

SUEZ EXPANSION

Effects unknown

Nicaragua's is not the only canal project moving forward faster than its environmental effects can be assessed. In August, Egypt announced a project to add a second lane to the Suez canal for 72 kilometres of its 162-kilometre length. By next summer, the canal is expected to ferry twice as much ship traffic between the Red Sea and the Mediterranean than it does at present.

The concern among marine scientists is that invasive species may find the expanded canal similarly convenient. Because it has no locks or other barriers, the canal's currents, which mostly flow from the Red Sea to the Mediterranean, offer marine organisms a free ride — and an expanded canal means that more sea life can ride those currents. But as in Nicaragua, no environmental review was conducted before the project began.

In early December, 225 scientists from 25 countries signed a letter urging environmental oversight. "There are means available to limit the introduction of non indigenous species which can be carried out at the early stages of a project but which become increasingly expensive as the project progresses. The ecological and economic cost of inaction may be substantial," the letter said. Three United Nations treaties have jurisdiction over activities that affect the health of the Mediterranean, but none has been enforced.

Of the nearly 700 invasive species already

in the Mediterranean, more than half arrived through the Suez (B. S. Galil *et al. Ethol. Ecol. Evol.* **26**, 152–171; 2014). Fish hauls off Turkey are up to 80% non-native species by weight, especially in shallow waters (M. Goren *et al. Rapp. Comm. Int. Mer. Médit.* **39**, 535; 2010). "We don't know where the tipping point is, but it will be reached soon," says marine biologist Bella Galil at the National Institute of Oceanography in Haifa, Israel. Without environmental oversight, she adds, there is no predicting what the system will tip to, either. But native communities are already eroding.

Near Turkey, for example, two species of shell-forming plankton (*Amphistegina lobifera* and *Amphisorus hemprichi*) now grow regularly. When they die, their remains accumulate in sandy layers that can be 50 centimetres thick (M. B. Yokes *et al. Mar. Biodivers. Rec.* **7**, e52; 2014), smothering natural rocky-bottom ecosystems. Two species of Red Sea rabbitfish (*Siganus luridus* and *Siganus rivulatus*) have razed swathes hundreds of metres long in rich seaweed meadows in the eastern Mediterranean, demolishing habitat for many natives. And just as in terrestrial ecosystems, says Enric Sala, a marine ecologist and explorer-in-residence at the National Geographic Society in Washington DC who has studied the rabbitfish, "when you remove the forest, all the birds are gone". **Juli Berwald**

▶ barrier to native terrestrial animals. At its eastern end, it will cut through the Cerro Silva Natural Reserve, 286,000 hectares of protected forest. It could have a significant impact on wildlife migration corridors, says Roberto Salom-Pérez, regional coordinator of the Mesoamerica Jaguar Program for Panthera, a conservation charity in Costa Rica. But he says that animals can co-exist with infrastructure if it is well planned. "We know that jaguars and other big mammals can cross the Panama Canal," he says. "But this is only possible because the well-protected Barro Colorado Island works as a stepping-stone for these species, and because protected areas surround the canal."

About 2% of Nicaragua's people live along the Grand Canal's proposed route. The Humboldt centre estimates that the canal zone will pass through or near 282 communities, including a large tract of indigenous communal land. The canal concession gives HKND the right to seize this and other land, and Nicaraguans far from the canal route have reported visits to their land by Chinese surveyors accompanied by Nicaraguan military escorts. In mid-December, people marched in Managua to protest against the canal project.

In 2007, Ortega promised citizens that he would not risk the waters of Lake Nicaragua for all the gold in the world. This October, he said that he had come around to the idea of the canal because it would be the country's fastest route to economic development. The nation's public sector stands to benefit from the deal: HKND will pay the government \$10 million annually for the first 10 years of the canal's operation, and hand ownership of the canal to the government gradually at a rate of roughly 10% per decade to a maximum of 99%. ■

ASTRONOMY

Planet hunters plot a course

Researchers aim to set aside differences in search for life on distant worlds.

BY ALEXANDRA WITZE

Scott Gaudi is tired of the fighting. An astronomer at Ohio State University in Columbus, he specializes in the notoriously fractious field of exoplanet research, in which battles have included bitter fights over data access and epic rifts between teams searching for planets outside our Solar System.

On 4 January in Seattle, Washington, Gaudi will take a tentative first step towards corraling this rowdy bunch. As chair of NASA's Exoplanet Exploration Program Analysis Group, he will try to nudge a roomful of US exoplanet scientists into generating a coherent, specific

vision for where the field should go.

The time is right. Researchers have almost finished combing through the thousands of leads that were produced by NASA's planet-hunting Kepler spacecraft between 2009 and 2013, and are squeezing some more data out of the craft's limited 'K2' mission extension (see *Nature* **514**, 414–415; 2014). By the mid-2020s, budgets permitting, astronomers expect to have a satellite called the Wide-Field Infrared Survey Telescope (WFIRST) busy cataloguing planets that are too far away from their host stars for Kepler to have spotted them.

