2017
VOL 11 ISSUE 1

current conservation

This magazine is produced with support from:

dakshin

FES
FOUNDATION FOR ECOLOGICAL SECURITY

THE DULEEP MATTHAI
NATURE CONSERVATION TRUST

सत्यमेव जयते
Department of Biotechnology
Govt. of India

ATREE
Ashoka Trust for Research in
Ecology and the Environment

WIPRO
Applying Thought

WWF

Wildlife
Conservation
Trust

BALIPARA FOUNDATION
Assam • India

Current Conservation carries the latest in research news from natural and social science facets of conservation, such as conservation biology, environmental history, anthropology, sociology, ecological economics and landscape ecology.

For more details, visit our website at www.currentconservation.org

ISSN 0974-0953

contents

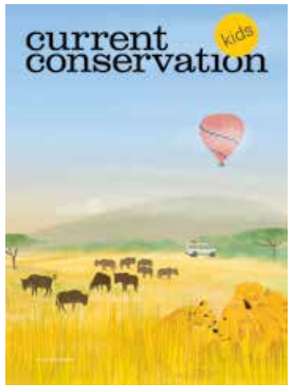
cc kids

Cover art by Kabini Amin

'Power lines' is the underlying theme of this issue of Current Conservation. There might be a direct reference to these words only in one article, but the message runs across several other contributions. The discussion of Palacin et al's 2016 paper narrates how birds struggle to navigate electricity lines disrupting their migratory routes. These tensions of the Great Bustard in Spain are not too far behind from what is happening in a prime tiger habitat in India. The country's first experimental river interlinking project is out to fragment and submerge parts of Panna Tiger Reserve, says Joanna Van Gruisen's in-depth understanding of the Ken-Betwa project.

Eben Goodale takes the discussion forward to highlight how conservation science needs to communicate with those affected or likely to be affected by the practice of conservation. The need for conservationists to engage with the politics of place is one message there. Caitlin Knight's piece marches for science with it suggesting that science is so much a part of life that it is imperative for scientists not to engage with both society and policy. There is one contribution, which take us away from the anxieties that contemporary conservation practice has to encounter. It is the review of the book Cheats and Deceits by Martin Stevens. It's not humans, but wildlife here that are using an "array of techniques… to further their own agendas."

Finally, we carry an obituary of the environmentalist Duleep Mathai, whose foundation (DMNCT) has supported CC since its inception.



Anmol Shrivastava

We travel to the African savanna, which has been home to people and animals for millennia. Enoch Mobisa tells us what it means to be a lion conservationist in the Maasai Mara National Reserve in Kenya. Learn more about African lions in our Species Profile. Did you know that lions live in family groups, called prides, and that cubs are brought up by all the females in the pride?

And, we have something new for you: we plan to introduce you to a new book with each issue. This time it is the 'Book of Beasts: An A to Z Rhyming Bestiary.' Read about the book and how it came to be. And read about the very special person who wrote it! Do you have a favourite book that you would like to share with other readers? Write and tell us about it! (editors.ccmagazine@gmail.com)

Power lines alter migration patterns

Great bustards in Spain 'run' into electricity en route

We know the big names in animal long distance flights. Jaws drop when we hear that the tiny arctic tern flies between Greenland and Antarctica every year, a round trip of 71,000 kms! Other magnificent animals – humpback whales, monarch butterflies, hordes of wildebeest – travel across the world breaking man's geographic and political boundaries effortlessly. But one of our many inventions, electricity, might be in the way of animal migrations, literally. Over 20 years, scientists in Spain have studied the threatened Great bustard, a heavily built bird standing tall at about one meter. In their quest to understand the bustard's migration patterns, they discovered at least one major cause of mortality – collision with power lines.

First, some basic facts: These birds are reluctant fliers. At the study site in central Spain, some birds are sedentary and don't migrate all their life, while others migrate distances up to 100 km every year. Young birds figure out their 'lifestyle' choice by age 3 – whether or not to migrate, how far to fly, in which direction, and so on. Genetics plays a part of course, but scientists have found that in this species, social learning plays a much bigger role. For instance, if a young bird interacts more with a sedentary adult, it tends to be sedentary all its life. If it hangs out more often with migrating adults, it will probably join their camp.

The study's big question was to see if and how human causes of mortality affect this migration pattern. The scientists attached radiotransmitter backpacks on 180 birds and traced them from the ground, through telescopes, even from an aeroplane! They also counted the number of birds at the breeding site before and after migration, every year for 16 years.

They found that migrants died earlier and more frequently than sedentary birds. And almost 40% of the deaths were caused by colliding with power lines. There is no doubt that power lines are a direct threat to these birds. But there is another important finding. Over the 20 years of observation, they found that the mixed population of migrants and sedentary birds no longer remained truly mixed. The tendency to migrate dropped drastically; more birds chose the sedentary lifestyle. Remember, young birds learn from those around, and with more migrants getting killed by power lines, it is easy to imagine that they followed the survivors, the non-migrants.

Whether this species will eventually become completely sedentary is hard to know, and will require many more decades of study. But if they do, it could be disastrous. Migration helps maintain genetic diversity by allowing gene flow across populations. Without this, animals would be more genetically similar to each other, and if one contracts a disease, others could become susceptible, and before we know it, entire populations could be wiped out. Many species have gone this route before and some have been lost forever, but there is still time to save this endangered species from going extinct.

Palacin, C, JC Alonso, CA Martin and JA Alonso. 2016. Changes in bird-migration patterns associated with human-induced mortality. *Conservation Biology* 31: 106-115.

Divya Ramesh studies predator-prey ecology at Indiana State University, where she tries to write, among other things, divyaram23@gmail.com.

Ken-Betwa link creating, not solving, water woes

Kabini Amin

Around 150 years ago a British engineer working in South India, Arthur Cotton, came up with revolutionary ideas to move and use water. The aim was "to arrest the unprofitable progress of its (the Godavari) waters to the sea". He sought to link rivers both for irrigation and as a means of navigation and movement of goods. The 19th century made strides in the engineering field and as so often happens with new technologies and ideas, they are seen as a cure-all for problems of life. In this context, the idea of solving water shortages and floods through the movement of river waters was born.*

The idea has floated around catching the imagination of some of India's water resource planners for some time. Both Prime Minister Vajpayee and President Abdul Kalam were impressed by it and the idea has been pushed as a BJP 'dream'. However some erstwhile Environment Ministers, like Jairam Ramesh, have examined the idea and pronounced it "disastrous". Even government agencies such as the National Commission for Integrated Water Resources Development Plan (NCIWRDP), after examining it carefully, considered it "unnecessary" and opined that the river basins could get all necessary resources from within their own area. River link schemes suggested in the 1970s were abandoned as technically or economically unfeasible.

Though we may still not fully understand our natural world, the 21st century has a far more developed knowledge of ecosystems and their crucial services than did the 19th, so while "unused" water may not provide direct financial gain, only the ecologically ignorant can regard a river's natural flow as "unprofitable progress".

It is extraordinary therefore that the Government still seeks to pursue an archaic engineering path for rivers.

The river-linking scheme has had a momentum of its own; but, unusually for such a complex and far-reaching strategy, its biggest push came from the courts. While recording their limitation to make policy decisions and take expert views, the Supreme Court judges, in a 2012 judgement, nevertheless directed the government to constitute a "Special Committee for the inter-linking of Rivers". This direction came in response to Public Interest Litigations (PILs) filed in the 1990s (No. 75 of 1998 and No. 15 of 1999) calling for the rivers to be nationalised and linked. These reached the Supreme Court in 2002 as Writ Petitions 668 and 512. The National Water Development Authority (NWDA), set up in 1982 to look at optimum utilisation of the river systems had completed the Detailed Project Report (DPR) of the Ken-Betwa link project in 2010. The Court ordered the new committee to evaluate this first.

The Court's benign attitude to river-linking seemingly arose from the simplistically appealing view of it being a flood and drought mitigation strategy. But river ecology is more complex and farmers and scientists alike have long known that floods also have their positive aspect. Annual floods help remove agricultural toxins and bring crucial nutrients to the farmland while also recharging ground water. Besides some of the worst flooding is actually caused by dams.

What is the Ken-Betwa controversy?

The Ken-Betwa project does not fit the flood-drought pattern. The Ken river flows through some of the most drought prone areas of the country, mostly in Madhya Pradesh. In spite of this the NWDA argues that it has "surplus water". The Betwa is deemed "deficient" and hence the project seeks to take water from the Ken basin to the Betwa's. In fact both rivers rise in the Vindhya region and when one endures a drought year of low rainfall, the other does too. These are both areas with a long dry season so both rivers received most of their rainfall in the monsoon months – matching each other for drought and flood.

Although today proponents most loudly claim that this will bring water to the drought prone farmers of the Bundelkhand region, the DPR of the project in fact states that "the main objective … is to make available water to water deficit areas of upper Betwa basin..." It is a project of water substitution. The Environment Impact Assessment (EIA) confirms that it is primarily for "the water scarce Raisen and Vidisha districts". Thus, in conception it mainly looks to benefit areas outside Bundhelkhand, actually less "water scarce" than its area of origin!

There are many *ecological* arguments against river-linking but it is also fraught with political and social landmines. Such projects bring to the table international disputes, interstate water wars and even intra-basin - district level - conflicts to the table. Already those in the Panna district through which the Ken largely flows are wondering why 'their' water should be taken elsewhere rather than used to improve their own meagre livelihoods. Only 24% of the sown agricultural area of Panna is irrigated. Even Chattarpur and Tikamgarh districts of Bundhelkhand that the project has claimed will benefit, already have 65% and 78% irrigation (Minor Irrigation Census 2001).

It is hard to find a positive in this planned link or understand why the present government is pushing for it so strongly. Even the present Minister of State for Environment, Forest and Climate Change (Independent Charge) A M Dave does not seem wholly convinced: he has termed it "an experiment". He believes the Ken-Betwa link should go ahead and an assessment of its impact on the environment be made after 5 to 10 years to see if others should go ahead. This is a strange view to hold when such projects require an Environment Impact Assessment exactly to assess this *before* the damage is done, before a unique river system is irrevocably ruined.

