. The COAR Transitions project uses agroecology as a transdisciplinary framework to build upon decades of UC work by advancing research to enhance UC's capacity to facilitate EATs in California through coordinated multicampus and statewide actions. The project's four goals are: 1) mapping and understanding agroecological transitions; 2) centering equity for EATs; 3) developing community-shaped descriptions of the contextual factors governing how and why agroecological changes can happen (i.e. regionally specific theories of change), a statewide policy roadmap for EATs, and a tool for assessing progress toward EATs; and 4) facilitating coordinated institutional changes through enhanced UC undergraduate and graduate and extension education, proposals for changes to UC and state policy, and establishment of the UC EATs Consortium. These four goals form a vision for socially and ecologically accountable transitions from individual farms to regional food systems, engaging UC with local agricultural communities, diverse organizations, and state agencies to foster deep, equitable change. Bringing together key faculty, staff, and students from across the five UC Agricultural Experiment Station (AES) campuses, Agriculture and Natural Resources (ANR), and aligned interdisciplinary institutes — Agricultural Sustainability Institute (UCD), Berkeley Food Institute (UCB), Center for Agroecology (UCSC), Organic Agriculture Institute (ANR), and Sustainable Agriculture Research and Education Program (ANR) — will help leverage UC and community partnerships to accelerate and amplify EATs in California.

Fast Practical Matrix Multiplication

Host Campus: Berkeley
Lead Investigator: Olga Holtz
Award Type: Planning/Pilot Award
Collaborating Sites: Davis, San Diego
Amount: $300,000

Abstract:
Matrix multiplication is a fundamental building block in many areas of science and technology, from computer graphics and digital communications to scientific simulations. The standard method for multiplying two nxn matrices requires a number of operations of cubic order in n, which takes a long time to perform for large matrices. In 1969, Volker Strassen shocked the world by discovering a way to multiply 2x2 matrices using only 7 multiplications instead of the usual 8, which led to the first sub-cubic time algorithm for multiplying square matrices of all sizes. Since then, researchers have found increasingly ingenious methods for multiplying larger matrices faster than the standard approach. However, most of these methods remain purely theoretical and not practically implementable because, unlike Strassen's, they are not based on small-size matrix multiplication.

This project aims to supercharge the search for new, faster, easy-to-implement matrix multiplication algorithms using a three-pronged approach:

We will use powerful optimization tools such as SAT solvers to search for special tensors and their so-called `flattenings' (matrix triples) that provide the blueprint for new multiplication algorithms. We will harness the power of artificial intelligence to guide the search for promising new tensors that enable faster multiplication. We will utilize random walks on flip graphs - networks that encode relationships between fast matrix multiplication algorithms. Navigating these networks in clever ways can lead us to discover new, faster methods.

The faster matrix multiplication algorithms we aim to discover could dramatically accelerate computations across the sciences and technology. In an age of big data, this acceleration is becoming ever more critical. Multiplying huge matrices is a key bottleneck in machine learning, data mining, physics simulations and more.

By combining tools from computer science, artificial intelligence and pure mathematics in innovative ways, this project will break new ground in one of the grand challenges of algorithms research. It will bring the extraordinary power of the latest optimization and AI technology to attack a mathematical problem of immense practical importance. The results could be transformative, delivering matrix multiplication speedups that help usher in the next generation of computational discovery.

Tools for Community-Engagement Initiatives to Educate Youth for an Environmentally Just Future

Host Campus: Irvine
Lead Investigator: Hosun Kang
Award Type: Planning/Pilot Award
Collaborating Sites: Los Angeles, Santa Barbara, Santa Cruz
Amount: $ 300,000

Abstract:
The increasing urgency of the global climate crisis and its disproportionate impact on people from non-dominant communities has motivated the emergence of numerous community-engagement initiatives focused on educating youth. Researchers generally agree that mitigating the climate crisis necessitates long-term, collective, and concerted efforts with multiple stake-holders, including researchers, teachers, students, parents, and community activists. There is also growing evidence that youth, teachers, and schools are critical to the climate change movement. However, we lack systematic research on the common components of community-engagement initiatives connected to both schools and out-of-school programs for youth that result in consequential outcomes, and how one can facilitate such collaborations among multiple stakeholders in a transformative and justice-centered way.

This pilot project aims to generate a framework, design principles, and illustrative cases that guide UC researcher-involved community-engagement initiatives for youth that aim to promote justice. Employing a design-based research approach, we will study four community-engagement initiatives (one per campus) at the four participating UCs for two years. All four initiatives involve collaborative partnerships among researchers from multiple disciplines, K-12 teachers and students, and community members. The team will convene monthly to share their partnership activities in various local contexts, discuss successes and challenges and share research findings, to develop and refine a framework and set of design principles. The following two questions will guide our research activities: (1) What framework and principles effectively guide the design and facilitation of justice-centered community-engagement activities for youth? (2) What types of partnerships result in actionable outcomes that can effectively promote climate justice?

This project is significant because it will produce tools useful to other researcher-community initiatives connected to education and to youth. These products will have the features of generativity and locality by attending to the diversity of initiatives in different local contexts. Also, this project will have a broad impact both nationally and globally given the many community-engagement initiatives focusing on environmental and climate change education.

The Art of Resilience UC Climate Action Arts Network: engaging California's public for change

Host Campus: Santa Cruz
Lead Investigator: Karolina Karlic
Award Type: Program Award
Collaborating Sites: Berkeley, Davis, Irvine, Merced, Riverside, Santa Barbara, San Diego
Amount: $1,676,913

Abstract:
Scientific understanding of climate change has accelerated in recent decades, but climate action has yet to keep pace. As the impacts of climate change become increasingly evident and public concern gains momentum, it is a pivotal time to integrate the role of the arts and cultural sectors in closing the gap between knowledge and action. Cultural and artistic production are proven strategies uniquely positioned to amplify the awareness, insight, and vision required to raise awareness and inspire impactful public engagement. UC Climate Action Arts Network (CAAN) unites arts & culture programming rooted in climate justice to address the knowledge-action gap as a climate art movement with exhibitions, education, and experiential learning. CAAN works strategically with community partners to co-create climate action knowledge together while advancing the priorities of California's Climate Adaptation Strategies to Strengthen Protections for Climate Vulnerable Communities by 1) Engaging with & building capacity in climate-vulnerable communities 2) Improving understanding of climate impacts on California's communities. Informed by our 2019 MPRI Placemaking planning grant and the United Nations Art Charter for Climate Action, CAAN encompasses a network of interconnected arts centers, institutes, and research groups as a system-wide database of artists, research programs, centers that partner with communities, corporate, and civic affiliates fostering interdisciplinary collaboration and innovative research endeavors for public engagement, cultural preservation, urban design, and workforce development. CAAN identifies critical areas of emphasis, including relationships between humanity and nature, the imperative of ethically navigating issues of othering and belonging, and the aligned efforts for economic, political, and social change by empowering California communities. CAAN provides competitive research fellowships, individual scholars undertaking compelling arts field research to collaborative groups bridging diverse academic backgrounds. CAAN tackles vital questions at the intersection of art, ecology, human and more than human rights, harnessing the collective expertise of knowledge and creativity while leveraging the strengths of California's vibrant arts & culture sectors to protect the planet and effect meaningful change on a statewide and global scale.

