



The Royal Society OF VICTORIA

Promoting science since 1854

PATRON: The Hon Linda Dessau AC
Governor of Victoria

PRESIDENT: Mr David Zerman

This Month's Events...

11th October: Professor Susan Blackmore

Joint Lecture with the Australian Skeptics (Victorian Division)

"Memes & Tremes: From Biology to the Future of Artificial Intelligence"

25th October: Dr Drew Berry

Annual RSV Science Communication Lecture

"Molecular Machines: Creating Flesh & Blood"

November Advance Notice

**15th November: Presentations &
Panel Discussion**

*"Earthrise 1968: The New View of
the Planet"*

22nd November: Very Young Scientists

**Celebrating the RSV Bursary Recipients in the 2018 Science
Talent Search**

October 2018 Newsletter

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rsv.org.au



Memes and Tremes: From Biology to the Future of Artificial Intelligence

Joint Presentation with the Australian Skeptics (Victorian Branch)

Thursday, 11th October 2018 at 7:00pm



Speaker: Professor Susan Blackmore

Visiting Professor, University of Plymouth

Universal Darwinism is the principle that when any kind of information is copied with variation and selection an evolutionary process inevitably begins. **Genes** are Earth's best-known replicator, giving rise to biological evolution, but there may be others.

Professor Richard Dawkins coined the term '**meme**' to apply to a second replicator that emerged when our ancestors became capable of imitation. Their memes – the sounds, actions and ways of doing things that they copied – spread and evolved, competing to use human bodies and brains, and creating human culture in the process. We became meme machines. The field of **memetics** differs from other theories of cultural evolution in being based on two "selfish replicators" – genes and memes. Arguably, memetics can better understand our fast-changing culture.

Could a **third replicator** emerge from the culture created by the second? Professor Susan Blackmore believes this is already happening. Digital information is now being copied, varied and selected ever faster by the silicon-based technology that we have provided for it. Professor Blackmore will speculate that a third replicator, **tremes**, is already emerging, evolving new types of intelligence, which means we need to consider how our own role is inevitably changing.



About the Speaker:

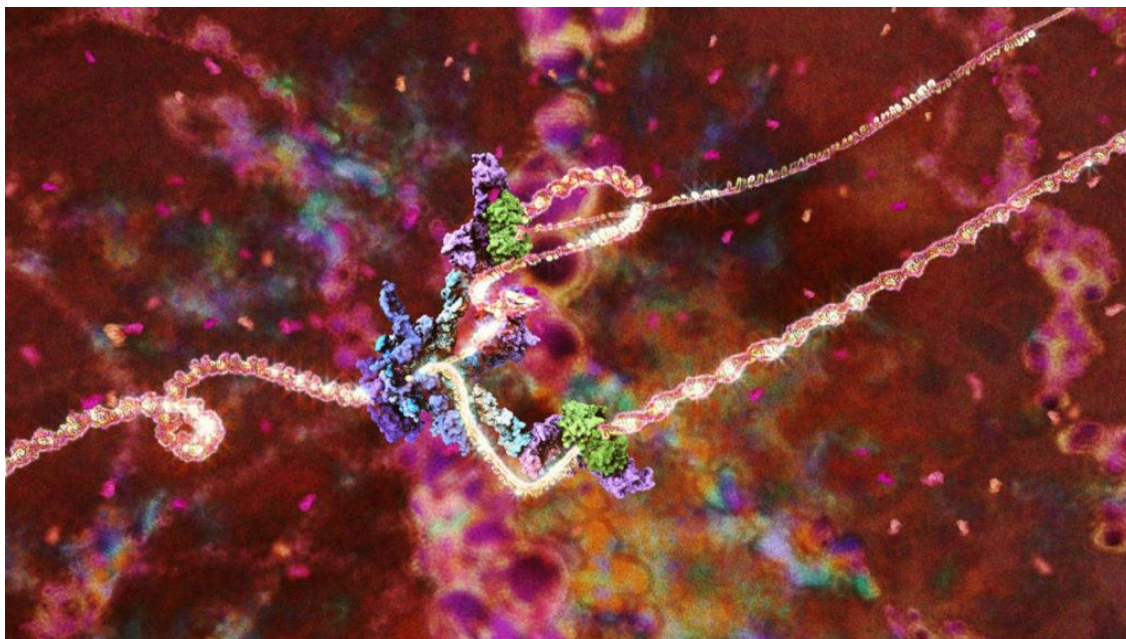
Professor Susan Blackmore is a psychologist, lecturer and writer researching consciousness, memes, and anomalous experiences, and a Visiting Professor at the University of Plymouth. She is a TED lecturer, blogs for the Guardian, and often appears on radio and television. [The Meme Machine](#) (1999) has been translated into 16 other languages; more recent books include [Conversations on Consciousness](#) (2005), [Zen and the Art of Consciousness](#) (2011), *Seeing Myself: The new science of out-of-body experiences* (2017) and a textbook [Consciousness: An Introduction](#) (3rd Ed 2018).

Eventbrite

Places limited, bookings essential! Pre-lecture function from 6:00pm. **Register online** now at <https://rsv.org.au/events/memes-tremes/>, call or email the RSV office to secure your place: 9663 5259, rsv@rsv.org.au. **RSV Members** should check their emails, or call the RSV office to access their **discount code**.