An indifferent impact assessment

An EIA should bring relevant information to the fore so that the claimed benefits can be weighed and balanced against the damage, along with possibilities of mitigation so that an informed decision may be made. This has not been adequately done in the case of the Ken-Betwa link and the EIA fails on most of its main objectives and core values. The first of these is: "to ensure that the environmental considerations are explicitly addressed and incorporated into the development and decision-making process":

A 77 m high dam is to be built on a river to siphon off around 1074 MCM (million cubic millimetre) of water, yet under "Impact on Water Environment", the EIA comments: "no change in the regime of Ken River due to Daudhan dam is anticipated." One does not need to be an expert to know that dams change the flow of water, hold back sediments and create barriers for fish – all of which would indicate a regime change.

Furthermore, in spite of it being the first dam and submergence area ever to be *inside* a Tiger Re-

There are many ecological arguments against river-linking but it is also fraught with political and social landmines. Such projects bring to the table international disputes, interstate water wars and even intra-basin - district level - conflicts to the table. Already those in the Panna district through which the Ken largely flows are wondering why 'their' water should be taken elsewhere rather than used to improve their own meagre livelihoods.

serve, the EIA has no special section on its impact on biodiversity. Where broached, it comments somewhat incredibly: "The change in habitat is not very significant". Ignoring the Panna Tiger Reserve Field Director's information that there are territories of two tigresses in the area as well as a large percentage of the park's vulture breeding area, they write "there are no known breeding grounds for any of the RET (Rare, Endangered, Threatened) species within the project area." The EIA's credibility is also dented by its list of mammal species: this includes half a dozen **not** found in the area; indeed some on the list are not even found in India!

The proponents claim the project's benefit will be a somewhat incredible 18-fold increase in agricultural production, and not a single environmental cost has been estimated to set against this. Furthermore key aspects of the link have been ignored or separated as different projects. Thus even on its own terms there is high doubt as to its efficacy, but examined from an ecological viewpoint the damage is huge and the EIA has glossed over and failed to appreciate or understand this.

The EIA claims that the reservoir "will aid the conservation and management … of species such as Tor tor (Mahsheer)." This overlooks the fact that the reservoir would be fully inside a National Park and Tiger Reserve, whose authorities have already made it clear that the law will allow no such activities. It ignores the Central Inland Fisheries Research Institute's study report comments regarding the "endangered" mahseer: "the river

Kabini Amin

also holds sizeable population of a famous sport fish Tor tor…the proposed dam would block free movement of the fishes to their breeding and feeding grounds, hence lead to further depletion of the species from the system."

Impact on endangered species

In the water, on land and in the air – several endangered species will be adversely affected. In these decades of vulture depletion, Panna has been one PA where they have held on and now have a chance to come back. Seven of India's nine vulture species are found here. For the long-billed vulture, especially, the unique steep cliffs of the Ken river gorge above Daudhan provide ideal nesting habitats. The Ken-Betwa project threatens to submerge these.

And of course the tiger: never before has a dam been built completely inside the Critical Tiger Habitat (CTH) of a Tiger Reserve. A CTH is "established on the basis of scientific and objective principles" and the Wildlife Protection Act requires it to be kept inviolate for the purpose of tiger conservation. Thus it is an area that should be no-go for anything else. It is even more amazing that this dam and the submergence area, more than half of which is in the CTH and most of the rest in the buffer zone, is planned within an area that was considered important enough for tiger that a new and costly project to reintroduce them to the area occurred. Over the last few years the Panna tiger population has gone from 0 in 2009 to an estimated 30+ in 2017. The success of this reintroduction programme has been hailed worldwide. Yet now it can be jettisoned under an 'experimental' river-link project?

Occasionally the NWDA have tried to suggest that the submergence will bring benefit to the tigers and other animals of the reserve, but this is somewhat disingenuous. They cite the provision of water by the reservoir. However, the park already has the perennial river. They say the draw down areas will attract and enhance the population of herbivores, thereby increasing prey base. However a nearly 10 year study on the ecology of Panna's tigers by Dr. RS Chundawat shows that Panna already enjoys herbivore density and high prey biomass comparable with India's best tiger reserves. The limiting factor for the tiger population in Panna is not food but space and connectivity. The submergence area would severely and catastrophically impact on both these. Apart from the 90 km^2 going under water, the reservoir would completely bifurcate the park and block tiger access corridors to forests in the west. A tiger reserve already suffering from space mis-match, would be reduced by 162 km^2, or more than 28%, according to the Field Director's calculations - a death knell!

Not really a solution for drought

The key for Bundelkhand's drought issues lies not in mega projects that will take 7-10 years to complete and bring debatable benefits even then. The way forward is to look to decentralised water management practises that can bring benefit within a year or two. Case studies in the area have established that local solutions are more effective in mitigating negative impacts of drought and in enhancing farmers' yields on a sustainable basis without altering the river's natural process. Per acre this also costs a tiny fraction of a mega project.

The other side of water management that is given little attention is that of improving irrigation systems. In many areas, farmers still flood their fields for irrigation. Not only does this entail the use of far more water than required for the crop but it also removes nutrients and means the run off takes pesticides and other pollutants back into the water systems. Sprinklers and drip irrigation can save as much as 30-70%.

The way forward is to look to decentralised water management practises that can bring benefit within a year or two. Case studies in the area have established that local solutions are more effective in mitigating negative impacts of drought and in enhancing farmers' yields on a sustainable basis without altering the river's natural process.

Bundelkhand's agriculture and wildlife, Raisen and Vidisha's farmers, all the inhabitants of these areas can benefit if the management of water resources is approached with vision, if 21st century knowledge and awareness is fused with traditional local skills and understanding.

Outdated planning

The Ken-Betwa link project was designed more than 20 years ago. The hydrological and rainfall figures used in its justification were from even earlier. The effects of climate change impinge more with each passing year. Recent research suggests that rainfall is decreasing over 'surplus' basins and models show that water yield is increasing in deficit basins. Scientists conclude this "calls for a re-evaluation of planning".

Another paper shows that a minimum of 30 years data is required to enable a realistic stream-flow assessment in rivers like the Ken. While many disagree with the categorisation of "surplus" for the Ken river's water, it is hard to categorically refute, since the data on which they base this is not in the public domain.

Environmentally damaging engineering 'solutions' such as the proposed Ken-Betwa link are outdated in these - hopefully - more enlightened times. Many parts of the world have, with experience, learnt the cost of dams – the USA has removed around 900 dams in the last 15 years and continues to decommission 60-70 annually. The dam age is passing. With her vision, creativity, modern skills and traditional knowledge, India could leapfrog ahead to lead the world in a more sustainable and localised way of managing and using water. .

Kabini Amin

References

Central Inland Fisheries Research Institute (CIFR). nd. *Final Report on Study of Aquatic Biodiversity in the River Ken*. Indian Council of Agricultural Research.

Ghosh, S, H Vittal, T Sharma, S Karmakar, KS Kasiviswanathan, Y Dhanesh, KP Sudheer *et al*. 2016. Indian summer monsoon rainfall: implications of contrasting trends in the spatial variability of means and extremes. *Public Library of Science (PloS) One* 11. http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0158670. Accessed on April 6, 2017.

Gopal, B and DK Marothia. 2016. Seeking viable solutions to water security in Bundelkhand. *Economic and Political Weekly (EPW)* 51. http://www.epw.in/journal/2016/44-45/commentary/seeking-viable-solutions-water-security-bundelkhand.html. Accessed on April 6, 2017.

Jain, VK, MK Jain, and RP Pandey. 2013. Effect of the length of the stream-flow record on truncation level for assessment of stream flow drought characteristics. *Journal of Hydrologic Engineering* 19: 1361-1373.

Morris, H. 1878. *A descriptive and historical account of the Godavery District in the presidency of Madras. London*: Trubner & Co. Pp 418.

National Water Development Agency (NWDA). 2010. *Detailed Project Report of Ken-Betwa Link Project (Phase 1)*. Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India.

National Water Development Agency (NWDA). 2015. *Ken-Betwa link project (phase-I): Environmental impact assessment and environmental management plan.* Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India.

Joanna Van Gruisen was a wildlife photographer and film-maker and now runs a small eco-lodge on the banks of the river Ken. She writes on wildlife and the health of the environment.

Duleep Matthai: 1924-2017

Environmentalist; born in Chennai on October 18th, 1924 and died in Vallabh Vidyanagar, Anand District, Gujarat on March 5th 2017 aged 92.

Duleep Matthai was a highly influential figure in India's nascent environmental movement in the 1970s that first flagged the long term environmental risks arising from loss of forest cover that comes with unfettered industrial and agricultural development. The current water scarcity in many parts of the country can be attributed to both loss of forest cover and excessive water extraction with ever deeper bore wells. Securing the country's water-catchment areas – the forests - was a key campaign for Matthai. His warnings and those of other environmentalists continue to fall on deaf ears because of widespread ignorance and indifference to the importance of ecological security.

Through his love of nature and wildlife developed from his early childhood growing up in the forested family estate in Kerala, Matthai understood long before it became widely accepted knowledge the ecological role of forests. He understood that the loss of large expanses of forests through human activity especially in the tropical regions and uplands of India poses a serious threat to human welfare and even survival.

Today there is undisputed scientific evidence that forests help to maintain air, water and soil quality, influence climatic conditions, regulate run`-off and ground water and reduce downstream sedimentation and flooding. They sequester carbon dioxide from the atmosphere to reduce the greenhouse effect and importantly protect the watersheds and river systems. Chronically drought affected areas are invariably those that have undergone severe deforestation.