Water Reuse for Sustainable Agriculture: Erase PFAS and Microbial Contamination in Water-Food Nexus

Host Campus: Riverside
Lead Investigator: Haizhou Liu
Award Type: Program Award
Collaborating Sites: Davis, Santa Barbara
Amount: $1,414,771

Abstract:
This MRPI project aims to improve agriculture sustainability and agro-urban ecosystem health by developing innovative recycled water treatment technologies and management strategies for recycled wastewater irrigation in agriculture, and evaluating downstream contaminant removal from food production and water-soil-food ecosystem using edible crop irrigation research trials. Unrelenting water scarcity in many regions worldwide, including California and many regions in the United States, poses a formidable challenge to agriculture, which accounts for 50-90% of water use. The product of wastewater treatment plants can become an increasingly valuable nontraditional and sustainable water resource for irrigation. One important challenge is ensuring the high quality and quantity of agricultural products in light of chemical and microbial contaminants that may be present in recycled wastewater.

Conventionally treated wastewater effluent contains a variety of contaminants including per-and poly-fluorinated Chemicals (PFAS), pharmaceuticals and personal care products (PPCPs) and pathogens that are heavily impacted by human activities. These recycled water derived contaminants substantially reduces plant growth and crop yield during recycled water irrigation. This project will: (1) Develop novel water treatment technologies to degrade chemical and microbial contaminants from recycled irrigation water, and evaluate their fate and transport in crops in the water-food nexus; (2) Develop water deficit irrigation management strategies to enhance water conservation and food production; (3) Evaluate soil health and microbial ecosystem adaptation in response to recycled water irrigation; (4) Develop novel on-farm implementable management practices (i.e., targeted crop use) to minimize the transfer of contaminants to food crops after recycled water irrigation. This project involves a combination of environmental, chemical, biological and agricultural engineering and extension expertise at the University of California, Riverside, Davis, Santa Barbara, and partnership with UC Agricultural Extension Centers in Riverside and Irvine in groundbreaking research activities. This project will enhance the UC's portfolio to develop robust water resource management approaches in agriculture and conceive exciting new ideas on sustainability.

Our focus will be on California and the supply chains behind materials, wherever they may extend geographically. Through development of databases as well as robust methodological frameworks for assessment and improvement, the proposed research center will strive for global reach.

The UC Active Matter Hub

Host Campus: Merced
Lead Investigator: Kevin Mitchell
Award Type: Planning/Pilot Award
Collaborating Sites: Santa Barbara, San Diego
Amount: $300,000

Abstract:
Active materials–collections of energy-consuming entities that organize in emergent structures–are a new paradigm for physics and biology. Nature provides many examples, from colonies of ants to epithelia and organoids. Moreover, synthetic biomimetic active materials, such as self-propelled colloids and dense biopolymers driven by molecular motors, are under development. These synthetic realizations exhibit many life-like properties and enable quantitative experiments and strict tests of theory. Importantly, they are revolutionizing bioinspired design to create the next generation of responsive and adaptive technologies, wearable devices, and biologically inspired fluidic systems.

The field of active matter has grown exponentially over the past decade and promises to be of enduring technological importance, with opportunities for external center-type support. The University of California has made key hires in this area, but has not established a critical mass of faculty at any one campus. This proposal links together three UC campuses (UCM, UCSB, UCSD)–each of which has strong research groups in this area, including some of the founders of the field–to create a synergistic hub of excellence that will make UC an international leader in active matter and provide the seed for establishing the UC Active Matter Hub as an externally funded center. The field has so far focused on studying active fluids, where active forces generate turbulent-like flows. Signature new directions of the UC Active Matter Hub will include developing techniques for controlling active flows and designing tunable active solids. Control and tunability via designed feedback are intrinsic properties of living matter, essential for technological applications and provide the physical basis for synthetic organ design. The UC Active Matter Hub will become the focus of active matter research on the West Coast through synergistic collaborations, workshops, shared educational moduli, and student exchanges, uniquely fueling the California biotech ecosystem.

The UC Active Matter Hub will train graduate and undergraduate students of diverse backgrounds (all campuses are minority-serving institutions) in this newly emerging field, augmenting and diversifying the California STEM workforce. Research exchanges among UC campuses will uniquely enrich student interdisciplinary training and networking.

CALI-GREAT: California's Groundbreaking and Responsible Evaluation of AI Tech for Sepsis Prevention

Host Campus: San Diego
Lead Investigator: Shamim Nemati
Award Type: Program Award
Collaborating Sites: Irvine, Los Angeles
Amount: $710,634

Abstract:
Sepsis, a life-threatening health problem, presents a substantial burden with over 300,000 severe sepsis patients treated in 2022 and hospital charges totaling $84 billion in California. Despite a high mortality rate of 16% in our state, translating to over 47,000 deaths, recent advancements in artificial intelligence (AI) offer a beacon of hope. The COMPOSER model, developed by UC San Diego researchers and published in Nature Digital Medicine, has shown a promising 17% reduction in mortality. The COMPOSER model utilizes predictive analytics algorithms to analyze real-time data from electronic health records, assessing over 150 patient variables to detect early signs of sepsis. Its deployment in emergency departments has led to not only a reduction in mortality but also improved adherence to protocolized care. The overarching goal of this project is the statewide implementation of the COMPOSER model to enhance early sepsis prediction and improve patient outcomes across California's healthcare system, with an estimated 8,000 lives saved per year. However, as with most technologies, this potential must be balanced by identifying and mitigating possible risks for patient harm and the propagation of healthcare disparities.

Our initiative will focus on external validation of the COMPOSER AI model at UC Irvine, UCLA and their affiliated community hospitals, by 1) identifying barriers to AI model deployment, including interoperability standards, data privacy, algorithmic transparency and bias, and provider and patient trust, 2) validating the model's performance across diverse patient cohorts and healthcare settings, and 3) implementing a privacy-preserving federated learning platform to iteratively improve model performance based on end-user feedback. This comprehensive framework for employing clinical AI solutions will engage a diverse cross section of stakeholders to foster a robust and reliable AI ecosystem that can be scaled to benefit the entire state.

