

Friday 24th February and Saturday 25th February – PROGRAM

8:00 am – 8:30 am Registration ATC101

8:30 am – 8:40 am Welcome ATC101

Chair of Department of Physics and Astronomy, Swinburne University of Technology, Professor Brenton Hall and

President of VicPhysics, Dr Barbara McKinnon

8:40 am – 9:30 am Opening keynote ATC101

Astrophysics at the Frontier Professor Alan Duffy

**Director, Space Technology and Industry
Institute, Swinburne University of Technology**

An astronomer at Swinburne University of Technology, Professor Alan Duffy is the inaugural Director of the Space Technology and Industry Institute at Swinburne, finding ways to use space to help companies and communities on Earth. His research background in computational astrophysics sees Alan model universes on supercomputers to understand how galaxies like our Milky Way form within vast clouds of dark matter. He is trying to find this dark matter as the Swinburne Node Leader in the \$35M ARC CoE for Dark Matter Particle Physics and a Chief Investigator of SABRE, the world's first dark matter detector in the Southern Hemisphere, at the Stawell Underground Physics Laboratory at the bottom of an active gold mine in Victoria. In this talk, Professor Duffy will explore the frontiers of astronomy with the latest results from Swinburne.



A1 Group-Worthy Physics Challenges

**Joe Cossette, Minnetonka High School -
Minnetonka, Minnesota, USA**

This session shares three different approaches to make physics problem solving practice more group-worthy: Murder Mysteries, Escape Rooms, and Scrambles. All activities introduced are available to download and modify for free.

Hybrid **EN101**

**A2 Beyond Bohr: a Quantum Approach
to the Atom**

**Dave Fish, Perimeter Institute, Ontario,
Canada**

Take your students Beyond Bohr in this workshop featuring a resource designed by educators in physics and chemistry in collaboration with researchers from Perimeter Institute. Most high school physics and chemistry classes culminate their discussion of the atom with the Bohr Model even though Bohr himself knew the model was wrong. In this workshop we will show you how you can introduce the quantum model of the atom with classroom-ready activities.

Hybrid **EN313**

**A3 Providing individualised feedback
to students using Excel and Word's Mail
Merge**

**Claire Rollinson, The Mac Robertson
Girls' High School**

Each assessment task is a valuable learning tool that should be used to promote the consolidation of skills and knowledge, however, students tend to focus on their marks rather than what can be learned from the task. The identification of strengths and areas for improvement via a visual, achievement-by-topic grid can be more informative than a grade and help students to shift their focus to how they can improve. This workshop presents a method using Excel and Word's Mail Merge function to generate achievement-by-topic reports with individualised comments for each student based on the marks awarded for each question on a task.

Please bring along a sample assessment to try in the workshop.

Live & Recorded **EN201**

**A4 Designing SAC tasks and
assessments for the new study design**

**Jane Coyle, Vicphysics Teachers'
Network**

The study design offers an extensive set of alternatives for assessments in Unit 1 & 2 but a much more limited set of tasks than previously, for Units 3 & 4. In this session we will unpack the assessments descriptors and look at ways we can cater to our student needs. I will provide some example tasks for units 1 & 2 that will also develop the skills required for the unit 3 & 4 SAC. Delegates are encouraged to bring a task they have used previously to review and redesign to reflect the new SAC criteria.

Hybrid **EN202**

**A5 Mapping VCE & IB Physics:
Lessons from Abroad**

Rachael Gore, Albert Park College

This session will explore how the International Baccalaureate Physics Curriculum maps to the VCE Physics Curriculum, especially in light of the new study design. Participants will leave with an understanding of how IB Physics pedagogical approaches, assessment, and resources can be used to support student extension and enrichment in VCE Physics. The presenter has had students achieve perfect scores in both IB and VCE Physics subjects, and strategies for high demand, high challenge student exam preparation will also be canvassed.