Molecular Machines: Creating Flesh and Blood

Thursday, 25th October 2018 at 7:00pm



Speaker: Dr Drew Berry

Biomedical Animator, Walter & Eliza Hall Institute of Medical Research

Join the celebrated Drew Berry, who will present his latest visualisation experiments in creating cinematic movies and real-time interactive 3D worlds to reveal the molecular engines that convert the food you eat into the chemical energy that powers your cells and tissues.



About the speaker:

Dr Drew Berry is a biomedical animator who creates beautiful, accurate visualisations of the dramatic cellular and molecular action that is going on inside our bodies. He began his career as a cell biologist and is fluent in navigating technical reports, research data and models from scientific journals. As an artist, he works as a translator, transforming abstract and complicated scientific concepts into vivid and meaningful visual journeys.

Since 1995 he has been a biomedical animator at the Walter and Eliza Hall Institute of Medical Research. His animations have exhibited at venues such as the Guggenheim Museum, MoMA, the Royal Institute of Great Britain and the University of Geneva. In 2010, he received a MacArthur Fellowship "Genius Grant".

Recognition and awards

- Doctorate of Technology (hc), Linköping University Sweden, 2016
- MacArthur Fellowship, USA 2010
- New York Times "If there is a Steven Spielberg of molecular animation, it is probably Drew Berry" 2010
- The New Yorker "[Drew Berry's] animations are astonishingly beautiful" 2008
- American Scientist "The admirers of Drew Berry, at the Walter and Eliza Hall Institute in Australia, talk about him the way Cellini talked about Michelangelo" 2009
- Nature Niche Prize, UK 2008
- Emmy "DNA" Windfall Films, UK 2005
- BAFTA "DNA Interactive" RGB Co, UK 2004



Places limited, bookings essential! Pre-lecture function from 6:00pm. **Register online** now at <https://rsv.org.au/events/molecular-machines/>, call or email the RSV office to secure your place: 9663 5259, rsv@rsv.org.au. **RSV Members** should check their emails, or call the RSV office to access their **discount code**.

Our Mesozoic Menagerie: Australia's Dinosaurs

Tuesday, 16th October 2018 at 7:00pm

The Lakes South Morang P-9 School, 80 Jardier Terrace, South Morang



Speaker: Dr Stephen Poropat

Research Associate, The Australian Age of Dinosaurs Museum of Natural History

Postdoctoral Researcher, Swinburne University of Technology

To date, only twenty Australian dinosaurs from the Mesozoic Era have been formally named on the basis of fossilised bones, and almost all of these are from the middle part of the Cretaceous, between 125 and 95 million years ago. This means that we have little idea of what Australia's Mesozoic dinosaurs were like throughout much of their existence. However, four major sites are currently providing new insights into Australia's Cretaceous dinosaurs, who lived from 145 to 66 million years ago. These are the Broome trackways in Western Australia, the Strzelecki and Otway ranges in Victoria, Lightning Ridge in New South Wales, and the Eromanga Basin in Queensland. Swinburne University palaeontologist Dr Stephen Poropat has been digging up Australian dinosaur fossils since 2004, and will share his latest exciting findings!



About the Speaker:

Born and raised in Melbourne, Australia, Dr Stephen Poropat wanted to be a palaeontologist from the moment he could pronounce the word. He studied science at Monash University from 2003 to 2006 with the aim of pursuing a career in palaeontology, and in 2011 he completed his Ph.D. on ostracod biostratigraphy and palaeoenvironmental reconstruction.

Stephen has worked as a Research Associate with the Australian Age of Dinosaurs Museum of Natural History in Winton, Queensland since 2011. He combined this work with a placement as a Postdoctoral Research Fellow with Uppsala University in Sweden. In 2017 Stephen moved from Uppsala back to Melbourne, to take up a position as a Postdoctoral Researcher with the Swinburne University of Technology.



Places limited, bookings essential!

<https://rsv.org.au/events/creating-green-cities/>

Register online now at

Creating Green, Healthy, Resilient and Liveable Cities

Wednesday, 17th October 2018 at 7:00pm

Ballarat Tech School, 136 Albert Street, Ballarat



Speaker: **Dr Amy Hahs**

Director, Urban Ecology into Action

Amy Hahs (PhD) is an urban ecologist, with a keen interest in understanding the interplay between biodiversity and urban environments. She has extensive research experience in the field of urban ecology, working directly on projects studying how urban vegetation and habitat features influence the biodiversity in those spaces, how to conserve indigenous plants and animals, and how to incorporate positive biodiversity outcomes into the design and management of urban landscapes.

As the Director of Urban Ecology in Action, Amy is committed to providing decision-makers with the most recent urban ecology knowledge to help make cities that support people and biodiversity. By actively combining research and practice, Amy's goal is to help develop green, healthy cities and towns, and conserve resilient ecological systems in areas where people live and work. Amy is a regular contributor to *The Nature of Cities*, and is VP-Research of the Ecological Society of Australia. An example of her work has recently been published by *Foreground*: [Soft Cities: Making room for nature in our urban future](#).

This event is supported by the **Ballarat STEM Network** in partnership with the Ballarat Tech School and the Inspiring Australia – Science Engagement Program in support of community lifelong learning.



Economic Development,
Jobs, Transport
and Resources



Places limited, bookings essential! Register online via Ballarat Tech School now at <https://rsv.org.au/events/creating-green-cities/>.