Our interdisciplinary team, comprising experts in critical care, biomedical informatics, and privacy, will address the challenges of AI deployment, including patient privacy, consent, and unbiased implementation. The ultimate goal is to foster a trustworthy AI ecosystem, establish a new standard for sepsis care in California, significantly reduce mortality rates, and decrease healthcare expenditure

Materials Science for Climate-Proof Agriculture

Host Campus: San Diego
Lead Investigator: Jonathan Pokorski
Award Type: Program Award
Collaborating Sites: Berkeley, Riverside
Amount: $1,650,287

Abstract:
Agriculture is the highest value industry in the state of California, yielding ~$60 billion of output annually. However, there are several factors threatening the health and productivity of the agricultural sector. The principal challenge is the changing climate, but other factors such as availability of farmland and the growing population are also a massive challenge. In addition, agricultural research suffers from a severe lack of funding relative to perceived high-value areas such as biomedical research and health care. For instance, the National Institutes of Health (NIH) has a ~$48 billion budget, which primarily funds biomedical research, while the National Institutes of Food and Agriculture (NIFA) only invests ~$90 million in research grants per year. The agricultural sector on its own is extremely important for the vibrancy of the California population, but when food security is considered, new research that could lead to improved crop yields directly impacts human health, as well. This proposal develops a multi-institutional and collaborative framework to relieve pressure on the agricultural sector by using materials science to grow plants in environments that do not require specific soil or climate conditions, essentially making plant growth 'climate proof'. The interdisciplinary team includes a plant scientist, synthetic biologist, materials scientist and a mechanical engineer whose expertise is manufacturing. We aim to develop plant culture substrates that can be used in hydroponic or vertical farming practices that are self-fertilizing, provide resistance to pests and pathogens, and allow for precise control of nutrients and water to the growing plants. To enable this, the collaborative team will develop hydrogels (e.g. gelatin or pectin) that can serve as soil replacements. The proposed materials will incorporate symbiotic microbes that continuously produce beneficial plant hormones to program plant growth and natural defense molecules to enhance stress resistance, develop new materials that promote plant growth, and integrate the entire package into a 3D-printable hydrogel to enable root formation, water retention, and nutrient diffusion. The multi-disciplinary team can achieve these lofty goals but requires a catalytic source of funding to generate impactful data that can lead to the first UC Plant Science Nanotechnology Center.

Developing the UC Obstetric Consortium On Real-world Evidence (UC OB CORE)

Host Campus: San Francisco
Lead Investigator: Nasim Sobhani
Award Type: Planning/Pilot Award
Collaborating Sites: Irvine, Los Angeles, San Diego
Amount: $300,000

Abstract:
The United States is in the midst of an ongoing health crisis in maternity care, with increasing rates of maternal morbidity, mortality, and disparities. At the same time, there is insufficient evidence to guide management and treatment of pregnant individuals, due to their historic exclusion from clinical trials. An alternative to the clinical trial for evidence generation is the utilization of real-world evidence (RWE), defined as evidence derived from non-trial data sources. Pregnancy-related RWE generation has traditionally been limited to single institutions, which lack sufficient sample size, or administrative databases, which lack clinical detail. As a result, the ability to advance clinical knowledge based on currently available RWE is limited, particularly when comparing variations in care and resultant outcomes among specific subpopulations.

This pilot project will establish the University of California Obstetric Consortium On Real-world Evidence (UC OB CORE), a new collaboration of leaders and junior scholars within four UC Health (San Francisco, San Diego, Los Angeles, and Irvine) medical centers who will work to advance RWE generation within pregnancy care. We will accomplish this through three primary aims. First, we plan to establish a central clinical data repository for all pregnancies and livebirths that occur within the four centers through a collaborative clinical, informatics, and data science effort that will harmonize pregnancy-related electronic health record data. Second, we will leverage these data to examine the management of diabetes in pregnancy as a use case to demonstrate the variations in care within the system and the subsequent impact on maternal and neonatal health outcomes. Third, we will host a UC OB CORE workshop that draws from the clinical expertise of academic obstetricians, technical expertise of physician informaticists, and methodological expertise of data scientists, epidemiologists, and engineers from across UC to develop a roadmap for expansion, including cross-specialty collaboration, mentorship, and career development. Successful completion of this pilot project will develop the foundation for obstetric RWE generation within UC that will ultimately improve the quality of maternal healthcare throughout California.

Leveraging California's linguistic diversity to improve large language models

Host Campus: Santa Cruz
Lead Investigator: Matthew Wagers
Award Type: Planning/Pilot Award
Collaborating Sites: Davis, Irvine, Los Angeles, Merced, Santa Barbara
Amount: $154,659

Abstract:
Engineered systems built around large language models (LLMs) are now ubiquitous. Their transformative potential comes with the risk of replicating an all-too-familiar problem: entrenching a particular language variety and language user, thereby raising barriers of access to services, education, and the workforce. The proposed MRPI builds upon an existing network of researchers in California to develop a solution-oriented assessment of how linguistic and neurocognitive diversity can be best incorporated into the design of LLMs for more equitable use.

LLMs are very large statistical models trained on trillions of words and implemented with many thousands more parameters than traditional models. They are capable of producing a wide variety of styles of language, including dialogues (like ChatGPT), in a convincingly human-like way. Nonetheless, training data for these models draw disproportionately on texts produced in perceived standard varieties of English, by neurotypical, monolingual speakers with high educational attainment (Cai et al, 2024). We hypothesize that responses generated by LLMs fail to address the needs of users who don't fall as squarely in those categories, in terms of both content-generation and ease of use (Dwivedi et al, 2024). Our team proposes to explore how severe the misalignment is between user background/needs and how it can be mitigated. In doing so it aims to better match the powerful new generation of AI tools with the linguistically and socially diverse population of California.

Our team will develop tools to assess gaps in the usability of systems built on LLMs and to minimize potential harms. The project has three primary strands: 1) experimental pilots employing psycholinguistic methods to identify gaps in user experiences with LLM content, assessing how these gaps might decrease accessibility to services, 2) four technical workshops (2 in-person, 2 virtual) introducing UC students and researchers to LLMs and the linguistic diversity of California, 3) a set of online, modular resources to expand graduate/undergraduate curricula, with datasets, scripts, and analyses, to be use in courses or training events across UC. Workshops will be collocated with the California Meeting of Psycholinguistics (started in 2017 by Co-PI Harris), inviting presenters to incorporate social science, humanistic and clinical/applied perspectives.

An Interdisciplinary approach to the study of Spanish-English bilingualism In California

Host Campus: Santa Cruz
Lead Investigator: Mark Amengual
Award Type: Planning/Pilot Award
Collaborating Sites: Berkeley, Los Angeles
Amount: $ 266,815

Abstract:
This collaborative initiative will enhance the research capacity and leadership of the UC system to address the linguistic issues of language contact, language shift, and language maintenance in the Spanish-speaking population of California by developing a robust and linguistically rich corpus of bilingual Spanish-English speech samples (Multilingual Hispanic Speech in California; MuHSiC) culled from sociolinguistic interviews and naturalistic conversations among speakers of diverse social profiles and regional origins throughout California. The audio recordings will be made available on an open website where researchers, teachers, students, and the public will be able to access a linguistic map of California Spanish-English bilingual speech. This research has two main outcomes: (i) the creation of an open-source oral corpus of Spanish-English bilingual speech in California, and (ii) the inauguration of a conference on bilingualism and speech in California to disseminate the results and encourage cross-campus collaborations. The project will design a targeted research strategy for UC by involving graduate students, engaging underrepresented undergraduate students in field research experience, and engaging with multiple cities and counties in our state, ultimately establishing UC as an international leader in bilingualism research.

Routes of Enslavement In the Americas

Host Campus: Irvine
Lead Investigator: Alex Borucki
Award Type: Program Award
Collaborating Sites: Merced, Santa Cruz
Amount: $ 839,629

Abstract:
The Intra-American Slave Trade Database, created by UC scholars Alex Borucki and Gregory O'Malley, is a vital resource for study of the African diaspora. Launched online in 2018, it documents more than 27,000 trafficking voyages from one part of the Americas to another from 1550 to 1860. This MRPI will expand the collaboration to a network of scholars across UC campuses to strengthen slavery studies at UC and to increase the database's coverage.

