

► have attempted to simulate conditions in the womb by growing embryos on a layer of maternal cells, but Zernicka-Goetz's group chose instead to use a gel matrix with higher levels of oxygen. The mouse embryos survived past gastrulation — the stage at which they form layers of cells that will become organs<sup>3</sup>. "It's incredible to look at," Zernicka-Goetz says.

## HUMAN INSIGHT

In *Nature Cell Biology*, she and her colleagues describe how they adapted the technique to work for human embryos donated by an *in vitro* fertilization (IVF) clinic<sup>2</sup>. Zernicka-Goetz and Brivanlou tracked the embryos' progress by comparing the genes that they expressed with those expressed in other animal embryos at similar stages<sup>1</sup>. The scientists were able to evaluate the embryos' structural development using data from a 1956 study in which researchers examined embryos found in women undergoing hysterectomies and other procedures<sup>4</sup>.

The teams watched as the cells in the embryos began to differentiate — and reveal features that are unique to human development. For instance, Brivanlou and his colleagues have identified a group of cells that shows up in the embryo around day 10 and disappears around day 12.

The scientists don't yet know the function of the cell cluster, which, at its peak, forms 5–10% of the embryo. But it seems to be a transient organ, akin to the tails that human embryos grow much later in development and then lose before birth. "This is like discovering a new organ in your body," Brivanlou says.

The culture method has also revealed vast differences between the genes expressed in human and mouse embryos, which suggests that rodents may not be good models

for understanding human development.

The culture technology is likely to be of broad interest to scientists. Martin Pera, a stem-cell researcher at the University of Melbourne in Australia, says that studying embryos *in vitro* could help researchers who are trying to grow stem cells into embryo-like structures to judge the accuracy of their work.

Once that feat is achieved, scientists could use these structures to conduct larger and more-complicated experiments to explore topics such as the development of birth defects or the effects of toxic compounds.

The fertility industry could also benefit from new *in vitro* technology. Norbert Gleicher, head of the Center for Human Reproduction, an IVF clinic in New York City, notes that about 50%

**"We know more about fish and mice and frogs than we know about ourselves."**

of embryos that implant into a mother's uterus do not survive. Studies of embryos *in vitro* could help researchers to understand what goes wrong in such cases. "The implantation process is a big black box for us clinicians," says Gleicher, who has collaborated with Brivanlou. Gleicher was not involved in the latest work, but he is beginning to use the *in vitro* culture method to study how to evaluate the viability of embryos for implantation in IVF clinics.

The ability to grow an embryo *in vitro* for 13 days raises ethical and policy considerations. At least 12 countries, including the United Kingdom, bar scientists from working with embryos older than 14 days. The US government drew up guidelines suggesting the limit in 1979, on the basis that 14 days marks the beginning of gastrulation in humans. It is also around the latest point at which an

embryo can split into identical twins. After this time, the logic goes, a unique individual comes into being.

Zernicka-Goetz and Brivanlou doubt that their embryos would survive much beyond the 14-day mark, because work in mice suggests that more-developed embryos need an unknown mix of hormones and nutrients from the mother to survive. To develop further, the embryos might also require a 3D scaffold to grow on, rather than the flat plates used in the initial tests. To learn more, the researchers are beginning to run experiments with embryos from non-human primates and from cows.

But their achievements in the lab may be grounds for re-examining the limit, says George Daley, a stem-cell researcher at Children's Hospital Boston in Massachusetts. He says that it is somewhat arbitrary. Such a debate would be complex and heated, and it could reach beyond researchers working directly with human embryos. If scientists succeed in growing stem cells into embryo-like structures, it could be difficult to determine whether the structures count as embryos, and thus are subject to the 14-day rule<sup>5</sup>. "It's an interesting ethical discussion we've got ahead of us here," says Pera.

