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Keynotes on the necessity for critical inter- and cross-disciplinary

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This topic explores the importance of interdisciplinary thought in directing the future of science. People have diverse opinions and perspectives that are essential to push society to be equitable and uplifting. Each demographic holds unique perspectives and interests that need to be protected within social ecosystems. However, inclusion and diversity are difficult to implement due to the natural conflicts of human interaction and systemic issues. The push for diversity and inclusion is complex and comprises many aspects that may be difficult to consider all at once. Although the challenges are present, the product of cross- and interdisciplinary practices allows for solutions that address the roots of issues to form long-lasting and effective change.

Introduction

Upending the Hard Sciences: Queering Science and Technology is a Fiat Lux[1] seminar that looks to discuss the importance of the intersections of hard and soft sciences.

Dr. Anna Spain Bradley (she/her) is the Vice Chancellor for Equity, Diversity, and Inclusion at UCLA and a professor of law at UCLA School of Law. She specializes in international law, human rights, and dispute resolution, and is researching the global understanding of racism as a violation of human rights.

Dr. Audrey Pool O'Neal (she/her) is currently an associate professor at UCLA's Department of Mechanical and Aerospace Engineering and Director of Women in Engineering at UCLA (WE@UCLA). She previously worked as a manager and engineer at the powertrain division of General Motors Corporation.

Dr. Charles Alexander (he/him) is the Associate Vice Provost for Student Diversity and the director of the Academic Advancement Program (AAP) at UCLA. He is also an associate professor in UCLA's School of Dentistry Division of Public and Population Health. He has been a consultant and peer reviewer for federal agencies, foundations, universities, and scholarly journals, and he recently contributed to the 2020 Surgeon General's report on oral health.

Professor Sergio Carbajo (he/him), the moderator and organizer, is an assistant professor at UCLA Electrical and Computer Engineering, an associate professor at UCLA Physics and Astronomy Department, and a visiting professor in Stanford University's Photon Science Division at SLAC National Accelerator Laboratory. He is also currently an equity, diversity, and inclusion officer at UCLA.

Discussion

Carbajo - How do you define interdisciplinary/co-disciplinary practice and how do you use it in your daily life?

O'Neal - My first introduction to interdisciplinary interactions was as a mechanical engineer at General Motors. I worked both in design and manufacturing. I often interacted with members of the design team to refine designs to be more cost-effective. My next exposure was when I watched people assemble the subcomponents which I had designed. I saw that certain parts were very inefficient for people to build, and realized the importance of including their limitations and needs within my design practice. With my transition into academia, I fully understood the responsibility of engineers within the context of society since our designs have direct impacts. It is important to communicate with experts in different departments. I study to better inform my full decisions since there are things that–just as an engineer–I may not recognize right away. I believe that it is important for all people to interact with people that are not within their field of expertise.

Alexander - With my background in public health, I primarily looked at diversity within healthcare, particularly how different people view healthcare. I am also concerned with who becomes a healthcare provider, and whether providers are trained to be cognizant of the multicultural society they are treating. My introduction to interdisciplinary education was through reforming the curriculum for healthcare providers at a university where I worked previously. Usually, medical schools teach curriculum through specific topics such as anatomy or biochemistry, even though many bodily systems use knowledge from multiple disciplines. I made a new curriculum that focused on teaching one system and pulling multiple different professionals to teach cohesively. This also applies to how people

should work within a hospital. It is important to bring multiple specialists to examine one patient for effective treatment.

Spain Bradley - Law is naturally interdisciplinary because it requires thinking about systems and society as a whole. However, people who practice law are still subject to common shortcomings of not always having the full picture. There is always room for more critical analysis to see what is missing and who is not included in the law, and from there, how do we include them and make effective changes to do so. It is impossible to separate passion from logic.

Carbajo - How do you balance diversity and under-representation?

Spain Bradley - Critical Diversity looks to address what people need as a group to survive, and what individuals need to thrive. Consolidating both layers of consideration is challenging because there are so many different backgrounds and experiences of people. This falls into providing equity and establishing what is best for the ecosystem of people. What rules must be established to help resolve conflict and maintain a peaceful environment? In the end, it is important to remain compassionate with each other since the whole process can be messy and difficult.