Our program targets three research areas: 1) interregional movements of African and African-descended captives within colonial Mexico (including California), 2) investigation of the Black Pacific by tracking coastal trafficking routes from California to Chile, and 3) further research on Caribbean migrations (coerced and free) of African-descended people, between islands and with the mainland Americas. Borucki, O'Malley, and Sabrina Smith will each oversee one target area, while collaborating on the project's shared goals. Each will lead a year of the initiative, centered on their campus and theme, and will coordinate with other UC co-investigators, postdoctoral fellows, graduate, and undergraduate students.

Year 1 –led by O'Malley– focuses on Caribbean maritime spaces and the trafficking of enslaved people between French, Spanish, Dutch, and British colonies. UC collaborators will include Kevin Dawson (UCMerced), who studies enslaved Africans' skilled maritime work as harbor pilots, pearl divers, and wreck salvagers; and Justin Dunnavant (UCLA) whose maritime archaeology for the Slave Wrecks project adds an interdisciplinary perspective.

Year 2 –led by Borucki– highlights the Black Pacific by systematizing regional databases and examining primary sources on the traffic of captives between ports of the Pacific Americas such as Acapulco, Panama, Lima, and Valparaiso. Collaborators include Rachel O'Toole (UCI, on Peru and Panama), Juan Cobo (UCSB, on Pacific Colombia), Celia Cussen (University of Chile), and others working on Mexico's Pacific coast.

Year 3 –led by Smith– focuses on creating a database from ethnohistorical sources to examine the movements of enslaved people within the colony of New Spain (today's Mexico and parts of the United States and Central America). The creation of this database will bring together research on local and regional notarial records across Mexico from scholars in the U.S. and Mexico.

Toxic Air Pollutants In California Environmental Justice Communities

Host Campus: Davis
Lead Investigator: Clare Cannon
Award Type: Program Award
Collaborating Sites: Irvine, Merced
Amount: $ 1,160,917

Abstract:
California has the worst air pollution in the US. Over the last few decades, regulations have improved air quality in areas suffering the most: Los Angeles, the Imperial Valley, the San Joaquin Valley, and the San Francisco Bay Area. In 2017, the state began focusing on disadvantaged communities through the enactment of Assembly Bill 617 (AB617): "The Community Air Protection Program."

AB617 established the nation's first state-run community-scale program to detect air pollution hotspots in communities, helping to reduce air pollutants that tend to occur at higher levels in low-income communities of color. The development of new air pollution measurement tools to implement AB617 can be an exceptional form of relief for these communities who for years have been advocating for access to cleaner air. Disadvantaged communities in California are typically exposed to two kinds of hazardous air pollutants (HAPs): toxic metals and toxic volatile organic compounds. As part of this effort, the California Air Resources Board funded Dr. Wexler, a co-PI of this proposal, to develop a cost-effective instrument to measure toxic metals in the air. Conventional toxic metal instruments cost about $200,000, while Dr. Wexler's instrument has similar performance but only costs $3,000 to build. With US EPA funding, Dr. Wexler is also developing an inexpensive instrument for measuring toxic VOCs. Conventional instruments that measure these compounds cost on average over $500,000. Dr. Wexler's instrument will cost about $20,000.

This proposal will use these novel instruments with collaborative community approaches and educational outreach to solve three problems for California's most disadvantaged communities:

1. Partner with community groups, such as Communities for a Better Environment (L.A., S.F.), and the Central California Environmental Justice Network (San Joaquin Valley), to identify HAPs in their communities and work with them on advocacy and policy analysis to improve air quality and health.

2. Train a new generation of interdisciplinary researchers able to help disadvantaged communities with their air quality problems.

3. Support the careers of three early career underrepresented minority assistant professors, Drs. Mendez, Cannon, and Alvarez, working on community air quality problems in Southern California, the SF Bay Area, and the San Joaquin Valley, respectively.

Advancing Knowledge and Reproductive Justice: The UC Community Research Hub

Host Campus: Davis
Lead Investigator: Brittany Chambers
Award Type: Program Award
Collaborating Sites: Berkeley, San Francisco
Amount: $ 1,327,643

Abstract:
The proposed project aims to develop a UC hub for community research- a participatory approach to including community members as meaningful partners that we have successfully implemented in our ongoing applied research. Amidst growing calls to address structural racism in research and to center communities most affected by health inequities, this project presents an opportunity for building systemwide capacity for anti-racist research approaches.

With a focus on birth and reproductive justice, we seek to draw on our successful community-driven research collaborations to formalize the model to train community members as researchers and train UC researchers in authentic community engagement.

The proposed three-year project aims to: (1) formalize and scale-up the community research model to train and authentically engage community members as researchers and partners; and (2) train faculty, trainees, and students in actualizing birth and reproductive justice in practice and research. In Year 1, we will create a curriculum for community research. In Year 2, we pilot the curriculum by training and mentoring community members as researchers, including providing placements with ongoing research programs. In Year 3, we will refine the curriculum and provide grants for community-led research, supported by UC students and faculty; and disseminate the community research model.

Building this research model contributes to the UC's public mission and will provide a foundation for centralizing community perspectives using anti-racist research. Specifically, with the focus on birth and reproductive justice, we aim to promote a rigorous approach to knowledge production that centers the experiences and builds capacity of communities of color. Establishing this hub for innovative research approaches will support the UC's efforts to conduct cutting edge community-engaged research and provide an important foundation for future funding, particularly as NIH releases funding calls for its UNITE initiative to address structural racism and promote racial equity and inclusion.

Just Transitions In Large Socioecological Systems: Drought, Sea-level Rise & Salinity In the Delta

Host Campus: Berkeley
Lead Investigator: Holly Doremus
Award Type: Program Award
Collaborating Sites: Davis, Merced, San Diego
Amount: $ 2,455,739

Abstract:
This research project addresses one of the most challenging, complex, and controversial issues in the management of the California Bay-Delta: how to balance nationally significant agricultural and fisheries interests, statewide water supply reliability interests, federally and state-protected ecological interests, and local recreational, cultural-historical, and subsistence interests in the management of salinity, an increasing challenge in the face of extended drought and sea-level rise. Through a participatory scenario-based approach, we use state-of-the-art computing, coupled with locally sourced knowledge, to build holistic understanding of the multifaceted tradeoffs associated with alternative nature-based, regulatory, demand-based, and engineering scenarios for salinity management while building social capital and information-sharing networks through extended public engagement and open-science technologies. Throughout, we test how the components of this approach (e.g., stakeholder workshops, technological resources) change stakeholders' perceptions of the issues and the acceptability of potential management strategies, their trust in science, policy, and other stakeholders, and their understanding of complex scientific issues. Research outcomes include: 1) quantitative understanding of how nature-based, policy-based, and engineering strategies may function independently or in combination to mitigate future salinity challenges–with applications to other estuaries such as the Chesapeake Bay, where salinity intrusion is a growing concern; 2) new understanding of how a topically-focused, participatory, scenario-based approach may promote a "just transition" in science-informed governance for resilience of large socio-ecological systems with deep histories of conflict; and 3) open cyberinfrastructure tools and enhanced social capital that lay a foundation for addressing other "wicked problems" (e.g., harmful algal blooms, species recovery) in the Bay-Delta. Training–for undergraduate and graduate students and public agency scientists–is integrated into the research program through new curricula, a Summer Institute, formal mentorship, and capstone/incubator projects. Trainees will develop games, tools, and visualizations that will enhance stakeholder engagement and will work directly with data generated from the project.