However it plays out, Brivanlou says that the new technology will give developmental biologists plenty to work on. "Every hour as we move forward in development is a treasure box for me," he says. ■ [SEE COMMENT GO.NATURE.COM/TQIJ3J](http://dx.doi.org/10.1038/nature17948)

1. Deglincerti, A. *et al. Nature* <http://dx.doi.org/10.1038/nature17948> (2016).
2. Shahbazi, M. N. *et al. Nature Cell Biol.* <http://dx.doi.org/10.1038/ncb3347> (2016).
3. Bedzhov, I., Leung, C. Y., Bialecka, M. & Zernicka-Goetz, M. *Nature Protoc.* **9**, 2732–2739 (2014).
4. Hertig, A. T., Rock, J. & Adams, E. C. *Am. J. Anat.* **98**, 435–493 (1956).
5. Pera, M. F. *et al. Nature Meth.* **12**, 917–919 (2015).

## CLIMATE RESEARCH

# Australian science agency softens blow of climate job cuts

*CSIRO adds 40 posts at new research centre amid hundreds of redundancies.*

BY MYLES GOUGH

**A**fter controversially ditching hundreds of jobs in climate research, Australia's national science agency has announced that it will launch a new climate-science centre — but researchers say that the move won't make up for the damage the cuts will cause.

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) said on 26 April that the centre — to be located in

Hobart — would employ 40 full-time researchers working on climate modelling, projections and adaptation, and that its funding and staffing levels would be guaranteed for a decade.

But the CSIRO also confirmed details of the job cuts it had announced in February, which have sparked protests in support of Australia's climate scientists. The agency said that 275 jobs would be lost (revising its earlier estimate of 350 redundancies), with about 145 of them in CSIRO's Oceans and Atmosphere, and

Land and Water divisions.

"Noting the importance of the climate-science field and following consultation with staff and stakeholders, we determined to maintain a higher level of staffing in this field than flagged earlier in the year," a CSIRO spokesperson told *Nature*.

The new climate centre is "a good news story in terms of what otherwise might have been," says Andy Pitman, director of the Australian Research Council's Centre



Scientists have protested against the CSIRO's decision to cut some 300 jobs in climate research.

of Excellence for Climate System Science in Sydney. "But we don't want to lose sight of the fact that the total scale of capability in CSIRO is being very significantly reduced," he added.

Other scientists were harsher in their judgement. "While the retention of some of CSIRO's climate-science capabilities is welcome, the level announced is analogous to trying to put a sticking plaster over a gaping wound," said Dave Griggs, a sustainability researcher at Monash University in Melbourne, in a statement released through the Australian Science Media Centre.

"This new climate-science centre will be clearly flagging to the international community that CSIRO is committed to a long-term climate-science research capability," Australia's chief scientist, Alan Finkel, told *Nature*. Finkel, who has helped to broker discussions between the CSIRO and climate scientists, acknowledged that there had been "questions raised about CSIRO's reputation" by the cuts.

### CLIMATE PROTESTS

Opposition to the CSIRO's cuts — the result of a strategic shift away from basic climate science — has been strong. Almost 3,000 scientists have signed an open letter to the CSIRO and to

Australia's government, raising concerns over the effects of the move on the nation's climate-research capacity. Rallies have been held in major Australian cities, and CSIRO management has been questioned by the Australian senate about its decision, as part of an ongoing inquiry scrutinizing government budget cuts.

But much damage has already been done. One senior scientist from the CSIRO who did not want to be named told *Nature* that senior staff members were already finding new jobs or looking for work elsewhere, and that the organization would find it difficult to keep climate scientists after demonstrating that it does not value their work.

Another researcher — John Church, a specialist in sea-level rise who has worked for the CSIRO for 38 years — says that the new centre is a positive step, but that the overall job losses are "still an incredible cut" to the organization's capability. "You can't hope to cover the range of activities that we did previously when [the CSIRO Oceans and Atmosphere unit] had more than 100 staff, with only 40," he says.

Church says that he expects to be among the scientists made redundant later this year. The reputational damage to the CSIRO is "not going to disappear overnight," he says. ■

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**CORRECTION**

The News story 'Human embryos grown in the lab for longest time ever' (*Nature* **533**, 15–16; 2016) wrongly characterized the US 14-day restriction on *in vitro* growth of human embryos as a law — it is a guideline.