Carbajo - Many people have to work with the tension that is present in forming an ecosystem of people. How does the tension affect what you do or say and how do you navigate through it?

O'Neal - The consideration of diversity is particularly crucial in the field of engineering, as exemplified by the development of the first car airbags. Initially, airbags were designed to protect the 50th percentile male, effectively leaving out women, children, and smaller men. This oversight was a result of the lack of diversity in the design team.[2] Consequently, many people outside the targeted group suffered fatal consequences. To avoid such tragedies, diversity must always be a priority in engineering, as certain conditions may be overlooked without proper representation. Although unfortunate, it took a tragedy to bring this issue to light. But it has raised awareness regarding who is missing from the table, and how they can be included. Therefore, inclusivity should be reinforced as an essential element in engineering practices.

Alexander - There is a dearth of diversity among those willing to take part in clinical trials. It is crucial to have a diverse pool of participants in such trials because the effectiveness and safety of treatments and medications can vary across different backgrounds. Historically, underrepresentation and mistreatment have occurred due to a lack of willingness to participate in these trials. This is partly because minority groups have a lack of trust in medical professionals stemming from past violations, such as the Tuskegee Experiment.[3] Consequently, individuals from these groups feel unsafe and are deterred from participating.

Carbajo - Due to the wide scope of people that need to be considered, many people are still left unseen. This creates unconscious damage being done. What can UCLA–as a national leading institution–do to enact policy to check and protect those who are oppressed? Are there things UCLA has done to create a system of checks and balances?

Spain Bradley - The UC system has a proud tradition of community involvement, and its policies are primarily communicated through documentation. An example of this is the UC Gender Recognition and Lived Name Policy,[4] which was put into effect as a result of changes in California state laws. Once a new policy is established, the next step is to implement these broad concepts on campuses by updating technology and facilities. However, law and policy are typically influenced by a select group of decision-makers at a table and often encounter real-world obstacles during implementation. Although law and policy can have a positive impact on society, they should not be relied on to drive active changes and calls from the community. If the individuals who are affected and suffering are not represented in the decision-making process, lasting change will not be achieved. The question then becomes: what is the optimal level of community participation in policy development?

Open Question Portion - The panel opened up for students to ask questions.

Student 1 - Many practices are outdated, such as people who are part of the LGBT community cannot donate blood. Even though we know it is wrong, it is still there. How will we change that?

Alexander - Recently, blood donation opened up for bisexual and monogamous gay men.[5] This is a movement caused by people being at the table, looking at the data, and by understanding the patterns of behavior and patterns of those particular communities. It may also be caused by individuals in the community having the scientific background to share with those who are making the rules. Therefore, it is moving in the right direction.

Student 2 - It takes a lot of time to enact policy at the college level. It feels very infuriating as college students since we are told to just wait. How can we speed up the process at an institution that is so large?

Spain Bradley - Many people in our positions also feel that it is slow. One big component of why it is slow is the scale of policy change required. The only time a quick change is implicated is during moments of crisis due to the small concentration of issues that everyone is focused on. However, when there are too many priorities to address, it becomes difficult to create the space and energy needed to address things quickly. It all boils down to how everything is organized and what to do when people disagree on priorities.

Alexander - There are differences between private and public institutions. Private institutions have a smaller decision-making time frame compared to public institutions. Public institutions have a lot of different departments that also need to be involved, while private institutions have a smaller scope of people to consider. It also may vary by campus due to campus culture.

Carbajo - There is often a hierarchy of power within institutions. This power structure may differ from what it is on paper, and it is important to find out who makes the calls.

Student 3 - How does one navigate through disagreement? Are there set rules or is it a case-by-case basis?

Alexander - Within a hospital setting, there may be many doctors seeing a case. They may all come and share their ideas and opinions, but in the end, the patient often makes the call for their treatment. Disagreement may be rooted in the team, but a conclusion is in the hands of the patient.