Social Networks and Health among Indigenous Californians Research Collaborative

Host Campus: Merced
Lead Investigator: Anna Epperson
Award Type: Program Award
Collaborating Sites: Santa Cruz, San Francisco
Amount: $ 738,302

Abstract:
Indigenous Peoples in California face barriers in accessing health services. Despite historical and cultural similarities, most health research examines those from tribes in the U.S. separately from those from Latin America, who are usually considered Hispanic/Latinx. California (CA) is home to the largest population of Indigenous people in the U.S. Research shows that social network composition, meaning the network of individuals connected through interpersonal relations (e.g., family, friends), influences health behaviors and health outcomes. Indigenous peoples have strong and interconnected social networks which may play an even bigger role in health-related perceptions and behaviors. However, social networks for Indigenous people in CA may span state, tribal, and national borders, leading them to prioritize health information from outside their local area. Following long-standing health inequities experienced by this under-researched population, these communities have been disproportionately impacted by COVID-19, with some of the highest rates of hospitalization and death. However, rates of COVID-19 vaccination are lower compared to other racial/ethnic groups. Despite the potential critical role of social networks, little research has examined social network composition in relation to Indigenous health decision-making; none in the context of COVID-19 vaccination. In collaboration with the Indigenous community, our study seeks to: 1) understand, through social network analysis, how variation in network characteristics is associated with COVID-19 vaccine-related knowledge, attitudes, and behaviors among Indigenous peoples living in CA; 2) design and test a health communication intervention aimed at increasing vaccination, disseminated through key influencers within social networks; 3) share resources on Indigenous health behavior research; and 4) provide health disparities training to students and community members. Our findings will characterize how individuals with transnational/trans-tribal networks make decisions about vaccines, setting the foundations for effective and targeted health interventions to increase vaccine uptake. While our initial priority is to study social network information flows for COVID-19 vaccination, our Collaborative intends to continue to contextualize Indigenous health decision-making within social networks more broadly.

UC-Dust: Addressing Future Changes In California Dust Storms

Host Campus: San Diego
Lead Investigator: Amato Evan
Award Type: Planning/Pilot Award
Collaborating Sites: Davis, Irvine, Los Angeles, Merced, San Diego
Amount: $ 299,471

Abstract:
Dust storms are a common occurrence in many parts of California and are associated with a multitude of negative human health, economic, and environmental impacts. A growing body of evidence suggests that as the planet warms the frequency and severity of dust storms will increase, and thus it is likely that dust storms will play an increasing role in the economy, health, and environment of California. Despite this, little is known about many aspects of current dust storm activity, including the conditions in which dust storms typically occur, its connection to recent drought, the communities most affected, the spectrum of health impacts, and the costs to the state's economy. Even less is understood about future changes in dust storms and those impacts.

The main goal of UC-Dust is to address the state's looming dust storm crisis. The first steps towards achieving this goal include assessing the current level of understanding, identifying critical areas where new knowledge is needed, compiling realistic mitigation and adaptation strategies, and communicating the issues with community partners and policymakers. UC-Dust brings together scholars who possess expertise in the nature and consequences of dust storms and are particularly well-suited to assess the impact of current and future dust in California. UC-Dust proposes the following activities: 1) Quantify current dust storm activity in California and impacts on human health, the environment, environmental justice, and the economy. 2) Identify likely future dust scenarios, impacts, and mitigation and adaptation strategies. 3) Ascertain key areas where lack of knowledge inhibits our ability to characterize current or future dust storm activity and consequences. 4) Generate a detailed report communicating main findings and a scientific summary brief for policy makers, and communicate findings to policymakers and community groups representing affected people.

One expected impact of this project is to improve the level of scientific understanding of dust storms and their consequences within the state and build the capacity to address the outstanding scientific questions. Another is to foster better informed communities, community groups, and policymakers, who will in-turn have more agency to demand action and direct state resources towards addressing gaps in understanding and mitigation and adaptation efforts.

Abolition Medicine and Disability Justice: Mapping Inequality and Renewing the Social

Host Campus: Irvine
Lead Investigator: Juliet McMullin
Award Type: Program Award
Collaborating Sites: Los Angeles, Riverside, Santa Cruz, San Francisco
Amount: $ 1,287,993

Abstract:
The COVID-19 pandemic and its health disparities, climate change-related disasters, continued anti-Black racism, SCOTUS decisions affecting patient autonomy, and racist border and immigration policies, have brought to the surface the deep entanglements of institutions and policies that maintain inequity and disparate health outcomes. Calls for health equity are not new, but faculty and students throughout the UC system are looking for new ways to contribute to our effort to identify structures of inequity and implement practices that dismantle systemic racism to reimagine education and the delivery of health care within and outside the clinic. Indeed, the UC Executive Report Disrupting the Status Quo (2020) identifies structural racism, social determinants of health, and diversifying the UC at all levels as "imperatives" for action. Examining structural inequity is also a focus of health humanities which has centered disability studies in an effort to shift away from a medical humanities focus on narratives of fixing the body to transforming the environment. Health humanities has a recent turn to engage questions of abolition medicine. Similar to disability studies, abolition medicine is also a commitment to building new institutions and processes for reimagining an equitable society. The project collectively engages with structural transformation through research, curriculum development, and training in the fields of health humanities and disability studies.

The expertise of this MRPI research collective will achieve these aims through a social mapping project that examines the consilience between and friction among locally-identified health equity issues and community reimaginings. Each campus's mapping will be a shared resource to support educational and policy projects, enhance graduate training in health humanities and disability studies, and develop eight course modules for undergraduate, graduate, and medical students. Our engagement with communities across California includes calls for community participation in our advisory board, paid internships for students, research experiences for community members, scholarly presentations, creative performances and dissemination, and scholarly publications. Each activity is designed to amplify a reimagining of care, collaborative engagements with health equity and to dismantle systemic racism and ableism.

Strengthening Policy and Translational Research to Advance Health Equity in California

Host Campus: Irvine
Lead Investigator: Denise Payán
Award Type: Program Award
Collaborating Sites: Berkeley, Merced, Riverside
Amount: $ 943,165

Abstract:
Strategies to bridge the gap between research evidence and policy can help to address health inequities in California. This MRPI will catalyze a new multicampus collaboration across four UC campuses (UC Irvine, UC Berkeley, UC Merced, UC Riverside) to strengthen and expand health equity and policy research capacity. Our specific aims are to:
1. build health equity and policy research capacity and infrastructure across three Minority Serving Institutions in the UC system (UC Irvine, UC Merced, UC Riverside);
2. conduct formative research to inform the development and implementation of translational research products; and
3. collaborate with policy and community stakeholders in Merced and Riverside Counties to conduct translational research-to-policy projects that address local health equity needs.

