



The USC Michelson Center for Convergent Bioscience opens in the fall of 2017, and will house a range of USC faculty, including Dr. Steven Kay, a provost professor of neurology, biomedical engineering, and biological sciences.

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USC's expanding scientific ambitions include San Diego

By Bradley J. Fikes

A good university helps open minds. A great university assists in changing lives. An outstanding university helps transform society.

The University of Southern California, with a presence from Los Angeles to San Diego and beyond, is striving to become that outstanding university.

Long known for its prowess in business education and athletics, and well funded from a multibillion-dollar capital campaign, USC has expanded its ambitions. The 137-year-old private university is tackling some very public issues, including medical care, homelessness, the economy and the

status of veterans.

To do this, the university has hired top academic scientists, especially in the biomedical field, and is building to accommodate their research goals. It's looking to forge partnerships across Southern California.

In San Diego, the university operates a recently established center for Alzheimer's research and a virtual military-oriented social work program draws many students from the region. USC is open to alliances with academic centers in the county, said Michael Quick, USC Provost and Senior Vice President for Academic Affairs.

USC is the largest private employer in the city of Los Angeles, generating an annual \$8 billion in direct and indirect economic output throughout the state, according to a report from Beacon Economics commissioned by the university.

This fall, the \$700 million USC Village residential and retail complex is scheduled to open, including eight residential colleges. The university says it's the largest development in the history of South Los Angeles.

Also in the fall, The USC Michelson Center for Convergent Bioscience is scheduled to open. It will be the largest

building on campus and the centerpiece of the university's efforts to encourage interdisciplinary collaboration to advance life science.

The Michelson Center will bring together expertise from the biological sciences at USC Dornsife College of Letters, Arts and Sciences, medical doctors and researchers from the Keck School of Medicine of USC, along engineering skills from USC Viterbi School of Engineering, the latter named after Qualcomm co-founder Andrew Viterbi.

The center was created through a \$50 million gift from Dr. Gary K. Michelson, an inventor and retired spinal surgeon. It's led by Steve Kay, who had briefly departed USC to co-lead The Scripps Research Institute.

This year, the San Diego-based USC Alzheimer's Therapeutic Research Institute moved into a permanent location. A part of the Keck School of Medicine, it's led by Dr. Paul Aisen. Long one of the country's most prominent Alzheimer's



Steve Kay, who leads the USC Michelson Center for Convergent Bioscience, discusses the university's programs for neurodegenerative diseases such as Alzheimer's. *Photo by Max Gerber*

researchers, Aisen has particular expertise in clinical trials.

Aisen was the second most highly funded researcher from the National Institutes of Health for fiscal year 2017, which ends Oct. 1. His award of \$5,001,194 was exceeded only by Richard Miech of the University of Michigan, who got \$5,145,680, according to the biomedical news site Stat.

However, USC's motives toward San Diego are questioned in some corners. Aisen was recruited from University of California San Diego under contentious circumstances involving litigation. That tussle, and the memory of USC's abortive bid for an alliance with The Scripps Research Institute, may remain sensitive topics with a San Diego County academic sector that prides its independence.

For its part, USC is looking to co-operate with other academic partners as allies to solve society's "wicked problems of the 21st century," Quick said.

"These are these big intractable complicated problems that don't have perfect solutions, but only trade-offs to good solutions," Quick said. "For example, we have the issue of homelessness. Any solution you have is not going to make everybody happy, but we've got to solve this problem."

No one university can solve these "wicked problems" on its own, Quick said. But a coalition of universities with the public and private sectors throughout Southern California could make a difference.

Life science partnership

Quick points to growing coordination between the region's powerful biomedical sector as one encouraging sign. Biocom, the San Diego-based life science trade group for California, operates an office in Los Angeles, as does the California Life Science Association.

Biocom is working with the Los Angeles

Economic Development Corp. to map the life science presence in the region and to help it grow. Steve Kay, director of the Michelson Center, recently became a board member of Biocom.

"Let's see what we can do for the Southern California region," Quick said. "I think if we're going to solve these big problems, we need huge amounts of human capital, probably bigger than any one university can bring."

"What would happen if UCSD and the University of San Diego, and the biotech community there, and (UC) Irvine, and USC and Caltech said, let's get together," Quick said. "Let's bring all the capital we have to bear on these kinds of problems, whether it's homelessness, whether it's immigration or whether it's dementia."