Come for a Walk & Birdwatching during National Bird Week

Wednesday, 21st October 2018 at 10:00am

Valley Reserve Ted Mason Education Hub, 80 Waimarie Dr, Mount Waverley



Come for a walk through Mount Waverley's Valley Reserve, as part of a celebration of National Bird Week and the Aussie Backyard Bird Count.

Ecologist Dr Joab Wilson will lead you through the indigenous habitat and draw your attention to the diversity of birds who work, nest and feed in the area.

Joab will give you some tips for identifying the various species and their calls so you can recognise birds next time you are out and about.

Part of the session will include promoting the following citizen science apps:

Aussie Backyard Bird Count

<https://itunes.apple.com/au/app/aussie-bird-count/id917024019?mt=8>

https://play.google.com/store/apps/details?id=au.org.birdlife.birdcount&hl=en_AU

Museum Victoria Field Guide to Victorian Fauna

<https://itunes.apple.com/au/app/field-guide-to-victorian-fauna/id423945031?mt=8>

https://play.google.com/store/apps/details?id=au.com.museumvictoria.fieldguide.vic&hl=en_US



Places limited, bookings essential! Register online with Sustainable Monash now at <https://www.eventbrite.com.au/e/birdwatching-walk-at-valley-reserve-1000-am-tickets-50099842979> .

Nominations for RSV Membership

Nominations for membership of the Society have been received on behalf of:

Dr Jeremy Carl **LAWRENCE**, Engineering Design & Science Consultant

Ms Alyson Nance **MACDONALD**, Engineering Design & Science Consultant

Miss Iris **HICKMAN**, Student and Registered Nurse

Dr Eddy Joseph **DE JONG**, Physics Master, Whitefriars College

Mr Daniel Joachim **GLUER**, IT Technician

Ms Lynette Carol **SMITH**, Science Communicator and Writer

Unless Members request a ballot, these will be considered for election by Council and if elected, will be announced at the Ordinary Meeting of the Royal Society of Victoria to be held on 8th November 2018. Recently elected members who have not yet signed the Society's membership book are warmly invited to attend the 11th October meeting to be formally welcomed as members. **Please inform the office if you plan to attend, so we can prepare your membership certificate for collection.**

A number of established members have indicated they have never had an occasion to 'sign in' – again, **please let us know at the office** if you'd like to rectify the situation, and we'll make sure you get the opportunity!

An Update on the Royal Society of Victoria's Development Proposal

With a very full program to deliver in the past couple of months, it has been some time since members were first advised of the outcome of June's Special General Meeting, which endorsed Council's proposal to explore the "Magic" concept with our development partners.

Apologies for the wait. To some extent, no news is good news – much of the action on the project in the past few months has been around working up a partnership agreement, which entails securing a funding source from our partners to directly appoint RSV staff and/or contractors with suitable qualifications to assist us with a particularly ambitious undertaking, including the process of member consultation and the development of a planning submission that is fit for the Society's purpose in the century to come.

On the other hand, no news means "other news" fills the void! Lest matters get too out of hand, please allow me to disabuse you of the following:

1. No, the former BoM site is not a former graveyard. It was a part of the back yard of the Caretaker's Cottage until it was established as a weather station in 1907.
2. Before 1859, part of the site now occupied by the Royal Society of Victoria was occupied by a small, open-air market for Melbourne Town – one of several - with an attendant rubbish tip that now causes our heritage building some not-insubstantial, enduring calamity through its shifting foundations. Members may be conflating this early purpose with the Victoria Market, which was indeed built upon Melbourne's first general cemetery.
3. No, Dame Nellie Melba's father is not buried under the old weather station. David Mitchell died in 1916 and, unless there was a secret ceremony by his curiously enthusiastic family of crypto-meteorologists, we're pretty sure he's interred elsewhere.

On a more serious note, we acknowledge the various concerns held by members and friends, particularly our engineers, for whom the 'reach for the stars' vision exercises some professional worry over everything from adequate foundations to structural issues with wind loads. While I can't put you at ease from a disciplinary point of view, I can certainly assure you the scrutiny on this particular project by the professional and broader community is extreme, and that there will be a number of third parties – regulators, auditors and heritage organisations – testing our proposals for their structural, design and precinct fitness. The scale of the proposal is attention-grabbing and thus alarming for many, but the project specifics are not a cavalier exercise – we have a very long road ahead in exploring the limits of the possible, and as a very small organisation of limited means, we must walk it at our own pace to ensure the project returns genuine benefit, both to the Society's enduring capacity to deliver and as a component of our broader mission to promote science in Victoria.

I aim to have a program laid out for your involvement by the end of the year – at this stage, it's likely we'll get busy in early 2019 with the process.

- **Mike Flattley, CEO**

The Neuroscience of Racism: Science and Stories

By Catriona Nguyen-Robertson
RSV Science Communications Officer

This article follows a presentation to the Royal Society of Victoria by Dr Larry Sherman, Professor of Neuroscience at Oregon Health and Science University on 18th August 2018, titled ["You and Your Racist Brain: The Neuroscience of Prejudice."](#)



As a Jewish male growing up in the affluent town of La Jolla, California, Dr Larry Sherman's experiences of racism and discrimination are most likely very different to mine – a Caucasian-Asian female who grew up in the very multicultural suburb of Footscray. When we get down to the psychology and neuroscience of prejudice, however, most people are the same.

As Dr Sherman stood up to present to the Royal Society of Victoria, the entire audience had made assumptions about him within a couple of microseconds. Our brains couldn't help it. We saw Dr Sherman as a 6'1" tall man with brown hair, hazel eyes, and fair skin - but of course, that's not all that makes him who he is. We sometimes need a few seconds more to register that there is more to a person than meets the eye.