This three-year initiative will have short-term and intermediate impacts by producing policy-relevant products and scientific articles to advance the translation of research evidence into policy. The California Initiative for Health Equity and Action (Cal-IHEA), a UC faculty-led effort housed at UC Berkeley to promote health equity through state policy change, will serve as the lead organization. In 2023, Cal-IHEA's leadership and administration will transition to UC Irvine, a Hispanic Serving Institution with growing health policy expertise. This project leverages this leadership transition and would launch a distinct focus on local evidence-based policymaking with new collaborators at UC Merced and UC Riverside.

Project activities include research and analytical training, mentoring, and financial support for graduate and undergraduate students at three UC campuses. First, we will examine how research evidence is used and integrated into state and local policy and identify the extent to which health equity values and concerns are reflected. Next, we will collaborate with two equity-focused community partners in Merced and Riverside Counties to carry out community-engaged research projects to promote local policy change and improve regional health. These projects can serve as models of how to conduct multidisciplinary health research aligned with local needs. Results will be used to develop grant proposals for extramural funding from policy-focused foundations, federal research agencies, and state government agencies.

California Initiative for Solid-to-Plasma Dynamics for Fusion Energy

Host Campus: Merced
Lead Investigator: David Strubbe
Award Type: Program Award
Collaborating Sites: Berkely, Irvine, San Diego, LANL, LLNL
Amount: $ 1,399,999

Abstract:
The quest for laser fusion reached a critical milestone in 2021 when ignition was achieved on the National Ignition Facility at Lawrence Livermore National Laboratory. After decades of effort, these experiments reached the cusp of energy output equaling input, demonstrating the potential of laser fusion as a clean energy source. To make further progress, it is imperative to better understand the first stage of such experiments, in which a solid at ordinary temperature and pressure absorbs laser light and transitions into a plasma, reaching conditions similar to the center of the Sun. Newly developed materials, such as aerogel foams, hold the promise of even higher energy gains, but our ability to model these complex materials has only just begun. It remains unclear how the initial solid and foam structure affects the resulting plasma and for how long a memory persists. This project aims to develop advanced multiscale simulation models and use these models to develop and apply experimental platforms to validate the simulations. UC PhD students and postdocs will perform the research with an interdisciplinary faculty team, working closely with national lab scientists and learning advanced theoretical and experimental methods. We will study the impact of material structure on the atomic scale and larger scales, comparing different forms of carbon: diamond, graphite, and graphene foams. The solid-to-plasma transition involves a cascade of processes over increasing time and length scales: absorption of light, redistribution of energy among electrons and then ions, plasma homogenization, and plasma expansion. These scales require different theoretical techniques, from quantum mechanical treatment of electrons, to classical treatment of atoms, to coarse-grained treatment of electrons and ions, and finally a macroscopic treatment. Models developed by machine learning will connect our simulations across these scales. We will perform experiments, and design future ones, to validate modeling predictions. Findings will improve the fundamental understanding of laser-matter interactions, develop innovative ways to measure plasma conditions, and develop critical simulation capabilities for early times through better physics and machine-learning models, helping to advance the quest for controlled fusion in this new era.

Anti-Asian Violence: Origins and Trajectories

Host Campus: Berkeley
Lead Investigator: Leti Volpp
Award Type: Planning/Pilot Award
Collaborating Sites: Davis, Irvine, Los Angeles
Amount: $ 243,446

Abstract:
Violent attacks against Asian Americans have risen exponentially since the advent of the COVID-19 pandemic. Nearly 40 percent of incidents reported nationwide have occurred in California. Our transdisciplinary research team will undertake an in-depth examination of the multi-faceted conditions of this violence, and of possible responses.

One predominant narrative of anti-Asian violence posits a unitary historical figure subject to exclusion, drawing a direct line between the historical legal context and the violence of today. A predominant response is to assume that this violence will end through more surveillance, policing, and the designation of cases of anti-Asian violence as hate crimes. Our research team has found that these dominant narratives put too much weight on the concept of hate, rendering anti-Asian violence the effect of individual prejudice, leading to limited responses. We will examine several historical trajectories of anti-Asian violence across multiple scales, in relation to causes that are local, national, and transnational. In addition, we will examine differences of gender, class, nationality, sexuality, and ethnicity elided in the idea of a unitary "Asian American" victim of violence. We will critically examine how the Asian/American body is mobilized in relation to the carceral state and will work to envision diverse modes of sustaining livable communities and forging multiracial alliances.

Drawing from expertise in the fields of Asian American Studies, Law, Gender Studies, Art, Performance, Social Welfare and American Studies, our research will tackle this problem with multiple approaches. We plan a working group to research historical trajectories of and existing responses to anti-Asian violence and will generate a white paper with our findings. We will edit a special issue of a journal devoted to new approaches to anti-Asian violence. We will co-teach an undergraduate course drawing from our expertise on this issue, and will organize a graduate student workshop that will lead to peer reviewed publication. Finally, we will curate a creative production and mini-exhibition to showcase the role of the arts in responding to anti-Asian violence. These activities will enable the University of California to emerge as the thought leader on the urgent issue of how to understand and address anti-Asian violence.

The Collaborative UC Teleophthalmology Initiative for Diabetic Retinopathy Screening

Host Campus: Davis
Lead Investigator: Glenn Yiu
Award Type: Program Award
Collaborating Sites: Los Angeles, San Diego, San Francisco
Amount: $ 2,000,000

Abstract:
Diabetic retinopathy (DR) is the leading cause of blindness in adults, and early detection and treatment are critical to prevent vision loss. Yet, fewer than 50% of the 3.2 million Californians with diabetes undergo recommended annual eye screening, with disproportionate impact on vulnerable populations. Teleophthalmology using retinal cameras deployed in primary care settings can increase adherence to retinopathy screening and expand eye care access in California. Recently, implementation of a remote, point-of-care retinal imaging program at UC Davis during the COVID19 pandemic improved eye screening from below national median (46%) to the top quartile of the Integrated Healthcare Association (IHA) benchmarks (>65%). A UCSD study also found that 23% of patients who underwent remote DR screening showed ocular pathology beyond diabetic retinopathy alone. However, widespread and sustained adoption of telehealth programs has been limited by technical, logistical, and financial barriers that vary between UC systems. We propose to establish a Collaborative UC Teleophthalmology Initiative (CUTI) between four UC health campuses (UCD, UCLA, UCSD, and UCSF) to 1) identify barriers to tele-ophthalmology utilization, 2) develop implementation packages to provide long-term, effective solutions to expand eye care access, and 3) develop a centralized repository of retinal images from UC sites for future research correlating retinal pathology to health data using artificial intelligence (AI). Our interdisciplinary collaboration includes experts in public health, diabetes care, clinical informatics, implementation science, and ophthalmic imaging to address obstacles in clinical workflow, technology integration, financial sustainability, and quality reporting. Our program provides training opportunities for medical and research trainees to utilize implementation science to address a public health problem, study health disparities, collaborate in health services research, and develop system-level solutions for long-term sustainability of teleophthalmology programs. Our primary mission is to achieve a 65% benchmark for diabetic eye screening across all 4 UC sites, with secondary goals of reducing healthcare disparities in eye care access in California and developing infrastructure for AI-based health research.