That means getting out of the universities and into the communities that need help, Quick said, a subject discussed in early conversations with UC Los Angeles and Caltech.

"One issue we've been talking a lot about is the importance of early childhood development in long term health education," he said. "Glasses so they can read. Better dental care because we know that the main reason that students don't go to school on a given day is because they have dental problems."

"And who's going to be against bringing to bear UCLA's expertise, Caltech's expertise, our expertise, and maybe expand this beyond Los Angeles to San Diego?"

USC has measurably strengthened its medical program, but its convergence of life science and engineering and information technology is even more important, said Dina Lozofsky, executive director of Biocom's Los Angeles office.

The Michelson Center is leading the way with convergence, said Lozofsky, who before joining Biocom was associate director for Licensing and Business Development at

UC Santa Barbara's Office of Technology and Industry Alliances.

"I think it's particularly significant that they've put it at the main University Park campus of USC," Lozofsky said. "Based on my experience, universities in general have issues encouraging collaboration between the different disciplines when there is physically a distance between them. Being a hub of the School of Medicine, but located at the main campus where engineering and some of the other programs are, will help them because of the geographical proximity."

The Keck School of Medicine is located at USC's Health Sciences Campus near downtown Los Angeles, seven miles away from the main campus.

On June 1, Biocom announced that Kay, the Michelson Center's director, had joined its board. His appointment is the first on Biocom's board from Los Angeles County, increasing its geographic diversity, Lozofsky said.

Data challenges

Life science used to be starved for data. Now researchers struggle to avoid drowning in megabytes, gigabytes and terabytes, and to turn that raw data into information they can act on.

Carl Kesselman's goal is to help life scientists organize that data so it can be properly interpreted. He's director of the Center for Health Informatics at USC Information Sciences Institute.

Kesselman helped create grid computing, which links computers together in networks that collaborate in problem-solving. That means someone using a computer on such a network has access to the power of a supercomputer. His background lies in computer science. Software he helped develop was used to discover the Higgs boson and make discoveries of gravitational waves.

Despite those accomplishments,



Carl Kesselman is helping biologists collect data more efficiently so they have more time for creative problem-solving. *Photo courtesy of USC*

Kesselman is approaching his current task of trying to tame the increasing mountains of data with some humility.

"The problems in biosciences and biology are a lot harder than physics," Kesselman said. "They're messier and the phenomena are more complex. The data are more diverse and complicated."

Biologists are overwhelmed by the task of keeping track of all the data they generate, he said.

"To be honest, biologists want to focus on the biology," he said. "They tend to be not so engineering-oriented and computationally oriented and they welcome my assistance."

Kesselman said he'd like to help bring these skills to life science projects, and train the scientists in how to properly organize data collection from the beginning.

"I'm really interested in how technology is used to solve problems and why it works and doesn't work and how we use technology to collaborate and with one another," he said.

"We took a long hard look at the kinds of systems we built, why they work why they don't work. So for example if you look at electronic health records they are notoriously bad. Because they weren't engineered to think about problems people want to solve. The UI (user interface) is terrible. The workflow is bad. So that's part of it."

Even worse, improper data organization and interpretation contributes to experimental errors, he said, including clinical trials and preclinical testing.

"In preclinical work, the success rate of experiments is around 10 percent, and the reproducibility rate of those published articles is 1 in 10," Kesselman said. "Think about it. We're investing billions of dollars in science, much of which isn't reproducible."

The success rate could be better if life scientists had more time to think about what they're doing, he said. But that time is scarce, and needlessly so.

"If you look at how creative people spend their time studies show they spend between 50 and 80 percent of their time doing mundane manipulation rather than being creative and thinking," Kesselman said. "So how do we accelerate discovery? How do we look at convergent discovery which is multi-disciplinary. How do we increase the robustness of our results? And what is the synergy between what the humans are good at and what the computers are good at?"

Kesselman points to the advances in consumer electronics that are now commonplace, such as taking a photo with a mobile phone.

"I take that picture. It's automatically uploaded. I don't know where it's stored. I don't care what the file name is. It's automatically analyzed and grouped into pictures of cats or bottles of wine."

But Kesselman finds many life scientists don't have these automated data transmission and classification tools.

"They are laboriously pulling pieces of data out of a standalone piece of equipment, and they're trying to figure out what file name to give it and make spreadsheets and it's a disaster," he said.

"Why can't we make science look like this?" Kesselman asked, holding up a mobile phone. "That's the underpinnings of what I've been doing."