Live & Recorded **EN204**

**A6 Can the use of past exam
questions enhance teaching and
learning?**

Colin Hopkins OAM retired

Many teachers use past examination papers as their preferred method of revision for the VCE exam. Does research suggest ideas and strategies to improve effectiveness? Can the use of Zone of Proximal Development principles be incorporated into an efficient learning and revision process? Can the use of IFT (Immediate Feedback Techniques) increase student engagement? Colin has looked at current research and will share his insights from the 2022 trial of this process. Copious digital resources will be shared.

Hybrid **EN205**
A7 Language-Learners-Literacy

Deepa Jain **Kew High School**

Teachers can teach however they like, as long as it is ethical and effective in imparting valuable learning, within applicable curriculum and resource constraints" (Scriven, 1994), however, students have to learn how to learn in order to transform Physics from challenging to interesting and convert challenging sophisticated language and texts into meaningful setting.

Learn how and what "instructional strategies" could make your teaching more effective and valuable to activate prior knowledge, set a purpose, comprehend a text; or model the process of being an effective reader/writer. Walk away with ideas and strategies, which are applicable from year 7 to 12. Develop a shared language to talk with your students and colleagues and feel acknowledged, supported and challenged.

Live & Recorded **EN210**

A8 VCAA Update

Maria James, VCAA Curriculum Manager, Science

Curriculum changes beginning in 2023 relate to physics including in the Victorian Curriculum F-10 and for VCE Physics. What are the implications of the refinement of the F-10 curriculum for VCE physics?

What is happening with enrolment trends for physics? What are the 'givens' for VCE assessment across Units 1 to 4? How can these changes be managed in schools where all sorts of priorities impact on teaching time? Depending on time, there may be an opportunity for audience questions to be answered.

Hybrid **ATC101**

A9 Physics of the Bounce: Investigations and Models

Dan O'Keeffe OAM, Vicphysics Teachers' Network

Investigating a bouncing ball is an excellent topic for reinforcing Newtonian physics. A bounce involves forces, momentum and energy transfer. This talk will show different experimental designs allowing many students to work independently. It will also outline two different models to explain the experimental results.

Live only **EN307**

A10 Quantitative measurement of Lorentz Force

Man Lam, Mt Alexander College

In this session, a series of electromagnetism experiments will be demonstrated. It aims to provide teachers new options to teach electromagnetism. One of the demonstration is to quantitative measure of Lorentz Force by varying current and magnetic field strength. The accuracy can be up to within 10% of the theoretical prediction.

Live only **AD104**

A11 Virtual Reality Astrotour and Strong Structure Lab Walking Tour

This Swinburne excursion taster option consists of a 20 minute Astrotour in the 3D virtual reality theatre followed by a walking tour of the Strong Structure Laboratory.

Live only **AR103**

A12 A Physics Excursion of a lifetime

Kristina Hicks, IFly

Guaranteed to engage the interest of your students! In secondary schools, student engagement in pursuing STEM content and related careers, particularly in physics, are often limited to the classroom with teachers hesitant to explore out of school excursions that do not directly relate to the curriculum. Highlighting the relevance of STEM content, iFly have designed excursions in line with Australian Achievement standards to engage students with inquiry and practical activities, that engage and provide artefacts that can be used for school assessment.

Live only, commercial presentation HAC

A13 BioBrain - Learning platform for Physics students

Caroline Cotton, BioBrain

BioBrain, is a curriculum aligned STEM learning platform covering VCE Physics, Chemistry and Biology and Year 10 Science. It has been written by teachers for teachers and students. The VCE content is set out according to the Study Design in Units, broken down into Areas of Study and then finally into the Key Knowledge. All the learning material is broken down into bite-sized chunks with exam style questions to assess understanding and an illustrated glossary of terms. The learning material is graded over three levels of difficulty. Students can keep track of their results, review answers, and retake quizzes to ensure full understanding and learning over time. Teachers can look at the class results or individual student results. All participants will receive a free trial of BioBrain to use with their students.

Live only, commercial presentation HAC

A14 Using "Smart carts" in kinematics and dynamics

Doug Bail, Ciderhouse

More than 25 years ago PASCO developed a revolutionary dynamics cart with super low friction wheels, replacing air tracks in schools and Universities around the world. The latest development, "Smart carts", now have a range of sensors built into the carts creating the ultimate tool for studying kinematics, dynamics, Newton's Laws, and more. Fast set up and continuous data sets put the focus on analysis and understanding.