Planning a UC Center for Climate-Adaptive Biodiversity Conservation

Host Campus: Santa Cruz
Lead Investigator: Erika Zavaleta
Award Type: Planning/Pilot Award
Collaborating Sites: Berkeley, Santa Barbara
Amount: $ 299,130

Abstract:
With an MRPI planning grant, we will convene a new multi-campus collaboration, the UC Center for Climate-Adaptive Biodiversity Conservation, to propel innovation and research on cutting edge approaches to adapting biodiversity to climate change. Rapid development and testing of strategies to support the species that underpin the resilience and stability of whole ecosystems is critical to sustaining both California's unique biodiversity and the fundamental social goods that it supports. Drought and fire frequency and severity in California are projected to increase over the next century, and in the last decade climatic changes already have dramatically affected the state's ecosystems, through events like the die-off of over 100 million trees, the trapping of endangered salmon in drying streams and some of the worst fire seasons in recorded history. Our ability to tackle these threats is limited by scarce data on new climate-targeted conservation strategies, and a lack of coordination among researchers across disciplines, and between different sectors. The proposed Center will bring together UC researchers, in collaboration with state agencies and community partners, to guide conservation planning for foundational species (those species that underlie ecosystem structure and function) in California's terrestrial ecosystems, globally recognized for their high proportion of unique and imperiled biodiversity. This effort will synergize with the PI team's existing research foci, efforts to increase representation in conservation science, and cross-sector engagements addressing biodiversity and climate change, including their roles in state agency conservation efforts like 30x30 and the California Fish and Game Commission. In Year 1 we will conduct outreach and a literature review to develop a synthesis of climate change impacts, a needs assessment and three climate adaptation case studies. In Year 2, we will share these findings in a series of climate-adaptation workshops, design a collaborative research agenda for the proposed Center, and pursue funding to support the Center into the future.

The California Interfacial Science Institute (CISI)

Host Campus: Berkeley
Lead Investigator: Michael Zuerch
Award Type: Program Award
Collaborating Sites: Los Angeles, Merced, Santa Barbara, Santa Cruz, San Diego, LLNL
Amount: $ 1,083,072

Abstract:
The world around us is governed by constant exchange of energy and particles at interfaces. Understanding interfacial chemistry at a molecular level is therefore of striking importance for a wide array of current challenges, such as clean water production, carbon dioxide capture, removal of plastics from water, clean energy production by photocatalysis, and energy storage in next-generation solid-state batteries. Despite this central importance of interfacial chemistry, relatively little is known about interfacial electronic and molecular structures, the electronic and atomistic dynamics, and how structure and dynamics lead to observed macroscopic properties.

The overarching goal of the California Interfacial Science Institute (CISI) is to coordinate and consolidate theoretical and experimental efforts across the University of California and to leverage the combined expertise towards the creation of a world-leading center for interfacial science. In this program, building on important results and unique method developments from the pilot phase of this program, we propose to expand the research to complex chemical phenomena in liquid water and hydrophobic liquid interfaces relevant to carbon dioxide capture, electric field induced surface catalysis relevant to the environment and green chemistry, in operando ion-charge dynamics at solid-solid interfaces relevant to energy conversion and storage, and the local electric field and dielectric effects in solutions and at interfaces relevant to all interfacial chemistry.

CISI involves leading experts in condensed phase and interfacial linear and nonlinear spectroscopy experiments (UCB, UCM, UCLA, LBNL), transport design (UCB, LLNL), and theory and computation (UCSC, UCM, LLNL, UCSD, UCSB, UCLA). Our multidisciplinary research team will jointly develop advanced experimental techniques that enable studying complex interfaces, and models to simulate and interpret interfacial structure and dynamics. The molecular level understanding obtained in the proposed studies will lead to new technological developments for addressing critical contemporary challenges. CISI includes a broad training component for both graduate and undergraduate students for developing the next generation of interdisciplinary researchers in interfacial science. CISI also will engage with the public through an expansive outreach program.

The Human in Question: Advancing Humanities Research at the University of California

Host Campus: Irvine
Lead Investigator: Tyrus Miller
Award Type: Program Award
Collaborating Sites: Berkeley, Davis, Los Angeles, Merced, Riverside, San Diego, San Francisco, Santa Barbara, Santa Cruz
Amount: $ 600,000

Abstract:
Since 1987, the UCHRI and the Humanities Network have furthered humanities research on key questions facing the state, the nation, and the world, including the cultural impact of digital technologies; the origins and consequences of racism and racialization; the creative expression and agency of marginalized groups and the pluralism and global reach of literary and artistic traditions; the social components of climate change; the experiential and historical dimensions of mass migration; the future of the liberal arts; and humanities and work. In all of these domains, the human is a set of open questions: What does it mean to be human? What happens to the human when the non-human can be programmed to think, feel, and express? What value does humanity offer to a world that humans have divided and degraded? And how can we channel the power of arts and ideas to reshape how people think about human and nonhuman forms of life in an interconnected world? The humanities are everywhere, embedded in the visual world, enacted in civic life and faith practices, and transmitted in the stories people tell about themselves and their communities. Connecting the ten campuses around common concerns, “The Human in Question” fosters research on all areas of human expression and activity, both historical and contemporary, in order to recover models of identity, community, and capacity that might contribute constructively to a shared future.

The 2022-23 UCHRI theme, “Refuge and Its Refusals,” addresses the humanities as spaces of creative reflection and furthers the work of refugee scholars and refugee scholarship. Future themes will be established in consultation with humanities centers and other campus stakeholders. UCHRI will continue to run a competitive grant-making program that fosters intercampus and public-facing partnerships. The campus humanities centers will collaborate on endeavors of mutual interest and benefit. Related projects support mentorship across the system, including the UC Underrepresented Scholars Fellowship mentoring program, now in its second year, and a graduate student mentorship program that involves UC Humanities PhD alumni. UCHRI is also running a multi-year working group on humanities research infrastructure, and continues to foster conversations about the future of graduate education in the humanities.

Labor and Automation in California Agriculture (LACA): Equity, Productivity & Resilience

Host Campus: Merced
Lead Investigator: Thomas Harmon
Award Type: Program Award
Collaborating Sites: Berkeley, Davis, Riverside, ANR
Amount: $ 3,102,383

Abstract:
California is an agriculturally diverse and productive state, and yet its food system is vulnerable to climate change, regulatory change, water availability, and unexpected disturbances. Agricultural workforce shortages are also negatively affecting our food system. The proposed Labor and Automation in California Agriculture or LACA team is an interdisciplinary group spanning 4 UC campuses and UC Agriculture & Natural Resources (ANR) that is striving for transdisciplinary outcomes. Partnering with farmers, workers, and agriculturalists, LACA's goal is to create a new model for agricultural technology, the AgTech-Labor, that is farmer- and worker-friendly, while enhancing productivity and environmental sustainability. The proposed research approach will launch UC to the forefront of agrifood system research because of its (1) participatory design framework, (2) features aimed at sustaining California's agricultural culture and the environment, and (3) intention to create attractive and equitable career pathways in AgTech.