Together, Kepler and WFIRST will produce a rough census of how many planets there are

in our Galaxy. But NASA has yet to work out how to tackle the next, more crucial questions: could anything actually live on any of these planets? And what will it take to understand a given world's chances of being habitable?

"The big thing we're wondering now is: what is it that we want to do after WFIRST?" says Gaudi.

He and others say that it is not too early to start worrying. NASA prioritizes its missions according to community surveys that happen every ten years. Exoplanet science fared badly in the 2010 survey, partly because the community could not agree on a unified vision.

"We live in a time where, for the first time in

history, we can potentially answer whether we are alone in the Universe,” says Lisa Kaltenegger, an astronomer at Cornell University in Ithaca, New York. “It would be such a shame if we don’t get to it.”

Nearly everyone agrees that the next big step would be a space telescope that could observe alien worlds directly. (Kepler uses indirect methods to infer the existence of extrasolar planets.) Back in 2000, NASA even started planning such a spacecraft. But those dreams foundered on the potential cost of the mission, and on the lack of technologies to make it happen.

A direct-imaging telescope would use one of two methods to block out the light of host stars and let it detect much fainter planets in orbit around them. One approach is a coronagraph, a disc that sits inside a space telescope and blocks the light of the central star so that the planet pops into view. WFIRST is currently planned to have a coronagraph that would enable it to image exoplanets directly, but the instrument may be cut for budgetary reasons. Another option is a starshade, an orbiting piece of opaque material that would position itself at some distance from a space telescope and block the star’s light from there.

“We’d all be very disappointed if there wasn’t some kind of imaging mission in the next decade, given how exciting and vibrant this field is,” says Suvrath Mahadevan, an exoplanet researcher at Pennsylvania State University in University Park.

For now, the European Space Agency is planning PLATO (Planetary Transits and Oscillations of Stars), a 2024 exoplanet mission that would not image planets directly. And US astronomers will keep trying to pick up more bits of information about exoplanets. The Transiting Exoplanet Survey Satellite, a NASA mission scheduled for 2017, will hunt for planets crossing the faces of half a million nearby bright stars. And the James Webb Space Telescope, due to launch in 2018, will explore clouds and atmospheres on relatively small exoplanets — although it is unlikely to see anything as small as Earth.

Still, those upcoming missions do not really address the question of whether humans are alone in the cosmos, says Aki Roberge, an astrophysicist at the Goddard Space Flight Center in Greenbelt, Maryland. “I believe the time is near,” she says, “when we should really try to tackle it with a mission capable of finding habitable conditions on nearby Earth-like worlds and seeing if they might support life.” ■

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Survivors of Ebola carry antibodies that might be used to save the lives of those infected with the virus.

EMERGING DISEASES

Ebola raises profile of blood-based therapy

Convalescent plasma therapy is trialled to fight Ebola, but could also be used for new and emerging pathogens.

BY DECLAN BUTLER

With no drugs available to treat Ebola, eyes are turning to a therapy that had largely been relegated to the history books: transfusing patients with blood plasma donated by survivors, which contains antibodies against the virus.

Clinical trials of convalescent plasma therapy (CPT) have started in the past few weeks in Liberia, and are due to begin soon in Guinea and Sierra Leone. If the therapy saves lives, the approach could quickly be scaled up.

Success would also raise awareness of CPT’s potential to treat other new and emerging infectious diseases for which there are no readily available effective drugs or vaccines, such as SARS, avian influenza and Middle East respiratory syndrome (MERS). “Clinical trials of convalescent plasma should be considered in other emerging infections,” says David Heymann, an infectious-disease researcher at the London School of Hygiene and Tropical Medicine, and chair of Public Health England.

Many scientists have long argued that CPT has been wrongly neglected, both as a therapy for emerging diseases and in preparation for future unknown threats. Today, the approach is gaining ground. Trials of convalescent plasma are beginning for the treatment of patients with MERS, which has infected 938 people and killed 343 of them since it was discovered in

2012. And an international protocol aimed at removing hurdles to quickly rolling out trials of convalescent plasma has recently been drafted.

Convalescent plasma was found to effectively treat diphtheria and tetanus at the end of the nineteenth century, and was widely used in the first half of the twentieth century to treat diseases such as measles, mumps and pneumonia. But it fell off the radar after the development of antibiotics, antiviral drugs and vaccines. (An exception was the adoption of CPT in Argentina for Argentine haemorrhagic fever after a successful controlled trial in the 1970s.)

When available, drugs and vaccines are usually a better option. They are easier to mass-produce and administer, and their quality and dosing can be better controlled. CPT is more complicated — it requires collecting survivors’ blood, screening it for pathogens and then organizing patient transfusion. And standardizing batches of plasma is difficult, because antibody levels in donated blood can vary widely.

But an epidemic or pandemic of a new pathogen turns that logic on its head. As in the case of the Ebola epidemic, there are typically no drugs or vaccines available, and developing these usually takes years. By contrast, “convalescent plasma is one of the few things you can get up and running quickly”, says Calum Semple, a paediatrician and clinical virologist at the University of Liverpool, UK, who is involved in the Guinea Ebola trial. Trials for Ebola and other ▶