People often say that we are not born racist, however the truth is actually more complicated: new-born infants exhibit no preference for faces of various ethnic groups, however from the age of 3 months, infants begin to take longer to scan faces - indicating that they are thinking more about appearances - and exhibit a preference for faces of their parents' (and own) ethnic group(s)⁴. These findings imply that while we may not be born racist, our perceptions of ethnic differences are learned during early development as a result of exposure to own- versus other-race faces.

By the age of four, both 'white' children and children of colour display a skin colour bias in their perceptions; **Margaret Beale Spencer** presented children (African-American and Caucasian) that showed pictures of two people denoted only by colour, and when asked which of the two was the good boy or girl, 70-80% of children in both groups selected the 'white' images³.

We also teach children to avoid the topic of ethnic differences, as though it is taboo to mention that other people have different coloured skin. Rather than telling children that the reason some people have a darker skin tone is due to their greater levels of melanin pigment, they are often told simply not to ask about it – it's "rude" and, by association, negative. Dr Sherman hypothesises that it is perhaps during this very early stage of development that it is critical to

Human behaviour and reactions can easily be conditioned, as shown by **John Watson** and **Rosalie Rayner's Little Albert** experiment¹: Albert was continually brought a white rat, and while he was initially curious and played with the rat, Watson and Rayner hit a steel bar with a hammer every time they brought it out, which would startle him and make him cry. Over time, Albert began to cry as soon as he saw the white rat being brought towards him, even without the noise, and this fear extended to other white, furry animals. While there have been numerous criticisms of this study, including investigating the health status and identity of "Albert", it has left a lasting impression in the field of psychology.

introduce the idea of racial differences in an open way, because no matter how much children are covered in "bubble wrap", they will inevitably be exposed to people who look different to them. When this happens, it's important that stereotypes aren't associated with them (such as those that pervade the media) because those can "sink into [a child's] brain". While he is not a social scientist, Dr Sherman offered words of wisdom on how we can embrace racial identity without prejudice. He stresses the importance of not trying to be 'colour blind' – especially given that our brains seem to make that practically impossible – but that we should be accepting of the fact that we are a diverse species, with different experiences and valuable points of view.

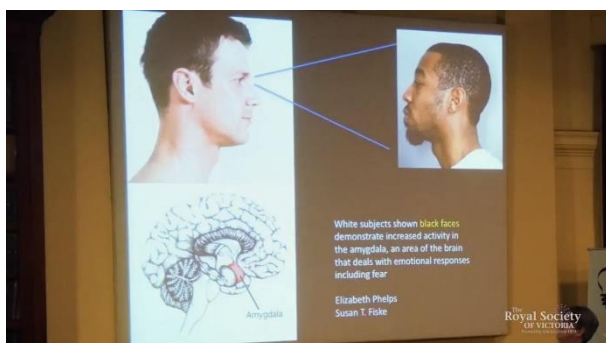
We perceive people who are not like us as 'outer' and can even fear them – and fear is a powerful driver of thinking and behaviour. **Brenda Major** and her colleagues demonstrated that learned fear extends to racial prejudice by performing several experiments in which people of different races gave

either positive or negative feedback to each other, or played a word game similar to Boggle; when more prejudiced individuals played with a partner of the same ethnicity, they viewed it as a challenge, however when competing against or receiving feedback from someone of a different race, it was more often perceived as a threat⁵, thus a basic interaction is altered by the initial recognition of a face. I admit to prejudicial fear as a child: I was injured in kindergarten by a girl of a darker skin tone, and when I next came across another girl of a similar, darker skin tone in grade three, I was automatically apprehensive and kept a distance. While I never said anything to my new classmate, I told my mother on the first night of grade three, who explained to me that we shouldn't group people of the same ethnicity together. The girl and I are still friends to this day and I've welcomed people of various ethnicities into my life since - it goes to show that we can undo the conditioning of our brains.

I may have had the help I needed to overcome it personally, but racism remains tenaciously embedded in our society. In order to understand the neural basis for prejudice, we have to take a closer look at the brain. Functional MRI can be used to map areas of the brain that are activated during facial recognition. Within milliseconds of seeing a face, people can take in the visual cues of race, gender, and approximate age. When European American males were shown flashes of unfamiliar, Caucasian faces as part of a Stanford University psychology and radiology study, the first area of the brain to be activated was the *fusiform gyrus*, which is involved in facial recognition⁶. When they were shown faces of people of colour on the other hand, the *fusiform gyrus* response was delayed, and the first area of the brain to

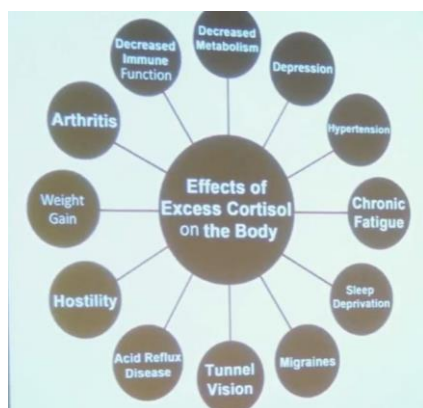
A survey led by **Western Sydney University** revealed that 51.4% of respondents claimed to express anti-Middle Eastern sentiment and 43.9% with anti-African sentiment². Furthermore, individuals with a Language Other Than English (LOTE) or Aboriginal and Torres Strait Islander background reported the highest rates of racism and discrimination in public, at work, or in educational institutions. While a survey of 6000 people may not be the most convincing sample size for a study, the numbers are still staggering and serve as a reminder that racism is a potent societal issue.

respond was the *amygdala*, responsible for the fight or flight response; the face was not a face, but a threat. The amygdala response was annulled, however, if the person of colour's face was that of a well-known person or a few character details were provide prior to the experiment – the face was a face again. There may have been something behind Dr Sherman's mother's comments to him when he was young, that "[African-Americans] all look the same to [her]": when we are unfamiliar with people of different ethnicities, the *amygdala* initially



groups them together as a possible threat, rather than the *fusiform gyrus* recognising their individual faces.