Join us for a hands-on quick review of how to get started with the carts and explore some of the investigations smart carts make possible.

Live only, commercial presentation HAC

A15 Infinite Exam

Tristan Vale, Infinite Exam

Are you frustrated that year 12 Physics trial exams are only available in pdf format? Infinite Exam is a Year 12 Physics Exam Generator that changes the way schools buy trial exams. In a matter of minutes, you can create your exam by dragging and dropping the questions from the database and then clicking download. A zip file with your perfectly formatted exam and solutions is generated as a word document! Need your exam even quicker? Choose one of the pre-set exams that are ready to go. Not only can you make end of year trial exams, you can also make short quizzes, lesson starters, tests by concept or area of study and questions that are personalised to your students' learning needs.

Live only, commercial presentation HAC

A16 Modern Teaching Aids

Amanda Lovett, Modern Teaching Aids

In this engaging, hands-on workshop participants will experience how easy data collection in Physics can be. Enjoy the experience of undertaking simple methods to collect meaningful data that can **improve students understanding of Physics**. Participants will **experience the fun** of working with **EASY to use and innovative technologies** while they explore a range of physics based experiments with relevant and appropriate applications for the: demonstrating, testing, monitoring, collection, manipulation and analysis of data. Come and see how EASY it is...

Live only, commercial presentation HAC

10:40 am – 11:25 am Morning Tea

HAC

**11:25 am – 12:15 pm Unit 3 & 4 Assessment in the new VCE
Study Design: round table discussion**
(sponsored by Edrolo)
online and live

HAC

12:20 pm – 1:00 pm Lunch

HAC

1:10 pm – 2:00 pm Session B

**B1 Making Underground Science in the
United States available for students
around the world**

**Chad Ronish, Sanford Underground
Research Facility, South Dakota, USA**

The Sanford Underground Research Facility in Lead, South Dakota, USA is conducting particle physics research 1.5 Km under the Black Hills. Our Dark Matter, Neutrino and other international collaboration experiments serve as phenomena for our students to access rigorous science content through presentations, tours, and curriculum units that provide access and equity. Our professional development programs help educators of all levels open the world of real life science to students who get to experience, figure-out and do real science. We help create the Wonder that drives student imaginations and questioning attitudes. Join us to see what we do and explore how we can support you and your students.

Hybrid

EN101

**B2 IDEA - A structured approach to
writing scientific explanations**

Catherine Bellair, Thomas Carr College

Students often struggle to provide the required detail and depth when writing explanations. The IDEA approach provides students with an easy to remember way of structuring explanations. The approach can be applied at any level from Year 7 Science to VCE Physics.

Hybrid

EN313

**B3 Mapping the Key Science Skills to
the new Assessment Tasks**

**Dino Cevolatti & Stuart Bird, Castlemaine
Secondary College**

Dino Cevolatti and Stuart Bird will lead a workshop designed to explore how the new Assessment Task types required for Units 3 and 4 Physics in the new Study Design can be better understood and implemented in the context of the Key Science Skills. We will begin by considering how the four Assessment Tasks can be characterised as 1) Modelling Applications, 2) Data Analyses, 3) Problem Solving, and 4) Conceptual Comparisons. We will then consider how the Key Science Skills can be mapped to these four Assessment Tasks and the Practical Investigation. Based on these considerations we will explore the types of questions that will be useful in building and assessing students' skills across these domains. We will end with some suggested approaches to matching Assessment Tasks to Areas of Study as well as the planning, designing and implementation of School Assessed Coursework.

Live & Recorded

EN201

**B4 Radio Astronomy: The Invisible
Universe**

**Emma Barnett & Mark Gleeson, Victorian
Space Science Education Centre at
Strathmore SC**

Turn your students into real astronomers where they utilise a dedicated radio telescope to probe a region of deep-space in search of objects such as stars, supernova and supermassive blackholes.

