And California might ultimately have some company. At Columbia University in New York City, science dean Peter de Menocal — a palaeoclimatologist — hopes to build an alliance of major universities and philanthropists to support research into pressing questions about the impacts of climate change. Potential topics include local variations in sea-level rise and the changing availability of freshwater resources and food.

De Menocal has already tested the idea on a smaller scale. Last year, he launched the Center for Climate and Life at Columbia, enlisting corporate philanthropists to fund the university's Earth scientists. The project has raised about US$8 million. "This problem is bigger than any one institution," says de Menocal. "What private philanthropy can do that the federal government doesn't do is target assets to solve specific problems."

Writ large, that is what academics in California hope to do. The proposed climate institute there has drawn support from nearly all the state's major academic institutions, including all ten University of California campuses and private powerhouses such as Stanford University and the California Institute of Technology in Pasadena. Scientists from any institution would be eligible for grants to study topics ranging from ocean acidification to tax policy, Kammen says; priority would go to projects and experiments that engage communities, businesses and policymakers.

It would not be the first time that California has stepped up to support an area of science that has fallen out of favour in Washington DC. In 2004, the state's voters approved $3 billion to create the California Institute for Regenerative Medicine in Oakland, after then-President George W. Bush restricted federal support for research on human embryonic stem cells; that centre has since funded more than 750 projects. The proposal for a new climate institute began similarly, as a reaction to White House policies, but its organizers say that the concept has evolved into a reflective exercise about academics' responsibility to help create a better future.

"The goal is to develop the research we need, and then put climate solutions into practice."

"It almost became an inventory or indictment of ourselves," says Benjamin Houlton, director of the John Muir Institute of the Environment at the University of California, Davis, and chair of the committee that is developing the institute proposal. "We realized we weren't doing enough."

Panel members aim to bring a complete plan to the California legislature this year, in the hope of persuading lawmakers to fund the effort. Kammen says that the institute's backers would like to have the institute up and running by September 2018, when Brown is set to host a global climate summit in San Francisco, California.

But the California initiative still faces significant challenges. Severin Borenstein, an economist at the University of California, Berkeley, warns that academics will face plenty of competition for a limited pool of cap-and-trade revenue. He also notes that efforts to create such interdisciplinary climate institutes have struggled in the past, largely because it's hard to rally academics from disparate fields around a common goal. Nonetheless, Borenstein favours the climate initiative, because he sees global warming as an issue on which California can have a truly global impact.

"The main way California can contribute to dealing with climate change is through innovation," he says. "We can invent and test the technologies and processes that will allow the rest of the world to reduce their greenhouse-gas emissions." ■

NEUROSCIENCE

China launches imaging factory

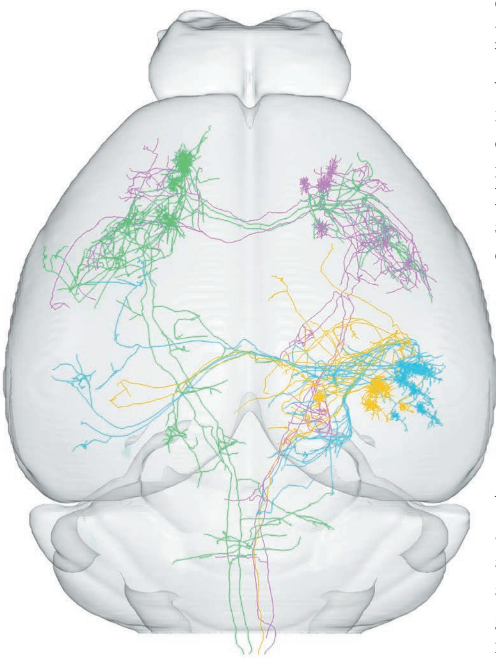
Institute aims to make industrial-scale brain mapping a standard tool for neuroscience.

BY DAVID CYRANOSKI

Neuroscientists who painstakingly map the twists and turns of neural circuitry through the brain are about to see their field expand to an industrial scale. A huge facility set to open in Suzhou, China, next month should transform high-resolution brain mapping, its developers say.

Where typical laboratories might use one or two brain-imaging systems, the new facility boasts 50 automated machines that can rapidly slice up a mouse brain, snap high-definition pictures of each slice and reconstruct those into a 3D picture. This factory-like scale will "dramatically accelerate progress", says Hongkui Zeng, a molecular biologist at the Allen Institute for Brain Science in Seattle, Washington, which is partnering with the centre. "Large-scale, standardized data generation in an industrial manner will change the way neuroscience is done," she says.

The institute, which will also image human brains, aims to be an international hub that will help researchers to map neural connectivity for everything from studies of Alzheimer's disease to brain-inspired artificial-intelligence projects, says Qingming Luo, a researcher in biomedical imaging at the Huazhong University of Science and Technology (HUST) in Wuhan, China. Luo leads the new facility, called the HUST-Suzhou Institute for Brainsmatics, which has a 5-year budget of 450 million yuan (US$67 million) and will employ some 120 scientists and technicians. Luo, who calls himself a "brainsmatician", also built the institute's high-speed brain-imaging systems.