When both victims of racism and racists themselves hold a fear of one another, their fight or flight response is constant – and while it's beneficial to have this response in low doses, it is harmful when sustained. Chronic high levels of the “stress hormone” cortisol as a result of experiencing discrimination lead



to weight gain, sleep deprivation, hostility, hypertension, a weakened immune system, and other negative health effects⁹. Also, individuals with higher perceived stress from internalised racism tend to have behavioural disengagement and cortisol dysregulation, putting them at greater risk of metabolic abnormalities¹⁰. Dr Sherman

Functional MRI was used in additional studies to determine whether racial variation also modulates the empathic neural responses of the *anterior cingulate cortex*, which mediates both pain and empathy for others' pain. These studies revealed that only pain applied to members of the same race of an individual stimulated the empathic neural response, and decreased for other racial groups⁷, but when members from other racial groups are considered as part of that individual's social group or team (e.g. sports team), the empathic response returned⁸. This distinction between recognising the familiar versus unfamiliar has downstream physiological consequences due to the release of cortisol when our go-to response is fear.

observed that the leading causes of death among African-Americans – heart disease, cancer, stroke, etc. – are all ailments that can be exacerbated by chronic cortisol elevation, and hypothesised that there may be a role of systemic racism in driving this¹¹. High levels of cortisol also induce the death of neural stem cells, particularly affecting the *hippocampus*, which is involved in learning and memory,

and therefore can be linked to decreased learning and memory capabilities, as well as depression. With so many detrimental effects to physical and emotional health, it is therefore unsurprising that Dr Sherman classifies racism not just as a social problem, but also as a “public health problem”.

DNA is constructed of individual base nucleotides (A, G, T and C), that together provide the code for our cells to build molecules. Epigenetic modifications include adding or removing a methyl group to a specific site of DNA, such that it acts as a physical blockade on the DNA sequence to make it more difficult to be read while the DNA sequence remains unaltered. With three billion nucleotide (pairs) in each cell, DNA is supercoiled around a series of histone proteins in order to compact it – similar to winding an old telephone cord around each of your fingers. Histone proteins can also undergo epigenetic modifications to alter the accessibility of certain genes where genes wrapped tightly around the histones are hidden and the strands in between each histone are more readable. Genes that are methylated or around histones are inaccessible by the transcription machinery that reads DNA to transcribe it into functional molecules. The epigenetic effects of chronic high cortisol levels can therefore switch genes on and off – which genes are affected is still being investigated, but it is clear that racism and trauma not only have an impact on us during our lifetime, but also on our descendants, with clear intergenerational effects.

The effects of stress and high cortisol (and, indirectly, racism) can also be passed down through generations via the epigenetic modifications of genes, as though ‘we leave traces of our social history in our offspring’. While it remains difficult to disentangle the exact relationship between parental trauma and downstream epigenetic effects, there was a correlation of epigenetic changes to a stress-related gene that is associated with post-traumatic stress disorder (PTSD) and depression: Holocaust survivors have greater methylation of this gene compared to study control groups of Jewish parents, whereas Holocaust survivor's offspring had lower methylation compared to control offspring – perhaps children of Holocaust survivors inherited traits that promote resilience¹². Dr Sherman generously shared his family history and own experiences of persecution as someone from a Jewish heritage. His grandfather was the only one of nine siblings who escaped anti-Jewish pogroms, and his grandmother lived in Austria, where her family were killed in the concentration camps of the Holocaust; his grandparents were some of the few of his ancestral lineage to make it out of Europe alive. During Dr Sherman's life, the only time being Jewish has given him particular grief was on the playground in primary school, when he was beaten up after informing another child that he didn't go to a church, but to a synagogue, but he is unsure of whether he has personally inherited epigenetic modifications to his DNA as a result of ancestral persecution.

His story made me wonder what epigenetic changes may have been made to my own DNA from my parents' histories. My mother was persecuted during the Fall of Saigon for being the daughter of an aristocrat. She was among the wave of Vietnamese refugees that arrived in Australia in the late 1970s, after spending time in a refugee camp in Indonesia. The traces of her high cortisol levels while being victimised as a refugee may therefore have been inherited in my *epigenome*. I'm fortunate in that I myself have never been a victim of racist behaviour – in fact, not many people realise that I'm part Vietnamese until they see my surname – although, growing up in the multicultural suburb of Footscray, I wouldn't have been out of place either way. Sometimes I feel slightly isolated among the Vietnamese Community of Australia (VCA), as I can't speak Vietnamese well and I'm usually the token



Footscray, Melbourne, Victoria

Caucasian asked to dress up in a traditional *ao dai* and sing the Australian national anthem to open their formal events. This may go back to Dr Sherman's idea that groups who have had to adapt to being a minority, such as the Vietnamese community in Australia, can occasionally be less welcoming of people from the dominant 'inner' group due to the sharp culture divide. Perhaps it's because of this that I've often felt a little out of place among the Vietnamese growing up; however, the more VCA events I attend, the more I become a familiar face and they accept me a lot more.