We will achieve the LACA objectives using 4 interwoven research thrusts which, although described separately, required a convergent (trans-disciplinary) approach to be successful. The 3 primary, interwoven thrusts are: (1) AgTech – Developing novel AgTech systems, specifically 3 types of stationary and robotic systems, (2) The Environment – Developing novel environmental sustainability tools and functions in the context of the 3 initial AgTech systems, and (3) Labor – Using the same 3 systems to examine the future of farm work, barriers to adoption, and California farm labor markets. Thrust (4), Underlying and Emerging Issues, will strategically attack key policy and legal issues, agroeconomic, and social issues that LACA needs to consider while creating the new AgTech-Labor model. We will transfer knowledge created by LACA to the betterment of California, its students, workers, and citizens by disseminating our research outcomes in case study reports, curricula, AgTech training materials and best practices. We will impact UC graduate students by cross-training them in the 4 research thrusts, motivate UC undergraduates to pursue exciting AgTech-related careers, and inspire California middleschoolers from under-resourced communities to better lives and careers as part of an equitable, productive, and resilient California food system.

The Global Latinidades Project: Globalizing Latinx Studies for the Next Millennium

Host Campus: Santa Barbara
Lead Investigator: Ben Olguin
Award Type: Program Award
Collaborating Sites: Davis, Merced, Riverside, Santa Cruz
Amount: $ 1,846,185

Abstract:
Latinx Studies has made profound contributions to 20th- and 21st-century thought through its complex explications of culture and politics in borderlands and myriad colonial contact zones. The field's terrain, however, has remained grounded in a north American milieu, particularly the US-Mexico borderlands, Caribbean locales, and various Latin American diasporic flows to and within the US. The Global Latinidades Project expands the scope of Latinx Studies by re-focusing the field's attention onto a broader global terrain. The goal is to recover and assess new and complex models of Latinx life, culture, history and politics—or Latinidades—that are synthesized in contact with peoples and contexts throughout the world, particularly Africa and the Mediterranean, Asia and Pacific Islands, subaltern Europe, and neglected areas of the Americas.

Latinx people comprise 40% of California, 20% of the US, and are growing throughout the world. The Latinx population has always been complex, internally diverse, and global. It continues to evolve in unique ways that pose multiple challenges—and opportunities—regarding policy, social services, education, cultural politics and more. These demographic developments have led to new trajectories, such as the growing subfields of Central American studies, AfroLatinidades, Latinx-Asian studies, Latinx spiritual diversity, and global Latinx human rights paradigms. Concurrently, the field of Latinx studies has continued to expand in Latin America, Europe and Asia. However, the Latinx Studies in the US, and the University of California System, have yet to devote substantial attention to these global developments.

This five-campus interdisciplinary programming initiative addresses this lacuna through workshops, symposia, colloquia, workshops, and strategic grants-in-aid to stimulate and develop research in these new global trajectories. It involves publication and grant initiatives and culminates with a major conference. Pursuant to the field's expansion, collaborators also will create new undergraduate and graduate courses that emphasize new Latinx globalities.

To extend and consolidate the globalization of Latinx Studies, collaborators will seek internal and external funding, including NEH Summer Institutes; NEH Humanities Initiatives at Hispanic Serving Institutions; Education Department Title V awards; and other sources.

Robot-facilitated Health Equity in Post-Pandemic California and Beyond

Host Campus: San Diego
Lead Investigator: Laurel Riek
Award Type: Program Award
Collaborating Sites: Irvine, Los Angeles
Amount: $ 1,157,603

Abstract:
COVID-19 is exacerbating societal inequities and will continue to drastically affect our existence for years to come. Two populations are at an exceptionally high risk of infection, adverse physical and mental health outcomes (including suicide), and extended isolation from others: 1) Healthcare Workers (HCW), frontline staff who deliver care to others (e.g., physicians, nurses), and 2) People who cannot leave their homes due to being at high risk of infection (P@HR), e.g., people with cancer, or disabilities.

While commercial tele-medical technologies can address some of these issues, they lack touch and mobility, key features needed for meaningful, embodied, independent interaction in the world. They also place HCWs at risk (requiring bedside delivery/training), and are inaccessible and/or unusable by many P@HR. Mobile teleoperated robots with touch and manipulation capabilities are needed to protect the lives of HCWs and improve quality of life for the growing population of P@HR.

Thus, this MRPI's research goal is to advance the state-of-the-art in mobile telemanipulation and remote participation in the world to enable at-risk Californians to engage in rich and meaningful ways within health and community environments, realized via four specific aims:

(1) Implement UC-Iris, a novel, easy-to-use, low-cost, mobile telemanipulation robot that enables embodied telepresence via touch, vision, and mobility.

(2) Advance the state-of-the-art in tactile sensing and haptics technology to enhance a teleoperator's ability to embody UC-Iris.

(3) Explore P@HR use of UC-Iris for independence and inclusion in their physical communities.

(4) Assess how systems like UC-Iris may improve quality of life / work (for P@HR / HCWs)

This project will make substantial scientific, engineering, and societal contributions, including 1) Advancing innovative telemanipulation technologies to meet the needs of our changing world, including new methods for shared control, tactile sensing, and haptic interaction, 2) Deriving new insights into how to use telemanipulation robots to accomplish high-value tasks in hospitals and communities, 3) Improving quality of life and work for millions of Californians, especially those at-risk due to pandemic related risks and restrictions.

UC Coronavirus Assembly Research Consortium

Host Campus: Riverside
Lead Investigator: Roya Zandi
Award Type: Program Award
Collaborating Sites: Davis, Merced
Amount: $ 1,755,358

Abstract:
Replication and assembly pathways of SARS-CoV-2, responsible for COVID-19, resemble those of other coronaviruses; nevertheless, the mechanisms involved are unclear. While in vitro experiments and computer simulations of viruses, including HIV and HBV, have improved our understanding of their formation and how to combat them, currently, there are no similar studies aimed at understanding coronavirus (CoV) assembly. With the goal of determining ways to disrupt viral assembly, we propose to investigate the roles of structural proteins in SARS-CoV-2 assembly using an integrated, multidisciplinary approach across multiple scales and environments. At the single-molecule level, we will use Atomic Force Microscopy with super-resolution and confocal microscopy to study the assembly of viruslike particles (VLPs) within cell-like vesicles. The single-molecule investigations will be complemented by studying the bulk properties of cell membranes interacting with viral proteins using X-ray scattering and Langmuir monolayers. All in vitro studies will be informed and complemented by in vivo microscopy studies of VLP assembly within living cell lines and tissue culture. To interpret the experimental data and provide predictions regarding potential therapeutic targets, we will use computer simulations to study the multimerization of proteins and their interaction with RNA, and the protein-protein and membraneprotein interactions. Existing and predicted drug candidates will undergo in vitro and in vivo testing. Thus, our efforts will result in the development of a robust model platform to perform fundamental studies and test therapies targeted toward disrupting viral assembly.

Since the COVID-19 pandemic has challenged every aspect of daily life, one of our goals is to increase public understanding of the role of science in addressing this pandemic through our virus-centered outreach efforts which include K-12 workshops and public lectures. This project will also provide unique interdisciplinary training and educational opportunities for undergraduate and graduate students from underserved areas of California, producing a highly trained workforce with enhanced future employment prospects in California's biotechnology industry and beyond. Our ultimate goal is to develop a UC-wide extramurally funded multi-campus institute based on principles of physical virology.