of scientists on topics that include health, education and the environment.

"Trump doesn't have a prominent policy shop and a prominent set of policy advisers," says Douglas Holtz-Eakin, who counselled Republican senator John McCain (Arizona) on economic policy during his failed 2008 presidential bid. "Clinton has a vast bureaucracy and a ten-point plan for going out to lunch, so they couldn't be more different."

The two candidates — whose campaign staff declined multiple interview requests — also seem to think very differently about the role of science. Although Clinton has described science and innovation as a foundation for the future, science funding seems to be an afterthought for Trump, says John Karsten, coordinator of the Center for Technology Innovation at the Brookings Institution, a think tank in Washington DC. Instead, the Republican has focused on issues such as national security, immigration and crumbling infrastructure.

Climate change is one of the few science topics that has grabbed the campaign spotlight — in part because of Republican anger over Obama's regulations to limit greenhouse-gas emissions from power plants, vehicles and oil and gas development. Clinton's climate and energy proposals would largely maintain the current course; by contrast, in a major policy speech on 26 May, Trump promised to roll back Obama's "totalitarian" regulations and withdraw the United States from the Paris climate agreement. Trump, who has long denied mainstream climate science, also said that his administration will focus on "real environmental challenges, not phony ones".

SPLIT TICKETS

This yawning philosophical divide is apparent in the party platforms that the Republicans and Democrats developed ahead of their nominating conventions this month. Environmentalists have criticized the Republican platform for labelling coal a "clean" energy source, even though it produces more carbon dioxide emissions per unit of energy than any other fossil fuel. Democrats, meanwhile, are poised to adopt a platform this week at their national convention that calls for using "every tool available to reduce emissions now".

"Climate is going to be talked about in this campaign."

"Climate is going to be talked about in this campaign, because the candidates have distinctly different positions," says Michael Oppenheimer, a climate scientist at Princeton University in New Jersey who is advising the Clinton team. Although his workload was light during primary season, Oppenheimer anticipates questions from the campaign about how global warming might affect certain regions, or the extent to which an extreme weather event might be related to global warming.

Some experts say that the Democratic party's adoption of science as a campaign issue — which Obama kick-started in 2008 — risks further polarizing thorny policy debates around scientific issues such as global warming. "The Democrats found that science was a good thing for them, just like historically strong support for the military was good for the Republicans," says Daniel Sarewitz, co-director of Arizona State University's Consortium for Science, Policy and Outcomes in Washington DC (and a regular contributor to *Nature*). "If the Democrats are the party of science, and you are a Republican, what does that make you think?"

But Holtz-Eakin says that the Trump campaign's apparent decision to forgo science advice is a reflection of Trump himself, not of Republican priorities. In 2008, he notes, the McCain campaign consulted scientists to formulate its positions on issues such as global warming — just as Clinton has done.

With just over three months until the election, there is still a chance that Trump will assemble his own coterie of science advisers, says Andrew Rosenberg, who heads the Center for Science and Democracy at the Union of Concerned Scientists in Cambridge, Massachusetts. Doing so not only informs policy positions, it builds relationships that are useful after the election, when the winning candidate begins to assemble a government.

"These things widen the network," Rosenberg says. "I know it's happening with the Clinton campaign, and at some point I would expect it would happen with the Trump campaign." ■

ASTRONOMY

How to hunt for alien life

Astrobiologists try to determine the chemical signature of life on other worlds.

BY ALEXANDRA WITZE

In the search for life beyond Earth, false alarms abound. Researchers have generally considered, and rejected, claims ranging from a 1970s report of life on Mars to the 1990s 'discovery' of fossilized space microbes in a meteorite.

Now, inspired by the detection of thousands of planets beyond the Solar System, NASA has started a fresh effort to learn how to recognize extraterrestrial life. The goal is to understand what gases alien life might produce — and how Earth-bound astronomers might detect such 'biosignatures' in light passing through the atmospheres of planets trillions of kilometres away (see 'Searching for alien life').

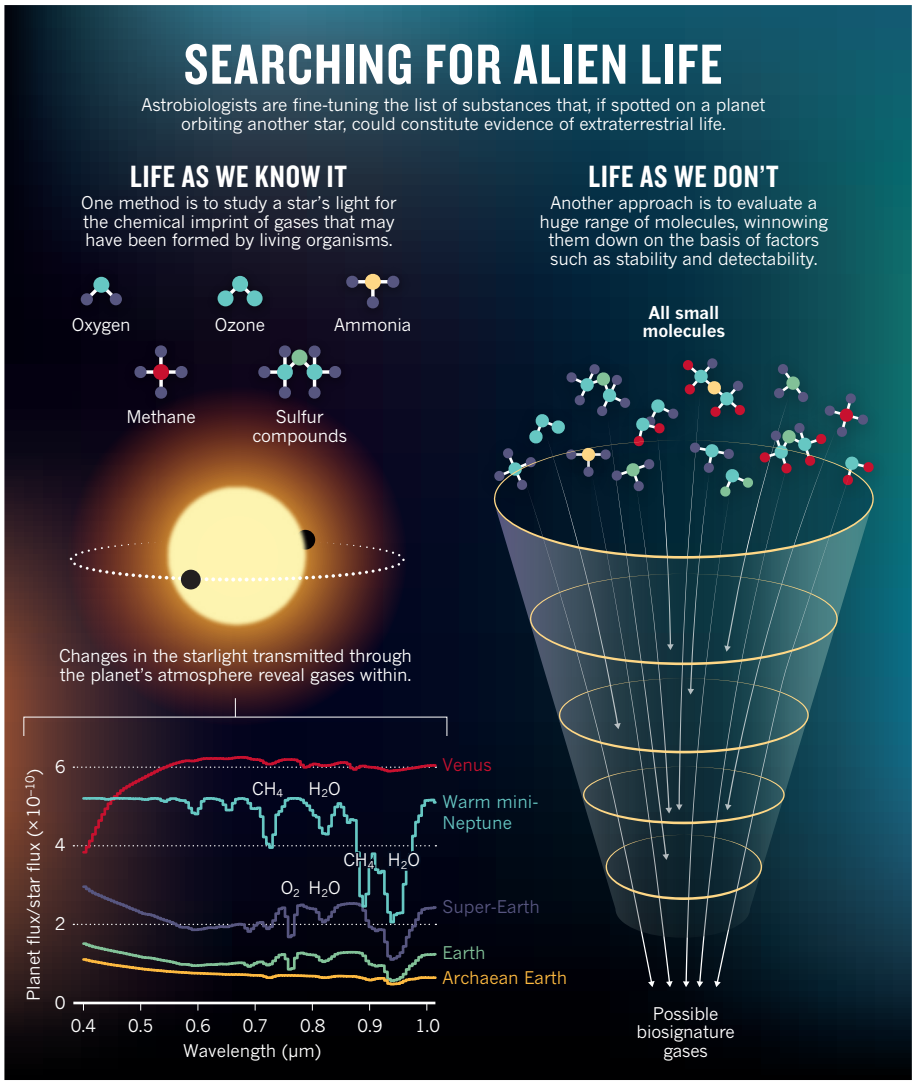
The agency will convene a workshop this week in Seattle, Washington, with the ultimate goal of advising a NASA exoplanet group on how to avoid embarrassing errors in the future. "We have to come together and determine what good evidence of life on another planet could be," says Shawn Domagal-Goldman, one of the workshop's organizers and an astronomer at NASA's Goddard Space Flight Center in Greenbelt, Maryland.

