

► projects in physics, space technology and astronomy — it pledges to invest more than Can\$200 million per year in new and expanded programmes starting in 2016.

Dufour says that the research landscape has become “a bit of a dog’s breakfast” with the Conservatives’ targeted research initiatives. And he notes that the focus on industrial research has not improved Canada’s overall research and development performance.

The Organisation for Economic Co-operation and Development (OECD) reported in November that Canada has dropped out of the top ten research and development performers, ceding ground to more aggressive countries such as Taiwan. The OECD also reports that Canada has seen one of the sharpest declines in the percentage of gross domestic product spent on research.

#### ELECTION TOPIC

Opposition parties hope to make science an issue in the October election, but their criticism might be blunted by initiatives such as Harper’s Can\$243-million, ten-year commitment to the Thirty Meter Telescope (TMT), announced earlier this month and highlighted in the budget. The international observatory is to be constructed on the summit of Mauna Kea in Hawaii.

“You can rest assured the TMT will be trotted out during the campaign as evidence that they are investing in research that is probing the origins of the Universe,” says Scott Findlay, a biologist at the University of Ottawa and founding member of Evidence for Democracy, a group that pushes for more science-based decision-making in government.

The budget also commits Canada to supporting the International Space Station until 2024, an extension that the United States and Russia have already committed to.

As the election nears, the government is expected to start announcing projects financed by its Can\$1.5-billion Canada First Research Excellence Fund, which aims to put Canadian universities “among the best in the world for talent and breakthrough discoveries”. Applicants must spell out the strategic relevance of proposed projects and their potential to “create long-term economic advantages for Canada”.

Many of Canada’s university presidents enthusiastically endorsed the fund when Harper announced details in December. And some were quick to applaud the new budget’s provisions. “They will benefit Canada and Canadians now and for years to come,” says David Barnard, president of the University of Manitoba and chair of the Association of Universities and Colleges of Canada. ■



FILIPPO MONTEFORTE/AFP/GETTY

Pope Francis says that humanity “has slapped nature in the face”.

#### SOCIETY

# Vatican hosts climate meeting

*Religious leaders and scientists gather to discuss moral implications of global warming as Pope drafts key letter.*

BY EDWIN CARTLIDGE

Pope Francis has drawn attention for his progressive teachings on sexuality, contraception and abortion. Now he and the Catholic Church are tackling another contentious issue: climate change.

This week, scientists, religious figures and policymakers gathered at the Vatican to discuss the science of global warming and the danger posed to the world’s poorest people. The meeting came as Francis prepares an encyclical letter to bishops on climate change for release this summer, ahead of United Nations climate negotiations in December. The Pope’s strong feelings on the matter are apparent: in January he said that people were “mostly” responsible for recent warming and that they have “slapped nature in the face”.

Two scholarly Vatican groups that advise the Pope on scientific issues organized the meeting. One, the Pontifical Academy of Sciences, has held several related conferences, including a 2011 meeting on melting glaciers

and another last year on sustainable development. But the climate gathering this week is the first at the Vatican to include religious leaders as well as scientists.

Roughly 20–25 individuals representing religions such as Protestant and Orthodox Christianity, Judaism and Islam joined a similar number of scientists. Nobel Prize-winning chemist Paul Crutzen, climatologist James Hansen and former UK Royal Society president Martin Rees were scheduled to attend, along with UN secretary-general Ban Ki-moon and Italian President Sergio Mattarella. All participants were asked to sign a statement “on the moral and religious imperative of sustainable development”.

Peter Raven, a botanist at the Missouri Botanical Garden in St Louis and an organizer of the meeting, says that such messages are crucial for winning public support for policies to reduce greenhouse-gas emissions. “The only way politicians can put binding agreements in place is if they are convinced that enough people care about the problem,” he

says. “And that will only happen if the problem has a strong ethical component.”

Among the moral arguments for action on climate change is the idea that society must preserve Earth for future generations, says another meeting organizer, climate scientist Veerabhadran Ramanathan of the Scripps Institution of Oceanography in La Jolla, California. A further argument is that the world’s 3 billion poorest people produce a fraction of humanity’s annual greenhouse-gas emissions — about 5% — but are predicted to suffer disproportionately from the impacts of climate change, such as more extreme weather.

Francis is not the first major religious leader — nor even the first pope — to speak out on climate change. In a 2009 statement, Archbishop of Canterbury Rowan Williams and other UK religious representatives recognized a moral imperative to address the causes of global warming. And last month, the presiding bishop of the US Episcopal Church, Katharine Jefferts Schori, described those who attribute global warming to purely natural causes as “often driven by greed and self-centred political interests, and sometimes by wilful blindness”.