Queered Science & Technology Center at UCLA ©

O'Neal - Although diversity is encouraged, it is still very difficult. It is much easier to work with similar people. However, the outcome of working with different people is always better. People all bring something unique to the table, and that is something very valuable. When I entered General Motors, there were not many women in the space. I was told to keep my head down and be just like the other guys. Now, I tell women in engineering to bring their authentic selves because they bring something that the field needs. I acknowledge that it will be hard and messy, but there will eventually be a worthwhile outcome.

Spain Bradley - When I was an environmental science major, I learned how to resolve conflicts through mediation, and the skills needed to separate people from problems. Conflict with people will always be present, but that is what is needed to make relationships with people. People should not be afraid to get into conflict with each other, but the most important is to be able to get through to the other side to become more connected. I recommend "Dignity" by Donna Hicks.[6]

Student 4 - What are steps students can take to live interdisciplinary lives?

O'Neal - One way is to get involved with student groups. It is difficult for departments to work with other departments, but it is more practical for students to connect with each other over similar interests to hear different perspectives.

Spain Bradley - Maybe it is important to make resources for people to find each other. Having a map of student groups would be beneficial for people who have a hard time finding other people to connect with.

Student 5 - There are an endless number of groups and people that are unrecognized or acknowledged. How do you find all the people who are slipping through the cracks when their lack of presence may not be blatantly obvious?

Cabajo - People can learn from the queer community even though it is not a perfect system. It is constantly evolving and adding to try and include all intersections of gender, sexual preference, and identities. It is one realm that is constantly fighting for representation and visibility. There is always tension in labeling. The queer community is a good model to look at something that is established, what are some individual assumptions, and how to challenge those assumptions. This connects back to my work as a physicist. The process is messy, and it is much easier to stick with what is already established or expected, but the results will not be as good.

Spain Bradley - When creating something, there will always be disagreement between different groups. There will always be something missing and people may leave unhappy. In the end, what people can do is care and be kind to each other.

Alexander - In population health, it is known that people are not represented sometimes, so people must go out and find those people and engage. For example, the homeless are often overlooked, and conversations need to be held. People who are at the table need to make active steps to find and include them.

O'Neal - I like to apply the engineering process to solve real-world problems. I categorize the known, the unknown, the initial conditions, and the boundaries. This makes the problem complicated because of the number of conditions that need to be considered. The pathway is not linear, and considering only one thing takes away the effectiveness of the final solution. Having a nuanced understanding makes everything more difficult, but it is worth the results since it solves the problem.

Student 6 - How can interdisciplinarity be employed?

O'Neal - WE@UCLA created a curriculum called Awareness to Action (A2A). Many students are looking to take interdisciplinary classes, but there are not enough resources for all of the students who are interested to be able to take them. The resources are out there, and people are becoming more open to taking interdisciplinary classes.

Carbajo - Some people are more susceptible to thinking purely based on logic. It takes time and money to ask questions, so people need to advocate for these interdisciplinary questions.

Student 7 - What are your opinions on Affirmative Action? What do you know about it now?

Spain Bradley - At the end of the day, everyone wants the USA to be a place where merit and hard work create success; however, it has never been like that. Affirmative Action is made to uplift people to reach a good ecosystem of people. Many things in politics need to be depoliticized and we need to have deep conversations about the needs of others.

Conclusions
This conversation opened opportunities to discuss the importance of diversity and intersectionality within all disciplines and life. Because people naturally gravitate towards ideas that are similar to their own and have limited perspectives, open conversations need to be present in all disciplines. Without diversity, people can be negatively impacted. However, systemic issues–like the abuse of power within the medical field in clinical trials for minority groups, or the politicization of topics that should not be political–are obstacles that are difficult to overcome. It is important to actively seek out solutions and include people who are not at the table because it is the only way to create solutions that have profound meaning and results. There will always be a conflict between people due to differing opinions and circumstances, but it is important to seek out ways to resolve problems together to form relationships and communities. Although government policy and law can be a way to ensure protection and inclusion, members of the community still need to find ways to remain involved. The rules that govern society need to shift with the focus on multiple different communities and are only possible with a conscious effort of interdisciplinary considerations and actions.

Acknowledgments

Notes and references

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