This workshop explores 'The Invisible Universe Program' from the Victorian Space Science Education Centre. You'll have a chance to use the radio telescope as your students would, if you choose to participate in this program. Further, curriculum material will be provided that includes an introduction to astronomy, radio astronomy, activities to track celestial objects, and steps to collect radio emissions centered around 1420MHz. As far as we know, this is the world's first radio telescope exclusively devoted to high-school students.

This program has been demonstrated to scale from Year 7 to Year 11, used by 3000 students to date. All lesson plans and student led activities are accessible using VSSECs learning management system. How you deliver this in your classroom is up to you and your school. This program would be an ideal practical exercise for the new VCE Physics Study Design, but is designed to be accessible to all secondary levels. Following this workshop, teachers will be able to implement this program within their schools. Read more here: <https://www.vssec.vic.edu.au/radio-astronomy-the-invisible-universe/>

Participants should bring their own laptops to this workshop.

Live & Recorded **EN204**

B5 Quantum computers – approaching fast

**Professor Lloyd C L Hollenberg,
University of Melbourne**

Quantum computers are beginning to emerge from decades of development in physics research labs around the world – prototypes are here, and you can access them via the cloud. But what are they, what are they good for, and how do we educate students in this exciting new area? To answer these questions we will take a brief tour through the world of quantum computers – covering their origins, current status and outlook. We will focus on how we can provide an educational experience in the secondary-STEM context, through simple programming examples using the Quantum User Interface (QUI) system developed at the University of Melbourne. Audience participation

is easy and highly encouraged – bring your laptop (with Chrome browser)!

Live & Recorded **EN210**

B6 Review of the 2022 VCE Physics exam - Covid-19 and other stories

Andrew Hansen, Chief Assessor

This session reviews the key learnings from student responses to the 2022 exam. I carry out a question by question analysis and bring to you the principal take-home messages from the exam. This is an opportunity to engage in a discussion of strategies for improved student performance in 2022 and beyond.

Hybrid **ATC101**

B7 $E = mc^2$

Theo Hughes, Level 98

$E = mc^2$ is an iconic equation. It appears in VCE physics in several places. But can you justify it to students?... Do you misleadingly state: "Well $E = mc^2$ means starlight is bent by the sun." or "Mass increases with speed."?... or perhaps you're just interested in a fun talk about it?... then come along and enjoy the ride.

Hybrid **EN205**

B8 Assessment tasks, rubrics and marking schemes for Units 1 and 2

Maria James, VCAA Curriculum Manager, Science

Assessment at Units 1 and 2 is completely school-based. A list of 16 tasks have been suggested in the study design and we will discuss sample assessment tasks and marking schemes/rubrics that can be used to assess student work as well as provide feedback. Management of multiple option topics for Unit 2 Area of Study 2 will also be discussed including the role of flipped classroom and Socratic seminar approaches to support student agency.

Participants are welcome to bring in their own tasks to add to the conversations.

Live and recorded

EN304

B9 What we can do to encourage more girls to take physics in VCE

Sandor Kazi, Melbourne Girls' College

Getting more girls to do physics at the VCE level is something I am passionate about. In this workshop I'll share my experience working at an all girls school, how I have changed my teaching practice to engage more girls in physics, and what our students say about what they enjoy in the physics classroom. This workshop is an opportunity for all to discuss and share ideas on what we do in the classroom to encourage more girls to take VCE physics.

Hybrid

EN202

B10 Using technology in your classroom

Michael Maslin, Nunawading Christian College

There is some good technology out on the internet. Here are a few of my favourite sites that I use in my classroom. PhET and oPhysics are great for getting a visual of different concepts, they have a range of simulations and so come along, and I will show you the ones I particularly use for teaching the Photoelectric effect, waves and more.

Do you want to add some gamification in your classroom but not sure where to start? I will show you how to use Kahoots and other sites to make revision more interesting.

Of course, if you have other programs/websites that you would like to share or know about, bring your thoughts and questions and I look forward to spending the session going through them.