Matthai was a founding trustee of the World Wildlife Fund in India and always played an active role in promoting the organization within the country. He was largely instrumental in getting land allotted for setting up the WWF head office in New Delhi. His concerns about environmental degradation found resonance with Prime Minister Indira Gandhi, who discussed environment issues with him from time to time and also invited him to join as a member of important advisory bodies set up by the Government, such as the National Committee of Environment Planning and Coordination and the Indian Board of Wildlife chaired by the Prime Minister. Matthai was consulted also when the Department of Environment was established in 1980, especially in the matter of naming it properly. In 1980s, Matthai was appointed to the governing bodies of the newly established Indian Institute of Forest Management at Bhopal and the Wildlife Institute of India at Dehradun. He was also a member of the Steering Committee of the prestigious Project Tiger, which was also chaired by the Prime Minister whose purpose was to monitor the progress of what has to date been India's largest and most successful Wildlife Conservation Project.

Later, as Vice Chairman of the National Wastelands Development Board set up by Prime Minister Rajiv Gandhi, Matthai toured the country extensively often on foot to understand the challenges of restoring bio diversity including the native species of flora to degraded barren tracts laid waste by exploitative human activities. He then suggested possible solutions, which included aerial seeding wherever feasible, given the political will to make available necessary resources and overcome vested interests.

Professor MS Swaminathan, the eminent scientist and father of India's "Green Revolution" regards Duleep Matthai as the father of the ecological security movement in India and his commitment to the conservation of nature and the development of WWF India as "truly monumental".

Born into an eminent Kerala family, Duleep was the second

As Vice Chairman of the National Wastelands Development Board set up by Prime Minister Rajiv Gandhi, Matthai toured the country extensively often on foot to understand the challenges of restoring bio diversity including the native species of flora to degraded barren tracts laid waste by exploitative human activities. He then suggested possible solutions, which included aerial seeding wherever feasible, given the political will to make available necessary resources and overcome vested interests.

of the three children of Dr John Matthai, who served successively as Railways and Finance ministers in Independent India's first cabinet and Mrs Achamma Matthai who as Chairperson of the Central Social Welfare Board of the Govt of India played an important role in helping to resettle refugees from West Punjab in India after Independence and Partition.

Matthai's first job was in 1944 as a 20 year old management trainee in the tea industry in Assam with Jardine Henderson. In 1960 he moved to Bombay initially as JRD Tata's Executive Assistant before taking on senior roles in other Tata companies.

Despite his busy corporate life Matthai found time with Dr Salim Ali, the renowned ornithologist, to extend the conservation work of the Bombay Natural History Society. The two nature lovers became lifelong friends with their shared passionate interest and deep knowledge of India's large variety of birds.

In his mid-50s Duleep Matthai resigned from all his corporate activities to focus his energies on nature conservation and environmental protection and in doing so developed friendships with many similar minded people across India's social strata who mourn his loss.

Matthai helped set up in 2001 and became a founding trustee of the Foundation for Ecological Security an NGO that is actively involved in the massive and critical task of ecological restoration in the country, the "wastelands" in particular and in 2007 he set up on his own initiative and became a founding trustee of the Duleep Matthai Nature Conservation Trust to which he donated the major part of his personal assets.

He passed away, at the age of 92, in Vallabh Vidyanagar, Anand District, Gujarat. Personable, driven and determined he helped in more ways than one to bring wildlife conservation to centre-stage at a time when most Indians were competing with themselves to outdo the British destruction of natural India. His primary focus then was a concept that was understood by the ancients in India, but forgotten in the melee of development post 1947... that destroying forests in the name of development would end up exhausting the water supplies of the subcontinent and visit all manner of miseries on our long-suffering people. He used to say then what many young persons now understand: "Nature does not need us. We need Nature."

He is survived by his only son Arjun.

A version of this article first appeared in the April 2017 issue of Sanctuary Asia, www.sanctuaryasia.com.

Introducing COP Watch

The changing climate of climate change policy since the Paris Agreement

As some of you may remember, in issue 9.4 of Current Conservation (available to read online here: http://www.currentconservation.org/?q=issue/9.4), we ran an article in which we explored the implications of the COP21 climate talks, which took place in Paris in December 2015.

What happened in Paris?

To recap, in March 1994 the Rio Convention, which included the adoption of the ground-breaking United Nations Framework Convention on Climate Change (UNFCCC), came into force (more information on the UNFCCC can be found by following this link: http://unfccc.int/essential_background/convention/items/6036.php).

Since then, the annual Conference of Parties (COP) has met to review the Convention's implementation. COP now has a near global membership of 195 countries.

In December 2015, representatives from these 195 countries met in Paris for the 21st COP.

As a result of the negotiations, these representatives signed a treaty which pledged them to "(hold) the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C".

What has happened since the Paris talks?

On 4th November 2016, the Paris agreement was to come into force.

At the time of writing in April 2017, 142 of those 195 countries which originally signed have since ratified the treaty (i.e. they have put the terms of the agreement into national law).

In March 2017, the World Meteorological Organisation's annual report revealed that in 2016, globally averaged temperature reached 1.1°C above pre-industrial levels. So if we are to stick to the most ambitious target outlined in the Paris agreement, we now have only 0.4°C to play with.

What is predicted to happen in the future?

In terms of the rate of future temperature increases, there isn't a single answer1 to this question. But the key point is that there is an almost linear relationship between the amount of CO_2 going into the atmosphere and the increase in global temperature. In other words, when looked at simply, lower emissions = a smaller increase in temperature.

Why this fixation on "below 2°C"?

Fundamentally, the "below 2°C" target simply marks a line in the sand. It is not the line beyond which the effects of climate change will become apparent. As we have said, any more CO_2 emitted will cause warming. The next key point is that any warming will have consequences.

"[Climate change] is a collective endeavour, it's a collective accountability and it may not be too late."

Christine Lagarde,
Managing Director,
International Monetary Fund (IMF)

In fact, we are already seeing these consequences. According to the World Meteorological Organisation's annual report, published in March 2017, 2016 was the warmest year on record,

In March 2017, the World Meteorological Organisation's annual report revealed that in 2016, globally averaged temperature reached 1.1°C above pre-industrial levels. So if we are to stick to the most ambitious target outlined in the Paris agreement, we now have only 0.4°C to play with.

reaching, as we have mentioned, 1.1°C above pre-industrial levels. 2016 also broke a range of other climate records:

- Highest global average sea surface temperatures.
- Record temperatures in Thailand and India; the 54°C recorded at Mitribah in Kuwait, subject to ratification, is the highest temperature ever recorded for the entire Asian continent.
- For the first time during the month of November, global sea ice dropped to more than 4 million square kilometres below average.

Meanwhile, flooding, droughts and other extreme weather events displaced thousands of people.

So even if we hit the "below 2°C" target, some regions are still likely to experience severe consequences. But, 2°C provides a realistic target, at the lower end of projected temperature increases, behind which governments and nations can throw their collective efforts.

What can we do?

The answer to this question is also very complex. There are many actions we can take at an individual level which will reduce our personal emissions, and it is hard to underestimate the importance of these actions – if we all reduce by a bit, collectively we'll reduce by a lot.

But the focus of our new section, COP Watch, is governmental action in response to the Paris talks. Why? Because the challenge of climate change is so enormous that effective action, in my opinion at least, must be led by policy change at the very top of government. We need policy which fundamentally alters our current industrial and economic reliance on fossil fuels. So – we should keep a close eye on what steps our governments are, and aren't taking, and make sure they live up to their obligations under the Paris treaty.

What is the aim of COP Watch?

The aim of COP Watch is to make it easier for you to stay updated. To help you keep this 'close eye' on your governments. This new section in Current Conservation will have two major elements:

1. We will bring you the headline news – the policies agreed by governments to achieve their COP

commitments. We will also highlight those countries who are prominently failing to make the steps required.

2. We will bring you an update of whether we are on track to hit the 1.5°C target.

References:

COP21. COP - What's it all about? http://www.cop21paris.org/about/cop21. Accessed on April 5, 2017.

Creasey, M. 2015. Climate change and conservation. Current Conservation 9(4): 28-33.

Pachauri, RK, MR Allen, VR Barros, J Broome, W Cramer, R Christ, JA Church et al. 2014. Climate Change 2014 Synthesis Report. IPCC, Geneva, Switzerland, 151 pp.

United Nations Framework Convention on Climate Change (UNFCC). 2015. Paris Agreement - status of ratification. http://unfccc-cint/paris_agreement/items/9444.php. Accessed on April 6, 2017.

World Meteorological Organization. 2017. Climate breaks multiple records in 2016, with global impacts (Press release). https://public.wmo.int/en/media/press-release/climate-breaks-multiple-records2016-global-impacts. Accessed on April 5, 2017.

Appendix:

(1) As a guide for predicting future temperatures under different levels of emissions, the Intergovernmental Panel on Climate Change (IPCC) use the Representative Concentration Pathways (RCPs). The RCPs, are 4 projections for possible future global temperatures, under different levels of greenhouse gas emission.

They take into account the key factors which will influence the degree to which we manage to reduce emissions - climate policy, energy use, land use patterns, technology, population size, economic activity and lifestyle, and outline a set of possible futures based on levels of emissions under various permutations of these variables.

- Under both RCPs 6.0 & 8.5, the baseline scenarios in which there is little or no attempt to reduce emissions, global surface temperatures are projected to exceed 2°C (in the latter case exceeding 4°C) above pre-industrial temperatures.