In Anglophone nations, it's interesting that when children are asked to describe themselves, Caucasian children will rarely if ever say that they are Caucasian; rather, they are 'normal', while people of a different, minority ethnicity tend to use their ethnic label as a self-descriptor. With growing awareness of racism and privilege, there begins to be a redefining of self and our core values. Dr Sherman referred to the stages of achieving racial identity described by **William Cross** and **Janet Helms**; we pay little attention to racial identity when young. However, as we become more aware of our differences, we must not only immerse ourselves within our respective 'groups' to validate and better understand shared experiences, but also *emerge* ourselves in the broader cultures and experiences as effective ambassadors of our own. Dr Sherman believes that we should be advocates for each other, working as a team to share our voices and experiences, because otherwise we will remain as 'insiders vs outsiders,' and 'the majority versus minorities.' Given that neuroscience suggests that racial tension is an issue of familiarity, he recommends getting to know our neighbours. In speaking to police associations, he encouraged them to bring back local, neighbourhood officers, who can enjoy a friendly game of sport with local people, reducing unfamiliarity and distrust on both sides.



Professors Larry Sherman, David Walker and Paul Gorry.

We all have innate responses to faces – we naturally form opinions and notice particular characteristics about people – but the way we respond to faces is a learned behaviour. We physiologically become more receptive to the unfamiliar once it becomes familiar to us and we no longer see people who are different to us as threats. Perhaps it is simply a matter of getting to know the people around you and identifying with the people who may not look like you or members of your group. Racism is a social and public health problem for everyone involved – both racists and victims of racism – so it's time that we try to understand the basis of prejudice and racist attitudes and did something about

it, because the good news is that neuroscience shows that it's certainly possible. The impacts of racism and racist behaviour are reversible: epigenetic modifications to DNA may be reversed, neural stem cells can recover from high levels of cortisol if it is removed from the equation, and it is possible to create new neurons (neurogenesis) and re-wire circuits in the brain¹³. A neural pathway is created whenever certain thoughts and behaviours are repeated often enough, so it is possible to undo negative, racist behaviours and attitudes.

As someone who has family from both Scotland and Vietnam, interacts with people from a myriad of backgrounds (Footscray is as diverse as a Melbourne city gets), and have good friends who came out as transgender or gay, I honestly harbour no prejudicial thoughts towards any particular group, which goes to show that perhaps it is familiarity that is the key to minimising racist attitudes and behaviour. While I may only be one person and not reflective of the entire population, my story, in amongst the overwhelming evidence discussed by Dr Sherman, suggests that if we can rewire the brain to see diverse people in the same way, we may be able to do something about racism.



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Catriona Nguyen-Robertson is a PhD candidate with the Peter Doherty Institute for Infection and Immunity, and a passionate science communicator working with science engagement organisations in Victoria. Catriona is the Vice-President of Women in Science & Engineering at the University of Melbourne in 2018.

A video of Dr Sherman's lecture is available from the Society's [YouTube channel](https://youtu.be/r3N88xIWujE) at <https://youtu.be/r3N88xIWujE> - a shorter version featuring an interview and lecture highlights is also available at https://youtu.be/4SwOEcJL_mA.

The Royal Society of Victoria's Future Thinking Forum

Report to Members

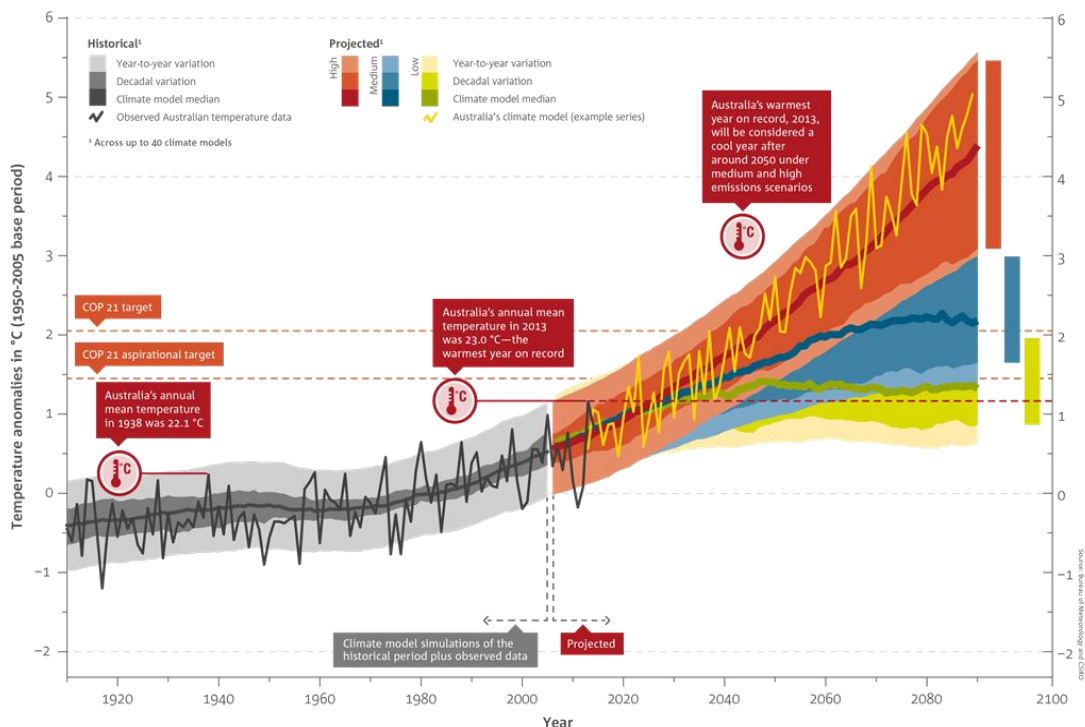
The reflections below follow a most thought-provoking and collaborative discussion on Victoria's future in the face of climate change with senior academics and government officials convened by the Royal Society of Victoria on Friday, 14th September 2018.