Live & Recorded

EN303

B11 Why do heavy things fly? Ask Lawnchair Larry*

Matthew Norman, Richmond High School

To my surprise, the textbook I was using didn't have a section on the Unit 2 option on flight. My students really wanted to do it, so I wrote my own course, which I present here, and you are welcome to share. This topic is a great way to demonstrate the strange things that happen with fluids and pressure. And students really love the idea of making paper planes in class! Come and make your own.

*Lawnchair Larry was a truck driver who tied his deck chair to 45 helium weather balloons. If he had studied physics, he might have used a lower number.

Live only

AD104

B12 Usain Bolt vs Spiro Liacos: It was neck and neck! And then the gun went off.

Spiro Liacos, Cheltenham Secondary College

Pracs, print resources, videos, and activities that will help you to fire up your Unit 2 and/or Year 10 Motion units. For example, using nothing more than a digital camera, find out how fast you can kick a soccer ball. In this session you will also compare Usain Bolt's 100m sprint with your own 100m sprint, analyse the motion of a NASA rocket as it blasts off into orbit, investigate how the velocity and acceleration of projectiles change, and a whole lot more. Activity sheets will all be provided.

Live & Recorded

EN308

B13 Problem-Based Learning in the Physics classroom

Caroline Cotton, BioBrain

Problem-based learning (PBL) develops higher order thinking skills amongst other things. Higher order thinking skills are seldom taught, but should be included as part of any curriculum. PBL learning teaches students to develop thinking skills such as the ability to hypothesise, synthesise, analyse, evaluate, and generalise

information rather than simply recall it. By solving unstructured problems, students also have the opportunity to develop critical thinking skills. Other benefits of PBL include developing students that are able to collaborate, solve problems, think clearly, and connect prior knowledge to the problem. Come along to this session to learn how to incorporate PBL into your Physics classroom. There will be examples provided. Learn how the role of a teacher changes when using PBL with your students.

Live only

EN307

B14 Virtual Reality Astrotour and Factory of the Future walking tour

This excursion taster consists of a 20 minute Astrotour in the 3D virtual reality theatre and a walking tour of the Factory of the Future, a facility which includes state of the art manufacturing tools and technologies.

Live only

AR103

2:10 pm – 3:00 pm Session C

C1 Supporting inclusion of Indigenous science in VCE Physics

Emma Barnett, VSSEC

The 2023 Physics VCE Study Design encourages teachers to include Aboriginal and Torres Strait Islander knowledge, cultures and history within their teaching, as well as an explicit inclusion within Area of Study 2 (Option 2.15). However, the Study Design provides limited resources for how this can be accomplished. There are many interesting scientific practices from Indigenous cultures that can be explored, as well as knowledge and perspectives that are relevant to all areas of science. Incorporating these within the classroom allows Aboriginal and Torres Strait Islander students to see their culture reflected in the curriculum while encouraging all students to participate in reconciliation, respect and recognition of Indigenous science. This workshop discusses the resources available to teachers, as well as key issues that should be addressed when including Indigenous science in VCE Physics.

Live & Recorded

EN204

collecting data one kilometre underground in the Stawell Underground Physics Lab. The ARC Centre of Excellence for Dark Matter Particle Physics brings together experts from across Australia and internationally to unlock the secrets of dark matter and foster the science and engineering leaders of the future. The Centre for Dark Matter Particle Physics designed a longitudinal partner program in which schools have regular incursions and curriculum-aligned lessons related to the nature of science and the science of detecting the unseen. In this hands-on session, we will discuss and trial a selection of curriculum-aligned activities to incorporate topics related to the detection of dark matter into physics lessons while overviewing the cutting-edge science taking place here in Victoria.