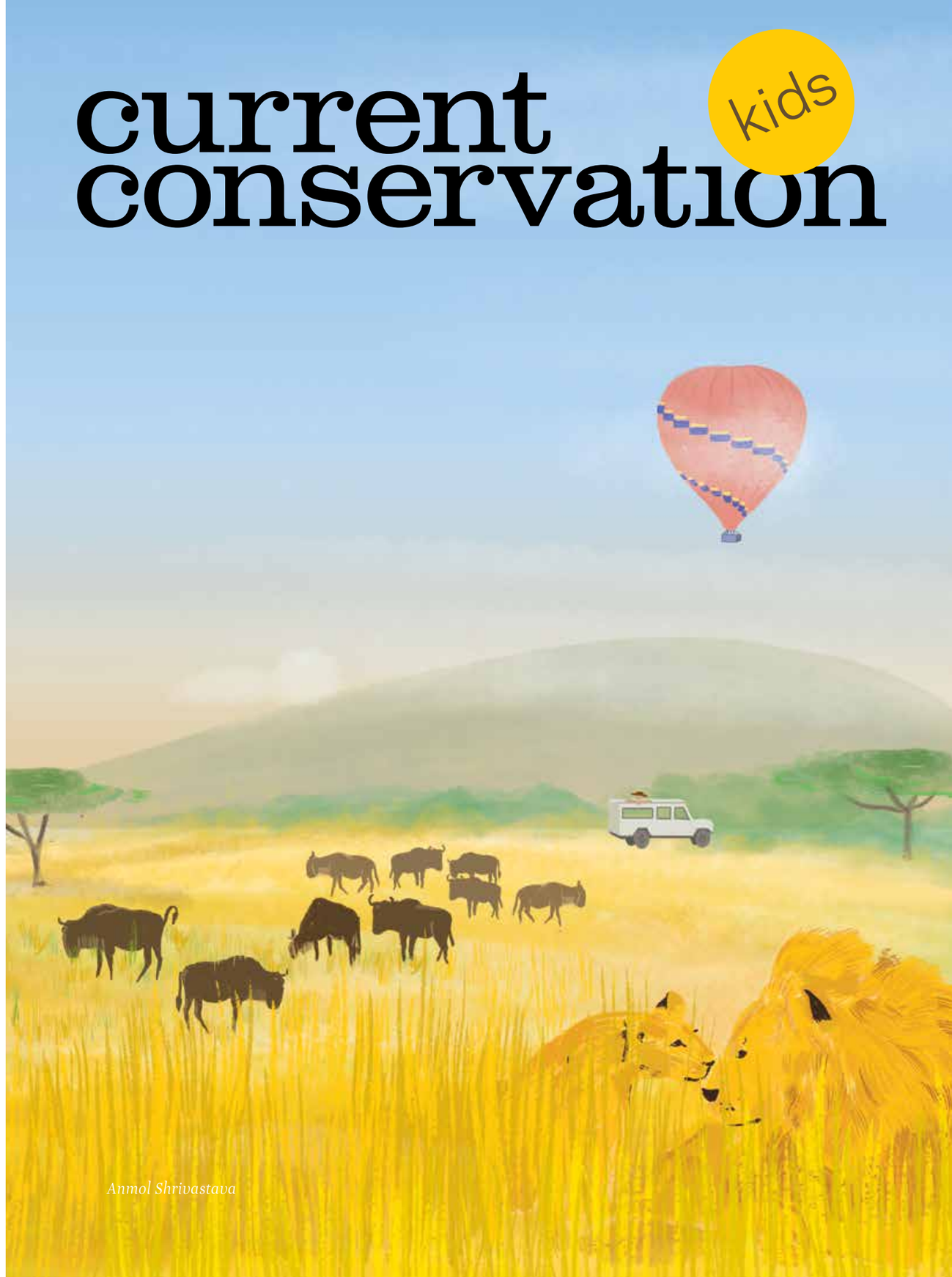
- Following RCP 4.5 is projected to result in an increase roughly in line with 2°C above pre-industrial temperatures.

- Under RCP 2.6 global warming is projected to likely stay below 2°C above pre-industrial temperatures, the minimum target of the Paris talks.

Matt Creasey is a Ph D Researcher at Centre for Ecology and Conservation, University of Exeter, UK, mjsc201@exeter.ac.uk.

Photographs: Matthew Creasey

current conservation kids



Anmol Shrivastava

A DAY IN THE LIFE OF A LION CONSERVATIONIST

My name is Enoch and I study lions on the savannahs of Africa. Being a lion conservationist is not always easy. It often involves working to minimize conflict between humans and lions. However, it is very interesting and very rewarding.

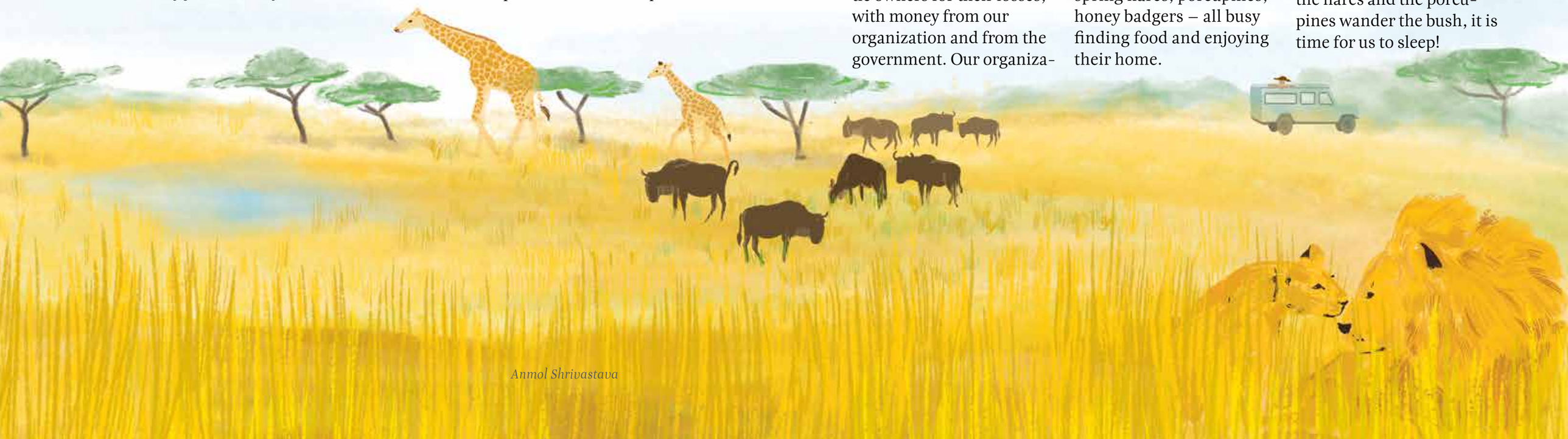
In the area I work, the Maasai Mara National Reserve in Kenya, both humans and lions rely on the same land. It provides them both with food and shelter. It is home to both. Sometimes this can lead to conflict, either because they need to use the same resources, for example water or land, or because the cattle which the humans keep for food, are also a tempting meal for the lions. And when threatened, both humans and lions can be dangerous. Both will defend themselves with violence. So my job isn't easy.

What is my most important skill? Doing without sleep. Each day brings different challenges, but every day is busy. With other rangers, I live much of the time in a camping site next to the park gate. Many days we visit local households affected by lions killing their livestock, to install lion-proof bomas (livestock enclosures). Before first light, we all load up in the Landrover and head off to the field. This morning, we climb up the Ololoolo escarpment, and before we reach the village of Kawai, we spot a wounded giraffe. We stop to check on it and realize that he has been shot by a poisoned arrow. We cannot deal with him alone, so call the Kenya Wildlife Services for help. Sadly, they cannot save him this time.

At Kawai, we hear that a pride of 11 lions went up the escarpment from the National Reserve, killing one cow and injuring several others. Visiting the homes of the cattle owners, we take photographs of the cow's injuries and strengthen the fences to protect them from further attacks. We will pay compensation to the cattle owners for their losses, with money from our organization and from the government. Our organization must also pay for half the cost of the new fences. Protecting people, their cattle and the lions can be expensive. We then head into the bush to find the lions and drive them back to the Reserve. If they are allowed to stay close to the community's homes, they may attack more livestock, which may result in them being attacked in turn by the local people.

In the afternoon, more villages to visit, more conflicts to resolve. Eventually, at 9 p.m., we turn for home. Tired as we are, as we drive back, we feel so fulfilled and close to the maker, Mother Nature. We see all the night wildlife – spring hares, porcupines, honey badgers – all busy finding food and enjoying their home.

As tired as African wild dogs, we eventually lie down to sleep at 11.30 p.m. Hopefully, we won't be called on to respond to attacks by poachers tonight, as we are sometimes! Tomorrow we must begin removing some wire traps we have found which were put in the bush by poachers, to catch wildlife for meat, before any animals are hurt. But for now, while the lions the hares and the porcupines wander the bush, it is time for us to sleep!



Anmol Shrivastava

AFRICAN LIONS

The scientific name of the African lion is *Panthera leo*. They are endangered and less than 30,000 wild lions remain in the African savannahs.

African lions mostly like living in open savannahs and sometimes in sparse scrub lands.

They live in family groups called prides, with a number of related females, and unrelated males which are father to all the cubs born while they are with the pride.

The lions mate throughout the year, depending on the availability of food. When there is enough food, more young ones are likely to be born.

Gestation lasts for 110 days and females have an average of 3 cubs per litter.

Multiple females in the pride often synchronize their litters so that other females have cubs at the same time, encouraging cooperative rearing by sisters.

If one mother dies from disease, an accident during hunting or is killed by poachers, her young cubs can be raised by her sisters in the pride.

Females share the care duties, and cubs in a pride suckle any mother that has enough milk to feed them.

Cubs depend on their mothers for survival up to two years of age.

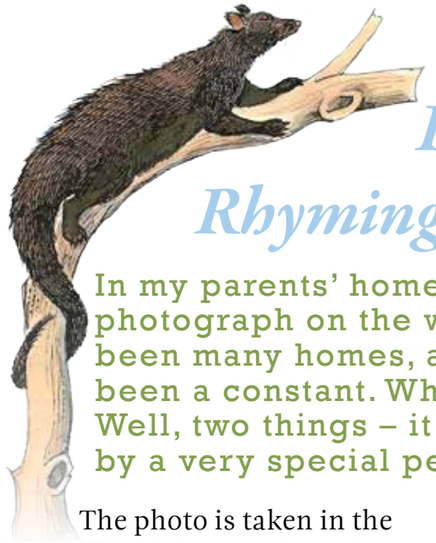
Young males must leave the pride when they are about two years old.

Young females may also leave but mostly they stay with their pride.

Lions have a strong attachment to particular areas, and human interference with this home range can cause problems.

Biologists identify members of a pride using the whisker patterns on the face or on both sides of the mouth.