Closer to home, Francis’s predecessor Benedict XVI made numerous statements on the environment, describing climate change in 2011 as a “worrying and complex

phenomenon”. But Ramanathan thinks that the huge popularity of the current pope presents a unique opportunity to raise awareness. “Pope Francis has become a Kennedy-like figure who goes beyond Catholicism and appeals to the whole world,” he says.

Even a popular pope can stir controversy, however. Francis’s support for action on climate change has raised hackles among some conservative Catholics, such as Steve Moore, who is chief economist at the Heritage Foundation, a free-market think tank in Washington DC. Francis has “allied himself with the far left”, Moore says.

But Dan Misleh, executive director of the Catholic Climate Covenant, an environmental group in Washington DC, says that Francis is unlikely to endorse specific policies to fight climate change. “I don’t think he is going to say that a carbon tax is preferable to a cap-and-trade programme,” Misleh says. “But I think he will say that there is a connection between how we treat the planet and how we treat one another.”

Such a strategy will allow Francis to avoid seeming “ideological” while still speaking

**“I think he will say that there is a connection between how we treat the planet and how we treat one another.”**

clearly about the role of humans in climate change, says James Bretzke, a Catholic theologian at Boston College in Massachusetts. Already, he says, several Vatican figures who are likely to be involved in drafting the Pope’s encyclical have made unequivocal statements on global warming. Last year, for example, Bishop Marcelo Sánchez Sorondo, chancellor of the Pontifical Academy of Sciences, said that “essentially all documents published now accept as a scientific truth that climate change is due to human activity”.

The document set to be signed at this week’s meeting contains a very similar statement, according to co-organizer Partha Dasgupta, an economist at the University of Cambridge, UK. Attendees were scheduled to discuss the physical and chemical processes that underlie global warming, he says, but a debate on the idea that human activities drive that warming was not planned. “Religious leaders might ask whether other scientists have different views,” says Dasgupta, adding that the small minority of scientists who are sceptical of climate change were not represented at the meeting.

Still, the Pope will be careful to point out where scientific uncertainties remain, Bretzke predicts. Such caution is borne of the Vatican’s famous over-certainty in the past. “Centuries ago, the Church got on the wrong end of cosmological arguments,” he says. “It has been chastened by that.” ■

## MEDICAL RESEARCH

# Gene-testing firms set sights on drug development

*Companies race to gather large DNA data sets in bid to find treatments based on genetics.*

BY ERIKA CHECK HAYDEN

Companies that offer genetic testing directly to consumers are renewing their ambitions. Recent moves by US regulators have given the firms fresh hope that the large genetic data sets they amass will have commercial as well as scientific value, spawning diagnostic tests or drugs.

The moment seems ripe. In February, the US Food and Drug Administration (FDA) allowed 23andMe — a company in Mountain View, California, that has offered genome analysis to consumers for nearly a decade — to begin marketing a test for mutations that cause a rare disease called Bloom syndrome. This was the first time that the agency had approved a genetic test marketed to the public, not clinicians — and companies are betting that it will not be the last.

Many expect the FDA to further expand the types of medically relevant information that consumer genetic tests can supply. The February decision “is a huge step for the field”, says Ken Chahine, a senior vice-president at Ancestry.com DNA of Provo, Utah, which offers genetic testing to the public. “You’re starting to see others get into this space because everyone sees a lot of value in it.”

Ancestry.com DNA, a subsidiary of genealogy website Ancestry.com, is one of those newcomers. The company has so far collected DNA from 850,000 customers, which it uses to help people to find relatives among members of its genealogy-focused social network. It is now exploring the idea of collecting users’ medical histories, too, so that it could offer them medically relevant information and investigate the genetic roots of diseases.

23andMe is farther down this road and has already attracted interest from health-care firms. In January, it signed a US\$60-million deal with California biotechnology company Genentech, which will use genetic data from 23andMe customers to develop therapeutics. The personal-genomics firm has also hired former Genentech executive Richard Scheller to lead an in-house effort to develop drugs. And, similar to Ancestry.com, 23andMe has access to a home-grown social network that encourages its customers to interact with the company and each other.

Commercial firms are not the only group seeking to build large pools of participants for genetic studies — or the only ones harnessing social networks for this cause. The medical-research study Genes for Good, which launched on 31 March, is seeking ▶