The exercise comes at a crucial time, as astronomers grapple with how to interpret exoplanet data from the next generation of telescopes. Some scientists are working to understand how nature could produce archetypal biosignature gases, such as oxygen, in the absence of living organisms. Others are trying to think as expansively as possible about the types of biochemistry that could sustain life.

"We could fool ourselves into thinking a lifeless planet has life — or we could be missing life because we don't really understand the context of what could be produced on another planet," says Sarah Rugheimer, an astronomer at the University of St Andrews, UK.

Detecting a biosignature gas is just the first step to understanding what could be happening on an exoplanet. Each world has its own combination of physical and chemical factors that may or may not lead to life, says Victoria Meadows, an astronomer at the University of Washington in Seattle. "Planets are hard, and we shouldn't think they are all going to be the same or reveal their secrets very easily," she says.

A planet's environment is key. Some Earth-sized planets orbit M dwarf stars — the most common type of star in the Galaxy — at the right distance to harbour liquid water. But Meadows' collaborators have shown[1] that photochemical reactions can send water into the planet's atmosphere and then break off its hydrogen, which escapes into space. What's left is a thick blanket of oxygen that might seem as



SOURCE: CHART: S. SEAGER & W. BAINS *SCI. ADV.* **1,** E1500047 (2015); CONE: REF. 5

if it came from living organisms, but results from a runaway greenhouse effect.

There are ways to tell. The runaway greenhouse would create an atmosphere thousands of times denser than Earth's, in which O_2 molecules collide to produce O_4. So spotting O_4 in a planet's atmosphere could be a clue that the oxygen does not, in fact, come from life, Meadows' team reported this year[2].

Another method is to draw up a list of alternative biosignature gases — things not as obvious as oxygen that might be made by organisms under certain conditions. These include dimethyl sulfide[3], which is produced by Earthly phytoplankton, or even ammonia[4]. On a cold alien planet, organisms might make the gas using the same chemical process as industrial manufacturers.

At the Massachusetts Institute of Technology in Cambridge, astronomer Sara Seager has begun to examine 14,000 compounds that are stable enough to exist in a planetary atmosphere. She and her colleagues are winnowing down their initial list of molecules using criteria such as whether there are geophysical ways to send the compound into the atmosphere[5].

"We're doing a triage process," says Seager. "We don't want to miss anything."

The Seattle meeting aims to compile a working list of biosignature gases and their chemical properties. The information will feed into how astronomers analyse data from NASA's James Webb Space Telescope, slated for launch in 2018. The telescope will be able to look at only a handful of habitable planets, but it will provide the first detailed glimpse of what gases surround which world, says Nikole Lewis, an astronomer at the Space Telescope Science Institute in Baltimore, Maryland.

No single gas is likely to be a slam-dunk indicator of alien life. But Domagal-Goldman hopes that the workshop will produce a framework for understanding where scientists could trip themselves up. "We don't want to have a great press release," he says, "and then a week later have egg on everybody's faces." ■

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EPIDEMIOLOGY

Brazil's birth-defects puzzle

Zika virus might not be only factor in reported microcephaly surge.

BY DECLAN BUTLER

Government researchers in Brazil are set to explore the country's peculiar distribution of Zika-linked microcephaly — babies born with abnormally small heads.

Zika virus has spread throughout Brazil, but extremely high rates of microcephaly have been reported only in the country's northeast. Although evidence suggests that Zika can cause microcephaly, the clustering pattern hints that other environmental, socioeconomic or biological factors could be at play.

"We suspect that something more than Zika virus is causing the high intensity and severity of cases," says Fatima Marinho, director of information and health analysis at Brazil's ministry of health. If that turns out to be true, it could change researchers' assessment of the risk that Zika poses to pregnant women and their children.

The idea has long been on Brazilian researchers' radar, but the enquiry marks the first time that scientists at the health ministry have taken up the hypothesis. The ministry has asked Oliver Brady, an epidemiologist at the London School of Hygiene & Tropical Medicine, ▶