Sonali Zohra

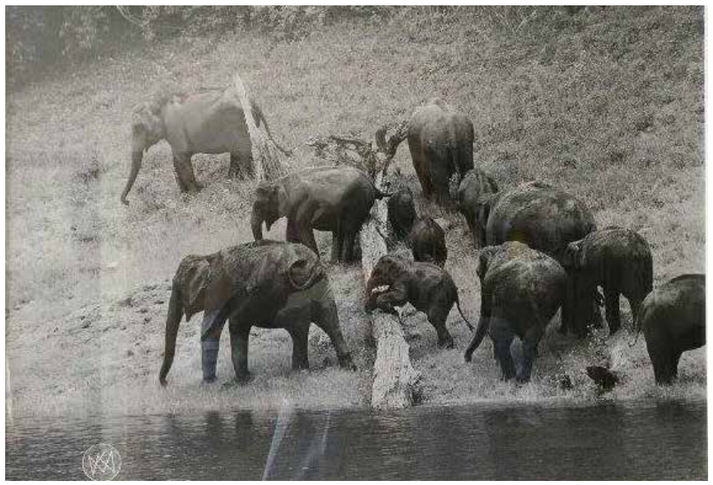


Book of Beasts: An A to Z Rhyming Bestiary by M Krishnan

In my parents' home, there is a large black and white photograph on the wall. Over the last 20 years, there have been many homes, and many walls, but this photograph has been a constant. What is so special about this photo you ask? Well, two things – it has a very special story and it was taken by a very special person.

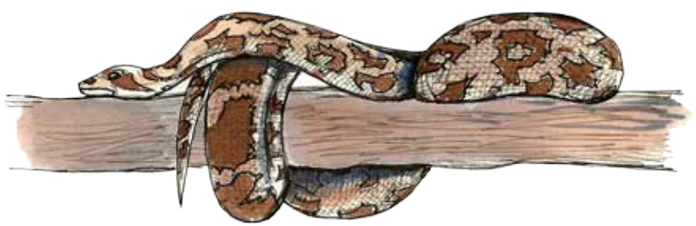
The photo is taken in the Nilgiri forests of South India and captures in its frame a herd of elephants. At first glance, it seems to be just a nice wildlife photograph of pachyderms in the forest. Now let me share with you the special part and tell you the story, one that my father has narrated to me more times than I can count.

The little elephant who could



M Krishnan

There are a number of elephants – big ones, ones with long trunks, ones with floppy ears and most importantly, a little one. The elephants are walking through the forest, and have come across a giant log that is blocking their path. Some who are big enough, walk majestically over the log, while others who can't, take the longer path around. They all continue with their walk. Well, all of them except our little friend, whom I like to call 'the little elephant who could'. As captured in the photo, he tries and tries to cross the log, with no success. All the elephants wonder why he is not taking the easy way out and plodding around. Finally, after many slips and slides and falls, the little elephant succeeds! He climbs over the log and marches triumphantly on.



Like I said before, this photograph was gifted and this story was told to my father by a very special person. His name was M Krishnan, and he had thousands of stories just like the one of 'the little elephant who could', that he had seen with his own eyes. If you asked me who Krishnan was, it would be difficult to answer, because he was so very many things. Krishnan was a photographer, he was an artist, he was a writer, a poet, but most significantly he was a lover of nature. Krishnan was born more than a 100 years ago, and spent a large part of his life wandering India's forests, observing the birds and beasts who made their homes there, photographing them, and writing about his times in these forests. Being the lover of words and wildlife that he was, about 25 years ago, Krishnan wrote a collection of poems as birthday presents for his granddaughter Asha.

Illustrations: M Krishnan (reproduced with permission from Duckbill)

The years passed and Asha decided she had to share these poems with animal lovers everywhere, and so she published them in a book titled *'Book of Beasts: An A to Z Rhyming Bestiary'*. If you want to learn about animals and birds, or you like to read poems, then the *Book of Beasts* is meant for you! Through this set of poems, Krishnan spells out the alphabet with an A to Z of wonderful and weird animals and birds.

As we turn through the pages, we see strange faces like the Eland, a kind of African antelope who resembles a cow, and familiar faces, like our favorite big cat - the tiger. Krishnan writes about animals from near and far, there are poems on Dingos from Australia and pythons from India alike. These poems are filled with fun facts, jokes and Krishnan's memories. The *Book of Beasts* is a treasure trove of information, and is so important to those of us who care about the conservation of nature and wildlife. Of the 24 animals and birds that Krishnan has written about in this book, today 11 or almost half of them are threatened or endangered in the wild. If after going through pages with Binturongs and Okapis, if you want to read about still stranger critters, no fear, because the Book of Beasts ends with the mysterious creature XYZ!

I'll leave you with a little verse inspired by this book.

If you want to meet an independent Kangaroo,
Or stumble upon a sullen Gnu,
If you wish to learn about the Hispid Hare,
Or the Sloth Bear-oh-so rare.
Then let your eyes and ears feast,
On the fantastic Book of Beasts.

Do you have wildlife poems that you've written? We'd love to read them and publish some in our next issue. Do share them with us at editor.ccmagazine@gmail.com

Who does conservation science and why that matters: a personal perspective

Listening to plenary talks at a conservation science conference can be rather depressing. We hear about species going extinct in our lifetimes, and about the array of forces deployed against biodiversity. Indeed, I remember several years ago having these dispiriting feelings at the Asian Chapter of the Association for Tropical Biology and Conservation (ATBC) meeting in Banda Aceh, Indonesia, as I listened to several researchers who expressed justifiable frustration with the policies of the countries where they were working and the outlook for conservation there.

But then there was a presentation by Dr. Sanjay Gubbi, now at the Nature Conservation Foundation, which gave me a jolt, and a sense that some problems were addressable. This presentation was remarkable for its tone: it highlighted small but significant victories, gradual increases in the amount of land protected as tiger reserves in India. A second significant quality of the talk was it was by an Indian scientist working in India who had a good feeling for the political pulse of his country. He described ways in which as a conservation scientist he was able to form sometimes unlikely alliances with other groups of people, including farmers and business people. I especially remember how he described convincing a particular politician by understanding his background: the politician came from a place of water shortage and Dr. Gubbi packaged his sales pitch to appeal to this personal knowledge of how valuable water can be.

Dr. Gubbi's presentation stimulated me to think about the importance of who does conservation, as well as what particular policies are advocated. For if conservation is a political practice, and if conservationists must persuade people of its use, sometimes against those people's short-term interests, then it is critical how this sales pitch is made. The most successful conservationists will be those who are able to communicate well with the people directly affected by conservation, those who understand the people's language, culture, tradi-

For if conservation is a political practice, and if conservationists must persuade people of its use, sometimes against those people's short-term interests, then it is critical how this sales pitch is made. The most successful conservationists will be those who are able to communicate well with the people directly affected by conservation, those who understand the people's language, culture, traditions and the intricacies of their political situation.

Megha Vishwanath

tions and the intricacies of their political situation.

I have experienced some of these issues first hand as a foreign scientist working in Asia. Several times when conducting a conservation education program, I was asked if was trying to influence the protection status of (or more directly to "buy"!) the Sri Lankan national park I worked in, representing American interests. Although it didn't make me question the use of our program, it did make me more skeptical of how successful a spokesperson I personally could be for conservation. Ultimately any idea that a foreigner may advocate can be perceived as embodying a different set of values than those of the local people they work amongst, or worse, being an imposition of such a foreign value system.

Fortunately, I have worked with a group of Asian colleagues, including my wife Dr. Uromi Manage Goodale, who have active conservation and education programs, so I hope I have made contributions through my work with them. The example of my Sri Lankan advisor, Prof. Sarath Wimalabandara Kotagama, has been particularly instructive. Prof. Kotagama helped build a grass-roots conservation movement that emphasized how natural resources were part of Sri Lanka's heritage, and he has reached out and engaged Sri Lankans through educational materials about wildlife in Sinhala. Subsequent travels around Asia have confirmed for me the impression that the conservation ethos is particularly strong in Sri Lanka. This strength, I believe, derives particularly from Sri Lankans' belief that conservation is protection of their own history and identity.

As I look back over my own career, I must say that I have been rather "academic", concentrating on ecological studies rather than actual conservation impact. By "academic" I do not mean "dry" or uninteresting; I have been fortunate to work on aspects of animal behavior and ecology, such as avian vocal mimicry, or species interactions in mixed-species bird flocks, that are, at least I find, endlessly fascinating. I hope that I have been able to stimulate the curiosity of people I have interacted with, and ultimately that such interest can drive a feeling of responsibility for nature. Now as a professor currently working in China I try to encourage the careers of students I work with, who can then make a conservation impact themselves. I need to guard against the laissez-faire temptation to not try conservation myself, for such a strategy should not be a replacement or alternative to practicing conservation. But I do believe that such an education pathway can promote conservation, particularly if it can develop Asian conservationists here in Asia.

As I look back over my own career, I must say that I have been rather "academic", concentrating on ecological studies rather than actual conservation impact. Now as a professor currently working in China I try to encourage the careers of students I work with, who can then make a conservation impact themselves. I need to guard against the laissez-faire temptation to not try conservation myself, for such a strategy should not be a replacement or alternative to practicing conservation.