By Charles Tan & Ellen Rochelmeyer
RSV Science Communications

Is Victoria's liveability resilient to extreme weather events and a changing climate?

Imagine sweltering through four days of 40°C – 50°C temperatures. Or not being able to get home because flooding has disrupted rail and road networks.

With the changing global climate, such scenarios are possible within the next 20 years. The question is: will Victoria be resilient to these challenges?



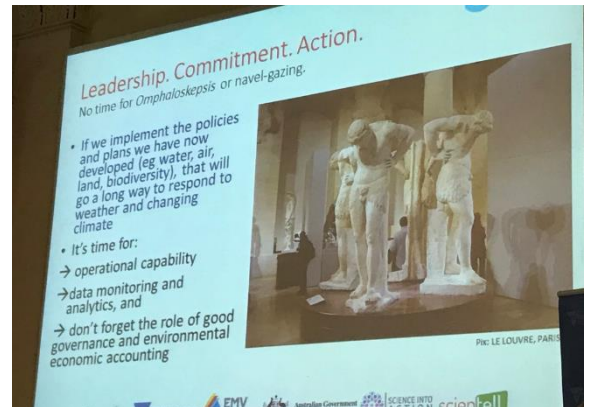
Australia's warmest year on record, 2013, will be considered a cool year beyond 2050 under both medium and high emissions scenarios

This is the problem senior government officials and researchers gathered together to answer. RSV's inaugural Future Thinking Forum saw representatives from over 30 agencies, including universities and government, meet to discuss Victoria's capacity to cope with extreme weather. Lead partners included the Department of Environment, Land, Water and Planning, Emergency Management Victoria and the Bureau of Meteorology. The day was led by **Dr Anthony Boxshall**, Director of Science into Action.

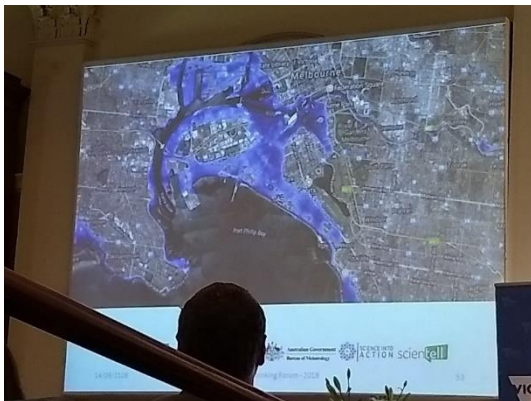
The proceedings began with the description of two possible extreme weather scenarios: a **severe heatwave** and an **extreme flooding and wind event**. These scenarios were not one of a distant future, nor were they from an Eco-Disaster novel. They could be Victoria's reality within the next two decades.

Following the portrayal of these daunting scenarios, speakers presented on the challenges and current state of knowledge and innovation in the public sector and academia. Four sectors were the focus of the day: **Urban Liveability, Human Health, Energy and Transport.**

In terms of urban liveability, Victoria can take a page or two to learn from how other cities around the world are dealing with flooding. Returning nature to the land and actively reworking it into the fabric of urban society has become a cornerstone of New Orleans' resilience strategy post-Hurricane Katrina. The recovery of biodiversity can provide more to Victoria than simply increasing Melbourne's liveability scores: biodiversity can also form a lead and lag indicator of a changing climate as 'the canary in the coal mine,' understanding that when conditions fail to support other animals, human impacts are not far behind.



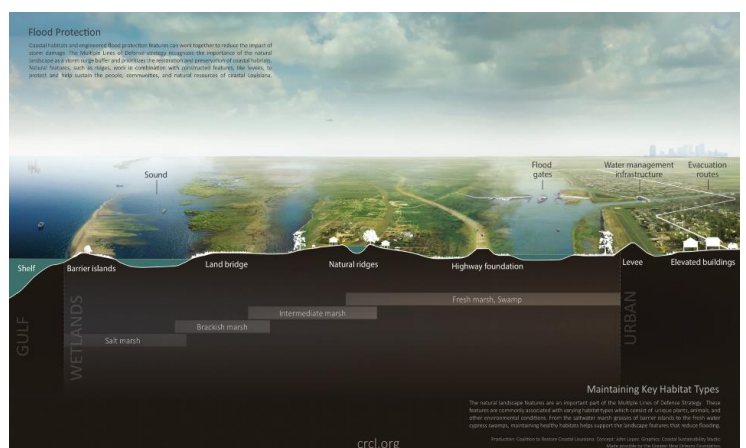
No time for navel gazing



Human health can also be severely impacted by heatwaves. A single isolated hot day alone is enough to increase mortality, let alone consecutive days. According to latest data on heatwaves, what were once 1-in-30-year events are now happening every 2-3 years. For Victoria to be resilient to heatwaves, we must move towards developing our climate-adapted building codes. Plan Melbourne 2017 has also proposed approaches to cooling and greening Melbourne, including increasing urban forests, developing new apartment cooling strategies, and creating more green transport corridors across Melbourne.