LUO Q. M. /SCI SIN VITAE

This reconstructed image shows how long-range neurons extend across a mouse brain.

HOT TOPIC

"There will be large demand, for sure," says Josh Huang, a neuroscientist at Cold Spring Harbor Laboratory in New York, which is also partnering with the Chinese institute. Access to high-throughput, rapid brain mapping could transform neuroscientists' understanding of how neurons are connected in the brain, he says — just as high-throughput sequencing helped geneticists to untangle the human genome in the 2000s. "This will have a major impact on building cell-resolution brain atlases in multiple species," he says.

BARCROFT MEDIA/GETTY

Mammalian brains have millions of cells, and human brains even have billions. And the cells come in some 10,000 different types, marked by differences in shape, size and the genes they express. Neuroscientists hope that mapping out the structures and how they interact will help to reveal their functions (see *Nature* **548,** 150–152; 2017). By comparing particular neuron types across multiple brains, scientists might be able to pick out the effects of a disease or a learned behaviour on cell structure, says Jürgen Goldschmidt, a brain-imaging researcher at the Leibniz Institute for Neurobiology in Magdeburg, Germany.

But such maps often require months or years of effort. The process involves shaving centimetre-long mouse brains into 15,000 ultrathin slices with a diamond blade, staining each layer with chemicals or fluorescent tags to pick out particular features, imaging each layer with a microscope and then reconstructing the images into a 3D map.

HIGH-SPEED MAPPING

That's where Luo's institute can help. Its vast number of machines have impressive speed and resolution, collaborators say. According to Zeng, the devices can gather the same amount of detail on a mouse brain in two weeks as would require months using other technologies, such as super-resolution confocal imaging.

Participants at a February meeting of the US BRAIN initiative (Brain Research through Advancing Innovative Neurotechnologies) in Bethesda, Maryland, were treated to a display of the technology's capabilities when they were shown an image of a neuron that wrapped all of the way around a mouse brain (see *Nature* **543,** 14–15; 2017). Allen Institute neuroscientist Christof Koch, whose team did the work in collaboration with Luo's group, suggests the extensive reach of the neuron shows that the cell has a role in coordinating inputs and outputs across the brain to create consciousness.

The Suzhou institute will generate a huge amount of data: each mouse brain map alone will be 8 terabytes, Luo says. But the volume of a human brain is nearly 1,500 times that of a mouse brain; it would take a single machine around 20 years to digitally reconstruct one at the institute's current rate. Luo aims to increase the speed of his machines and to use multiple devices in parallel.

Luo is keen for worldwide collaboration; along with the Allen Institute and Cold Spring Harbor Laboratory, Stanford University in California is forming a partnership with the centre. But Luo says that interest is so high that he won't be able to accommodate everyone. "We are already turning people down." ■

The number and severity of forest fires in Asia increased during the recent El Niño warming.

CLIMATE SCIENCE

El Niño drove up carbon emissions

Climate disruption altered behaviour of tropical forests.

BY GABRIEL POPKIN

The monster El Niño weather pattern of 2014–16 caused tropical forests to burp up 3 billion tonnes of carbon, according to a new analysis. That's equivalent to nearly 20% of the emissions produced during the same period by burning fossil fuels and making cement.

Measurements taken by NASA's Orbiting Carbon Observatory-2 (OCO-2) satellite, which tracks the levels of carbon dioxide in the atmosphere, suggest that El Niño boosted emissions in three ways. A combination of high temperatures and drought increased the number and severity of wildfires in southeast Asia, while drought stunted plant growth in the Amazon rainforest, reducing the amount of carbon it absorbed. And in Africa, warming temperatures and near-normal rainfall increased the rate at which forests exhaled CO_2. The overall jump in emissions from tropical forests was roughly three times the annual average carbon output from deforestation and land-use change globally between 2006 and 2015 (C. Le Quéré *et al. Earth Syst. Sci. Data* **8,** 605–649; 2016).

The analysis, presented on 7 August at a meeting of the Ecological Society of America in Portland, Oregon, is a coup for OCO-2. Since 2014, the satellite has given scientists their best view yet of the ebb and flow of CO_2 emissions. The 2014–16 El Niño was one of its first big tests.

"In the past, we had to model how those vegetation changes affected carbon dioxide," says David Schimel, an ecologist at NASA's Jet Propulsion Laboratory in Pasadena, California, who presented the results. "Now we're getting a chance to see what we got right and what we got wrong." Combining data from OCO-2 and satellites that measure methane and carbon monoxide is giving Schimel and his colleagues a detailed view of how forests around the world respond to El Niño's climate shocks.

All three emissions-increasing mechanisms that the team saw had been previously identified as ways in which extreme weather could affect plants, says Abigail Swann, an atmospheric scientist and biologist at the University of Washington in Seattle. "What's interesting is that they all happened," she says. "It suggests that [El Niño response] is going to be a more complicated combination of factors in the future." ■