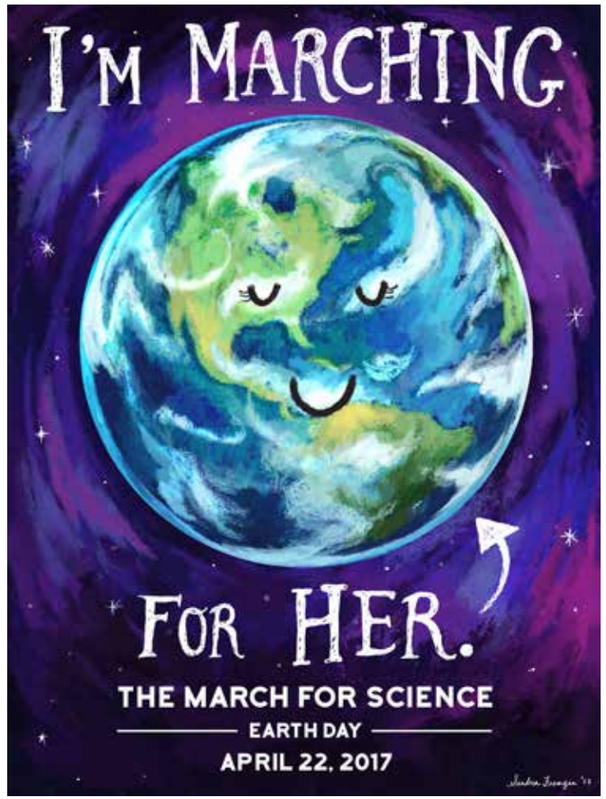
This past year, my colleagues and I published an academic paper about who does conservation science, published in Biological Conservation and accessible on my ResearchGate site. As the world economy changes, the percentage of papers published by non-high income (NHI) countries has increased, and we wanted to see whether this pattern was also found in conservation. We focused on the international literature, not because it is necessarily important for conservation action (indeed local-language and locally-distributed texts can be more important in true impact), but because success in the international literature is increasingly essential for career promotion. We were surprised to find that as a field, conservation science lags in the increase of NHI voices, ranking 10/10 of the randomly chosen fields we investigated. Part of the reason for this trend is that from the beginning conservation science had an over-representation – compared to other fields – from low income countries, since often it is those countries that are the most biodiverse, especially if situated in the tropics. But this traditional value on the voices of low income countries is now decreasing.

We offer two main solutions to this problem. One is short-term and is focused on the journals and their policies which could encourage more publications from developing and tropical countries. The more long-term solution is to see institutions of higher education in these countries as platforms for creating the next generation of conservationists. This is not to say that students who go abroad to get their degrees can't come back and work for their native country. Many do; however, many do not, leading to a 'brain drain' of sorts, seen in other fields. Some argue that in many fields a brain drain is not necessarily negative; but if conservation especially needs local voices as argued above, such a flow robs us potentially of the most powerful spokespeople. Further, not all graduates are academic themselves: programs in conservation science produce people who go into NGOs and government positions, bringing their conservation ethos with them.

Going back to that meeting of ATBC's Asian chapter, what is most encouraging is the cohort of students from many Asian countries presenting talks and posters. Yes, we may be losing forever some of our iconic Asian species, including rhinos, orangutans, the cat family both big and small. We are bleeding, and these losses are indescribably painful. But it is this group of young people who might hold the power to eventually slow the bleeding, and after seeing their progress, one sees the future brighter than before.

Eben Goodale is a Professor at Guangxi Key Lab of Forest Ecology and Conservation (under state evaluation), College of Forestry, Guangxi University, Nanning, Guangxi, China, ebengoodale@gxu.edu.cn; eben.goodale@outlook.com.

Science, Not Silence



Sandra Fremgen

On Earth Day 2017, scientists and science-lovers around the world united to demonstrate their appreciation of a concept that means different things to different people. For some, it is a job; for others, a hobby; many thank science for saving their life, and still others appreciate science for improving their standard of living.

Regardless of the exact nature of each supporter's prior interactions with, and affection for, science, one feeling united all participants involved in the demonstrations: Science is currently under attack. Two science advocates share their views on how we got to this point, and what we need to do next.

Sandra Fremgen

Science and Politics

Caitlin Kight

Humans are not unique in living communally, working cooperatively, using tools, investigating the world around us, or even in communicating. Cumulatively, however, these characteristics have allowed us to achieve remarkable things that set us apart from all other species on Earth: We create tools of astonishing complexity, engineer new structures and re-engineer entire environments, develop medical techniques to extend and improve lives, create breathtaking works of art, prepare exquisite culinary delights, and then use our unparalleled linguistic ability to discuss these advances, record them for posterity, learn from them, and work towards an even more successful future.

All of this is facilitated by science, "the state of knowing: knowledge as distinguished from ignorance or misunderstanding…a department of systematized knowledge…knowledge or a system of knowledge covering general truths or the operation of general laws" (Merriam-Webster). For most of us, the word "science" probably brings to mind images of spaceships and flasks full of mysterious chemicals and Petri dishes housing microscopic life forms, but these are only some of the many wonderful physical embodiments of the concept.

Cornell Alliance for Science

A fully inclusive visualization would require us to expand our minds' eyes to encompass nearly all aspects of our collective human culture, from the foods we eat (our ancestors' experiments determined which could be safely eaten, how their flavour could be improved through different types of preparation, which varieties could be domesticated, and how those domestic yields could be made greater and more quickly) all the way through to the art we appreciate in museums (thanks to our distant relatives who first discovered how to mix liquid with pigments to make paint, how to strengthen clay by exposing it to fire, how to extract metals from ores and then fashion them into useful and decorative implements, how to use mathematical rules to create aesthetically pleasing layouts, and so on). These are only a few examples of topics about which we are in a "state of knowing", and about which we have learned through a process of experimentation and observation.

All of this is facilitated by science, "the state of knowing: knowledge as distinguished from ignorance or misunderstanding… a department of systematized knowledge… knowledge or a system of knowledge covering general truths or the operation of general laws"

Kayla A Gomez

When you think of it like this, science sounds not just fundamental, essential, fascinating, and enjoyable, but also laudable; it sounds like an achievement that we should celebrate and protect and promote. It certainly doesn't sound as though it should be controversial—though particular disciplines and applications might be uncommonly thought-provoking—and you wouldn't think that "science", "scientist", or "scientific" could ever be used in a negative way.

And yet, the recent March For Science (MFS) campaign saw citizens around the world uniting to voice their support for a beleaguered ideal that has—especially in recent months—been attacked, misrepresented, misunderstood (sometimes deliberately), and suspiciously questioned. Over 800,000 scientists and science-lovers have joined a March For Science Facebook group where they can share pro-science anecdotes and coordinate pro-science activities. The MFS movement is not the first or only such effort, but it feels particularly poignant and meaningful. It seems to capture the zeitgeist very effectively: having despaired over the tone and style of science coverage in the press, watched stagnation or even backwards progress around prominent and hugely impactful issues such as climate change and vaccinations, seen science- and education-related budgets repeatedly slashed, and endured a growing vocal opposition to intellectualism in general, science supporters are now ready to take matters into their own hands and push back.

The prominence of the March for Science activities has encouraged and shined a spotlight on wider discussions around the role of science in society, and, in particular, around the intersection of science and politics—the latter of which can be defined as "the art or science of government or guiding/influencing governmental policy…the total complex of relations between people living in society" (Merriam-Webster).

Evan Kuhl

Although scientific research should be performed systematically, objectively, and without bias, the people, the process, and the outcomes can all become politicized—and this is by no means exclusive to contemporary societies. Galileo, for example, was punished in the 17th century for advocating Copernicanism because this belief was seen to undermine the power of the Catholic church by challenging the veracity of the Bible; officials feared this theory because if one portion of the Scripture was proven to be false, others might be equally tenuous, and suddenly the Church might find itself lacking in authority. That famous example is a negative form of politicization, but others are more positive. In the early 1960s, US president John F Kennedy delivered two notable speeches in which he publicly declared a belief that Americans could and should reach the Moon by the end of the decade. The source of the goal—political and technological competition with Russia—may not be a source of scientific pride, but the resulting innovations and achievements certainly were, and still are; Kennedy linked intellectual accomplishment with Americans' sense of identity, in the process promoting inspirational goals and a respect for both research and ideas.

Scientists are, of course, only human—with opinions and preconceptions and motives and desires—but they are humans who, by and large, typically strive to be aware of these characteristics (within the context of their work, at least) and compensate for them so as to maximise the chance of obtaining unequivocal insights about the universe; we'd all rather be remembered as a Ptolemy than a Copernicus, after all, so it does pay to be rigorous.

That said, careers, fortunes, and clout can all be influenced by the outcomes of scientific research, and so there will always

Scientists are, of course, only human—with opinions and preconceptions and motives and desires—but they are humans who, by and large, typically strive to be aware of these characteristics (within the context of their work, at least) and compensate for them so as to maximise the chance of obtaining unequivocal insights about the universe; we'd all rather be remembered as a Ptolemy than a Copernicus, after all, so it does pay to be rigorous.

Cornell Alliance for Science

be examples of impropriety—faked datasets, for example, or falsehoods and misdirection associated with conducting or interpreting studies (e.g., the case of Trofim Lysenko, discussed in Loren Graham's recent book *Lysenko's Ghost*). Scandals and public disagreements are damaging not just to those involved directly, but to all scientists and even science in general, since the public quickly lose faith in truth-seekers who seemingly can't be trusted to tell the truth themselves. When this is combined with scientists' innate desire to question and debate each new result, it creates an easy target for anyone wishing to paint science as unreliable and deceitful.

Those of us who know and love science—who engage in it, seek out opportunities to learn about it, teach it, look for ways to apply it to our daily lives in practical ways, interact with professional researchers, and advocate it to others—understand that its greatest strength is also its greatest weakness: Science can both reveal and obscure in one fell swoop. The old aphorism is true: The more you know, the more you know you don't know. As physicist and science communicator Professor Brian Cox said in a recent interview, "The value of science is in embracing doubt… [It] is not a collection of absolute truths. Scientists are delighted when we are wrong because it means we have learnt something" (Strom 2017).

Unfortunately, there are many people who take advantage of this pursuit of uncertainty and negated hypotheses—people who wilfully misconstrue the often repetitive and cyclical nature of the scientific process as being indicative of disorganization, confusion, and an inability to make progress. These are the sorts of people who deny that climate change is occurring and is caused by anthropogenic activity; these are the sorts of people who try to prevent science teachers from discussing evolution in the classroom. When these are also the people holding elected positions in which they make decisions about national priorities, policies, and research funding schemes, personal ignorance becomes public misfortune.

Many of the scientists whose studies helped usher in the creation of the atomic bomb—Oppenheimer, Einstein, and Meitner prominent among them—were painfully aware of the potential consequences of their work, and stridently argued for world leaders to act with diplomacy and restraint. Recently, Japanese scientists have boycotted a military funding scheme in a similar show of reluctance to have their research weaponized or otherwise used to the detriment of whatever fellow humans might be deemed "enemies of the state" at some point in the future (Cyranoski 2017).