When it comes to a resilient energy sector, we need more research on predicting energy flows. Understanding energy supply and demand flows in times of stress will help us to strengthen the existing energy distribution networks. Over 90,000 Victorians suffered without electricity to cool themselves during the Australia Day heatwave in 2018. Predicting such demand and using household generators to complement energy supplies is just one potential solution.

Should an extreme flood occur, there is a high likelihood that Victoria's transport network would become compromised. This would prevent families from being reunited as rail and road networks become inundated. For Victoria to become a climate resilient city, we must ensure all future development projects are designed for extreme weather scenarios. The Metro Tunnel is planning for climate resilience by embedding climate risk modelling into designs. Electric or autonomous vehicles (AV) may reduce cars on Victoria's roads by a factor of ten, easing congestion. However, more research is still required to understand how AV sensors would work in extreme weather such as floods or bushfires.



Coastal habitats and engineered flood protection work together to reduce the impact of storm damage in coastal Louisiana.

After a sobering insight to the realities ahead, participants broke into groups to workshop responses to heatwave and flood. Groups explored Victoria's current situation, the challenges we face and what we need to do now to adequately prepare.



Some of the symposium's speakers in action, providing vision, expertise and inspiration for an adaptable Victoria.

knowledge gaps that need addressing. One major gap identified is that **Victoria lacks coastal engineers and geomorphologists**. These experts are essential for resilient planning, especially in the face of rising sea levels. We need to bring this expertise back to Victoria and encourage local training. **Measuring and monitoring processes also need to improve** so that we can understand the effectiveness of implemented actions and adapt accordingly. Additionally, we need to **capitalise on new technologies and resources, such as Big Data**, which can help us make real-time adaptations to weather conditions.

Common themes emerged across all four sectors of Energy, Transport, Human Health and Urban Liveability. The good news is that in terms of policy, Victoria is leading with forward-thinking, adaptive policies. **The challenge we face is putting these policies into action.** By empowering local government and supporting the implementation of existing policy, Victoria can go a long way to building resilience to extreme weather.

A resilient Victoria will also require greater collaboration and communication across sectors. If different agencies work together, share information and coordinate actions, we will be able to prepare and respond more effectively to climate change. Critical to this will be courageous leaders who engage deeply with the community. Involving and informing the community is essential for understanding their concerns and values, as well as getting people on-board with climate actions.

The workshops also identified key



Above all, we need to act now. With the end of the day, we left with the hard realisation that climate change is no longer a future problem. It is a *now* problem. The extreme heatwave, storm and flood scenarios aren't 50 or 100 years in the future; they are likely to occur in as little as 10 years. Climate change is in train, and is no longer a choice. Strong leadership for long-term planning and difficult decisions – now, before a crisis – will help Victoria become adaptable and resilient to a changing climate.

After a day of rigorous discussions on Victoria's ability to respond to extreme climate change, the conclusions could be summarised in a single word: **collaboration**. Climate change is extremely complex and if we are to stand strong and be resilient in the future, academia, government, the private sector and community must find ways to create solutions together.

There is still much to do, and Energy, Transport, Human Health and Urban Liveability were only four of numerous sectors impacted by climate change. At the end of the Forum, attendees identified three important sectors to address next: **Agriculture, Water and Biodiversity**. In the wake of the success of this forum, it is planned that a 2019 Future Thinking Forum will address these further topics.

2018 Kids' Conference

Tuesday, 20th November 2018 from 9:00am to 3:00pm

Mercy Lecture Theatre, Australian Catholic University, 115 Victoria Pde, Fitzroy

Celebrating student voice through new approaches to digital technology in the History, Geography, Science and English Classrooms



The Kids' Conference involves short speaker sessions in which students in primary or secondary education can present their innovative projects relating to History, Geography, Science, English and technologies. Students can present solo or in small groups for no more than ten minutes.

This conference gives students from primary or secondary schools an opportunity to present innovative projects they have designed and developed. Students can present solo or in

small groups.

- The Conference promotes students as creators of knowledge and innovation to an audience of lead educators, policy makers and the teaching community.
- The Conference also promotes the role of teachers as facilitators of creative, collaborative and student-led projects.
- Students present on how they have developed their learning and enquiry by exploring new and emerging technologies and presentation tools.

Who attends?

Kids' conference brings together

- Primary and Secondary students as presenters
- History, Geography, English and Science Leader Teachers
- Early Career Teachers
- Pre-service Teachers and Primary and Secondary students

Program

Conference opens for registrations: 10th September 2018

Presenter registrations close: 31 October 2018

The conference is run in a warm and friendly environment to provide support and encouragement to all student presenters.

Register to attend

History, Geography, English and Science Leader Teachers, Early Career Teachers, Pre-service Teachers and students are invited to register and attend sessions in this year's Kids' Conference.

The Conference Science Stream is proudly supported by the Royal Society of Victoria.



Register online with the ACU now at <https://bit.ly/2w2dYIn>