These are extreme examples of how science can be politicized—and of how scientists can recognize that process—but recent events have shown, in particularly stark detail, that science is always politicized in some way or another (Naro and Francis 2017). Research is conducted by people who have grown up in particular cultures with particular ways of seeing and doing things; it is funded by patrons and institutions and governments with particular agendas; it is carried out within organizations and societies and countries with specific goals; it depends upon the ability of expertise, results, and progress to flow unimpeded across borders; it thrives on collaboration and openness rather than secrecy. Although many of us may once have believed that science is apolitical—"having no interest or involvement in political affairs; having no political significance" (Merriam-Webster)—the past few months have been a reminder that the impact of politics on science can be immense; now we have the opportunity to show that the reverse can be true as well. The popularity of the March For Science message shows that scientists are both frightened and galvanized by the current global political landscape. Although it is empowering to gather en masse with like-minded individuals and physically demonstrate our support for a scientific way of life, we will need to keep working long after April 22nd has come and gone. We must continue to speak out against misconceptions, advocate and advertise science. We must work with the press to achieve more informative, less sensationalistic coverage of scientific news. We must contact politicians to advocate pro-science activities and attitudes. If government officials fail to represent our interests, we must vote them out at the next election. If we worry about finding candidates who have sufficient expertise, we must consider stepping forward ourselves.

None of this will be easy, but no one person has to do it all. As the MFS Facebook group shows, the pro-science community is both vast and varied. Each of us can play to our individual strengths and, together, work towards a more fruitful synergy of science and politics; whatever personal debates we may have with each other in private, we need to be supportive and unified in public. We must be passionate, inspiring, clear, and persuasive. Above all, we must be persistent; as Galileo found many hundreds of years ago, the way to combat small-mindedness is with irrepressible science—not silence.

References:

Cyranoski, D. 2017. Japanese scientists call for boycott of military research. Nature. http://www.nature.com/news/japanesescientistscall-for-boycott-of-militaryresearch-1.21779. Accessed on April 21, 2017.

Science. 2017. Merriam-Webster.com. https://www.merriamwebster.com/. Accessed on April 21, 2017.

Naro, M and M Francis. 2017. Science is political. *The Nib*. https://thenib.com/science-is-political. Accessed April 21, 2017.

Strom, M. 2017. Professor Brian Cox on elections: 'Don't vote for politicians who say they have all the answers'. *The Sydney Morning Herald*. http://www.smh.com.au/technology/sci-tech/professor-brian-cox-onelections-dont-vote-for-politicians-who-say-they-have-all-theanswers-20170403-gvc6hu.html Accessed April 21, 2017.

Caitlin Kight is an editor, writer, and educator affiliated with the University of Exeter, caitlin.r.kight@gmail.com, http://www.caitlinkight.com.

Raeann Shimak

The Greatest Weapon in the Fight to Save Science

Stephanie Bryant

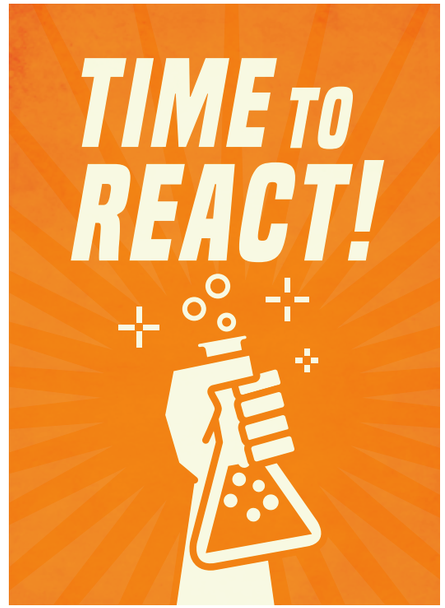
When I first set out to become a scientist I had little interest in politics. As an undergraduate student studying biology, I naively assumed that science was a universally appreciated field. After all, despite artificial borders, we all drink the same water and breathe the same air. Cancer, heart disease, and strokes treat conservatives and progressives equally. But after many years of depending on US government funding for research in academia, I've learned that science and politics are inextricably linked. The budget of the National Institute of Health, the largest funder of biomedical research in the world, is currently slated to lose $5.8 billion (~18%) of its 2018 budget under the new U.S. administration (Reardon et al. 2017). The Paris Agreement, which unites over 190 nations in a common effort to mitigate the effects of climate change, is at the mercy of the environmental regulations enacted (or redacted) by each nation's government (United Nations 2016). In learning that the boundaries of science are not limited by scientists, but by government and politics, I realized that I have only been doing half of my job as a scientist. It is not enough to simply do science. We must also advocate for science. As science students, professionals, and enthusiasts, we are the greatest weapons in the fight to save science.

Cornell Alliance for Science

Science is not just the work of people in white lab coats looking through microscopes. Chemistry, agriculture, drug-development, engineering, data science, and any other field that builds knowledge based on systematic experimentation and quantitative fact is a science. Historically, these fields have had a substantial impact on government policy. Research in environmental science informs decisions on issues such as pesticide use, city air pollution limits, and water treatment standards. Research in chemistry and biology impacts regulations on food safety and drug efficacy made by organizations such as the Medicines and Healthcare products Regulatory Agency in the U.K. and the Food and Drug Administration in the U.S. Without science, there is no evidence on which to base policy. Yet legislation is often still developed without regard for (or in spite of) evidence. Despite scientific consensus on the theory of evolution, many public schools in the U.S. allow teachers to teach creationism as an "alternative" to evolution. Likewise, many global powers continue to prioritize economic policy over efforts to curb climate change, despite overwhelming evidence that climate change is anthropogenic and will have negative global impacts for decades to come.

The crumbling relationship between science and politics galvanized scientists and science-supporters in over 400 cities across the globe to unite in a non-partisan March for Science on April 22nd to highlight the importance of evidence-based policy. In a healthy relationship between science and politics, voters would be educated on scientific issues and would take these matters into consideration when electing individuals to represent their interests. Elected officials would also be scientifically literate and represent the interests of their constituents, and would thus advocate for evidence-based policies that are best for the people. Yet people often ignore scientific evidence when forming opinions about science policy and when electing individuals to represent these opinions. Numerous political and social science studies have found that opinions on scientific issues are heavily influenced by existing beliefs, religion, and political party or ideology (Blank and Shaw 2015; Pew Research Center 2015; Mervis 2015). The resulting dissonance between public opinion and scientific evidence impacts policies on issues ranging from how government funds are allocated for scientific research to how science is taught in schools. While many of the factors contributing to this may be out of the direct control of scientists, we do have power over one of the most influential factors: science communication. The single greatest way to impact science policy is by imparting the importance of science to the public — by influencing policy through the people.

We can no longer leave science communication up to those in the mass media or politics. While science journalism is critical to the dissemination of science to the public, those with pre-existing perceptions based on non-scientific factors are difficult to reach with this medium. To reach greater numbers more effectively, we must take upon ourselves the responsibility of protecting and promoting science.



Cornell Alliance for Science

We can no longer leave science communication up to those in the mass media or politics. While science journalism is critical to the dissemination of science to the public, those with pre-existing perceptions based on non-scientific factors are difficult to reach with this medium. To reach greater numbers more effectively, we must take upon ourselves the responsibility of protecting and promoting science. Rejection of science is most likely to occur on issues where scientific evidence seems directly opposed to personal or religious beliefs or where it involves self-sacrifice (Blank and Shaw 2015; Pew Research Center 2015; Mervis 2015). To combat this, we must emphasize the ways in which science can be integrated with established beliefs and routines, and highlight the ways in which people personally benefit from science. If you are a scientist, you can do this by explaining your research and its impacts to as wide a range of non-scientists as possible. When you do so, be specific and focus on the impact of your work and how it fits into the ideology of your audience. Don't skip the "boring" details, either. By glossing over grueling tasks such as applying for grants and engaging in the peer-reviewed publication process, we fail to convey how rigorous our studies must be to be funded or published and reduce the perceived value of our research. Another immensely valuable way to share scientific data is by publishing in open access journals or pre-publishing in free online archives, eliminating the need for expensive journal subscriptions to view current scientific research.

If you are a science student, explain your course material or research projects to family, friends, and co-workers; this has the added bonus of helping you to learn the material better. If you are a science teacher, enthusiast,

illustrator, or citizen scientist, let people know! Use social media to share interesting laboratory experiments, illustrations, or blog posts with a wider audience. In the typical jargon-filled journal article format, science can be intimidating. Using social media platforms as outlets brings science to the people in a more familiar and inviting format. Sharing eye-catching photos of colorimetric reactions or fluorescence microscopy images can be a surprisingly effective way of starting a conversation about the importance of funding environmental or biomedical research. We may not be science journalists, but we are the people on the front lines of science. Learning about science informally through the experiences of people in the field can be much more personal and impactful than hearing about it from a journalist or news anchor.

In addition to talking about science, we must also act for science. While the March for Science sent a strong message to onlookers around the world, we must also actively share science within our own communities. Easy ways to do this include submitting op-eds to local newspapers, attending town hall meetings, or volunteering at local schools, libraries, and museums. Submit summaries of scientific articles to local publications. Give demonstrations or talks at community events. Whichever community platform you choose, it is important to tailor your message to your audience, as not everyone will be receptive to the same message. A rural farming community will likely be less interested in a talk on genome editing than in an explanation of how science enhances farming technologies or animal breeding practices. Yet everyone benefits from science in some way, so our message is for everyone.

However we choose to advocate, it is imperative that we make meaningful connections between people and science. By communicating to broader audiences in more personal ways, we may begin to heal the dissonance between science and politics. Whether or not you participated in the March for Science, it is vital to unite with other scientists to defend its most powerful slogan: Science not Silence.

References:

Blank, JM and D Shaw. 2015. Does partisanship shape attitudes toward science and public policy? The case for ideology and religion. *The Annals of the American Academy of Political and Social Science* 658: 18-35.

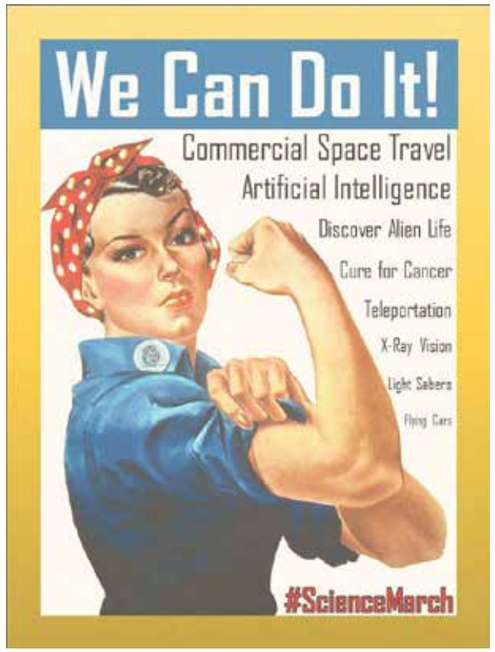
Funk, C and L Rainie. 2015. Americans, Politics and Science Issues. *Pew Research Center.* http://www.pewinternet.org/2015/07/01/americans-politics-and-science-issues/. Accessed on April 16, 2017.

Mervis, J. 2015. Politics, science, and public attitudes: what we're learning, and why it matters. *Science*. http://www.sciencemag.org/news/2015/02/politics-scienceandpublic-attitudeswhat-we-relearningand-why-it-matters. Accessed on April 21, 2017.

Reardon, S, J Tolleson, A Witze and E Ross. 2017. US science agencies face deep cuts in Trump budget. *Nature News* 543. http://www.nature.com/news/us scienceagenciesface-deep-cuts-intrumpbudget-1.21652. Accessed on April 21, 2017.

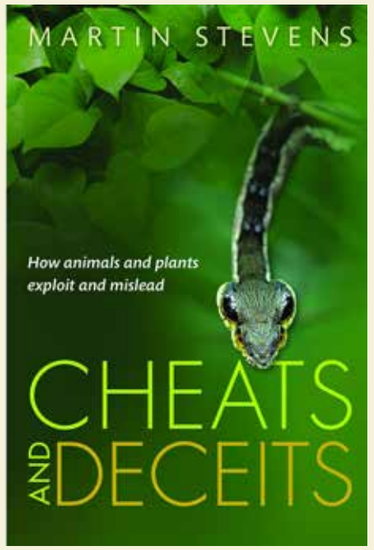
United Nations. 2016. *Paris Agreement.* United Nations Treaty Collection.

Stephanie Bryant is a Research Analyst at Markey Cancer Center at University of Kentucky, stephanie.bryant@uky.edu.



Raeann Shimak

Things are not always what they seem



Cheats and Deceits: How Animals and Plants Exploit and Mislead,
by Martin Stevens

ISBN-13: 978-0-19-870789-9

Oxford: Oxford University Press, 2016

Wildlife communication can be elegant and alluring; consider the intoxicating scent of a budding flower, the music of the dawn chorus, or the graceful mating dances of many bird species. But these beautiful behaviours hide a dirty secret: Just like humans, other organisms can be devious, and sometimes they wish to mislead. They may try to obscure their presence altogether with camouflage; they may use mimicry to convince other individuals they are a different species or perhaps even an inanimate object; they may even tell outright lies.

In *Cheats and Deceits,* author and sensory ecologist Martin Stevens explores the baffling, astounding, and impressive array of techniques that wildlife use to further their own agendas. He sets the stage with the case of the alcon blue butterfly, whose caterpillars are adopted by ants and fed for up to two years before they pupate, leave the ants' nest, and head off to start the cycle again. This remarkable process is made possible by the caterpillars' ability to mimic the smells and sounds of the ants, thus deceiving the latter into becoming caretakers even though the caterpillars do not help them. The author writes:

> *Deception should benefit those practising it, but it is often costly to the animals being tricked, from lost time or resources such as food, through to a greatly increased risk of death. This book is about how deception works in nature and how it evolves…Ultimately, this book is about what deception can tell us about how species interact with one another, and the processes of evolution and adaptation.*

So begins a riveting journey through an extensive catalogue of deceptive behaviours that are seen in nature. The reader learns, for example, about predators that trick their prey into approaching dangerously close, plants that facilitate reproduction by pretending to be mates of pollinating insects, and vulnerable animals that use displays to seem threatening to would-be attackers. Indeed, as these examples suggest, the vast majority of deception falls into one of only three broad categories: obtaining food, avoiding being eaten, and reproduction. The magic of the book is how it reveals, and revels in, the diversity to be found within each of these types—the many variations on a

theme that result when you factor in differences in habitat, mode of communication, relatedness of the deceiver and victim, and other constraints found in the environment.

Cheats and Deceits is one of those rare books that can be appreciated by both a scientific and a lay audience. This is not because Stevens oversimplifies his explanations and descriptions, but because he has such a clear and engaging style. One of the most appealing aspects of Stevens' writing is how he takes care to define scientific terms and describe the methodologies used to observe, explore, and test hypotheses about the fascinating behaviours described here. The author acknowledges pioneering researchers by name and academic affiliation and cites liberally, thus making it easy for readers to track down more information on any of the studies discussed in the volume. Many of the book's 69 figures include photographs of experimental setups and testing equipment; here, the scientific process is not something that is glossed over, but instead is placed front and centre so readers can get a sense of the incredible work required to find scientific answers.

The book could easily have been a literary cabinet of curiosities—full of amazing and engaging oddities, but lacking real educational value. However, Stevens takes care to contextualise his case studies so that readers also learn more broadly about how and why animals communicate, what types of characteristics can provide information to other individuals, and how and why these intricate behaviours might have developed to begin with. He is particularly careful to explore the "economics" of the behavioural transactions he describes—the costs and benefits for both the deceivers and the deceived, and the intricate balance that allows such behaviours to persist over time. Thus, *Cheats and Deceits* is not just a useful introduction to one particular realm of animal communication research, but also an excellent and engrossing way to learn about natural selection and evolution in general.

One of the other powerful messages in the book is, as Stevens himself writes:

> *…that deception takes place in a way that is most salient to the animals being deceived, with regard to their sensory apparatus, and using our own perceptions to judge this can be misleading, either missing the sophistication of deception because we don't perceive it properly, or even perhaps thinking the deception is not very good because it arises in areas in which our senses are superior to those of the animals being tricked.*

By allowing readers to sense the world through the eyes/ears/noses/feelers of a wealth of other species, Stevens shows not only that we can be easily misled by the signals we do experience, but also that the world around us may contain many *more* signals than we are even capable of perceiving. It is a stunning realisation that reminds readers just how impressively adapted our fellow animals are—even if they are sometimes cheats and deceits.

Caitlin Kight is an editor, writer, and educator affiliated with the University of Exeter, caitlin.r.kight@gmail.com, http://www.caitlinkight.com.

Current Conservation: Feedback Form

CC is produced with the generous support of various donors that allow us to to provide the magazine to our readers at a lowered cost. Help us show our donors that their contributions are valued and help us improve your reading experience by filling out the feedback form below.

The form is in two parts: the first part deals with the newly introduced CC Kids while the second part deals with the older sections of the magazine. Please fill out one section or both, as appropriate. You could either fill out the form and mail it to us at the address on the last page of the form or fill our online version at this link: https://goo.gl/forms/uvfqpbeuq2zLTGJz1

Name: Occupation:

Age: Organization:

Subscription: Individual/Institutional/Complimentary

How long have you been receiving Current Conservation?

Your preferred section in Current Conservation:
a. Research in Translation b. Feature c. CC Kids d. Interview e. Book Review f. Other

Part 1: CC Kids

1. The language used in CC Kids is :
   a. Very Difficult (I can't understand anything)
   b. Difficult (I can understand some parts of the article but many terms/parts which are too complicated in use of scientific terms and language).
   c. Easy (I can understand most of the article but for few terms/parts which are too complicated in language and expression)
   d. Very easy (I can understand all of the articles)
   e. Other

2. What do you like the most about CC Kids?
   a. Illustrations
   b. Easy language/quality of writing
   c. The good mix of art and science
   d. Relevance of articles to real-time/current environmental issues
   e. I do not like anything about CC Kids
   f. Other (Please explain)

3. What section of CC Kids do you like the most?
   a. Poem
   b. Species Profile
   c. Column
   d. Story-telling
   e. Research in Translation
   f. Other (Please explain)

4. What do you think we could do better to improve your CC Kids reading experience?

Part II: Other sections of the CC magazine

1. The language is:
   a. Very Difficult (I can't understand anything)
   b. Difficult (I can understand some parts of the article but many terms/parts are too complicated in their use of scientific terms and language).
   c. Easy (I can understand most of the articles but for some terms/parts are too complicated in language and expression)
   d. Very easy (I can understand all of the articles).
   e. Other (Please explain)

2. Do you find the articles relevant to real time conservation/environmental issues?

3. What do you like the most about Current Conservation?
   a. Illustrations
   b. Easy language/quality of writing
   c. The good mix of art and science
   d. Relevance of articles to real-time/current environmental issues
   e. I do not like anything about Current Conservation
   f. Other (Please explain)

4. So far, what has been your most favourite article in Current Conservation?

5. What do you think we could do better to improve your reading experience?

6. Would you like to continue receiving Current Conservation? If you are receiving a complimentary copy, would you be willing to subscribe?

7. Have you or would you recommend Current Conservation to others? Why?

8. How did you come to know about Current Conservation?
   a. Acquaintance/Friend
   b. Website (www.currentconservation.org)
   c. Social Media (Twitter/Facebook)
   d. School/Institution library
   e. Other

For more information on Current Conservation visit www.currentconservation.org or write to us at current-conservationmagazine@gmail.com.

Mailing address: Current Conservation, Dakshin Foundation, A-001, Samvriddhi Gardenia Apartments, 88/3, Byataranapura, Near Sahakar Nagar A Block, Bangalore – 560092.