Live

EN307

C3 Modelling Motion: Graphing to help students understand their experience of speed, acceleration, and force

John Cripps Clark, Deakin University

To appreciate the power of graphs in modelling, we need students to relate the experience of the phenomenon (speed) and its representation (graph). With simple classroom experiences and readily available equipment, we will explore how, at the initiation of a unit on motion and force, students produce graphs to represent walking at a constant speed, slowly and then a faster. Using a metronome, students make 'streamer graphs' using paper streamers to represent the

C2 Dark Matter Detection: Topics for the Physics Classroom

**Jackie Blondell, Outreach Coordinator
ARC Centre of Excellence for Dark
Matter Particle Physics**

In 2023, the Southern Hemisphere's first underground Dark Matter detector will start

distances walked per second, and discover that faster speed corresponds to walking a longer distance in unit time. We will explore how the experience of speed builds towards understanding acceleration; how students can make a forcemeter and measure and understand Force; and from experiencing both acceleration and Force understand Newton's second law. In the process students interpret and discuss the graphs they make and start to appreciate random and systematic errors.

Live only

EW301

C4 Hands on learning and assessment tasks for use with the new U1 and 2 study design

Adele Hudson, Aitken College and Lisa Milili

Designing learning and assessment tasks which challenge students and demonstrates how Physics is relevant to their lives and the wider community, promotes students' connection with the learning content. Unit 1 & 2 Physics is the perfect platform for learner-centred tasks as the different areas of study are relevant to many real-world situations. The focus of this session will be on a project designed for the first area of study in Unit 1 of Light and Heat. The project will be conducted over a period of two to three weeks, where students will apply their understanding in a range of hands-on learning tasks and will culminate in a solar oven challenge.

Live & Recorded

EN303

C5 Conceptual questions in teaching physics

Yuriy Verkhatsky, Bialik College

Certainly the way of knowing about the world that we label "physics" is characterized by precise relationships expressed through mathematical expressions. But exclusive focus on the mathematical relationships of physics doesn't lead to the good understanding of physics. This doesn't mean that there is anything wrong with numerical questions; it is just that they need to be supplemented with questions

that develop conceptual understanding and critical thinking. In this workshop many conceptual questions related to different areas of physics will be presented and the way how to use them in teaching physics will be discussed.

Live & recorded

EN201

C6 Astronomy during the school day

Paul Butler, Melbourne Girls Grammar School

The field of astronomy offers a wide range of opportunities for engaging students in physics. Optical astronomy, however, requires night-time conditions and reasonably low levels of light pollution. As a result, many courses resort to teaching about astronomy rather than teaching by doing astronomy. This session will explore some of the ways in which hands-on astronomy can be included in during the school day. Starting with optical astronomy, examples will be introduced for investigating the sun using sundials and projection imaging and moving on to space weather. Next, radio astronomy will be introduced through a range of building projects which can be linked to simple electronics to enable students to receive radio signals from space. Finally, online optical and radio astronomy systems will be demonstrated which can readily be accessed for data collection and analysis. The focus of this session will be to identify a range of resources which can be used in schools and which are free or involve relatively modest cost.

Live & Recorded

EN304

C7 Citizen Science in VCE Physics and Beyond

Colin Chapman, Victorian Academy of Teaching and Leadership

This presentation will explore the development of dynamic simulations that may be coupled with physical devices through an Arduino/ Micro: Bit microcontroller implementation in novel responsive design opportunities. Innovation in the use of electronic records of evidence that allow for embedded simulations and linked videos of physical experiment will be explored. The presentation will support Unit 1/ Outcome 2

How Do Electric Circuits Work? and Unit 2/
Outcome 2.4: How can AC electricity charge a
DC device? Apply the use of heat and light
sensors such as thermistors and light-dependent
resistors (LDR's) to trigger an output device
such as lighting or a motor.

Live & Recorded

EN210

C8 Developing Lab Skills for the soon-to-be Tertiary Student

Jacinta den Besten University of Melbourne

Experimentation is at the heart of all experimental sciences, but what is its role in the classroom? From confirming and re-enforcing content to developing scientific analysis and critique, how does the purpose of the classroom experiment influence the outcomes and engagement of a scientific literate student? Finally, what skills are universities looking to develop through their experimental programs and how can we better support our secondary students when entering the tertiary system? Join me for an interesting discussion and insight into the expectations, purpose, curriculum and pedagogy of tertiary Physics labs and the transition from the high-school experience.

Live & Recorded

EN210

C9 Review of the 2022 VCE Physics exam - Covid-19 and other stories

Andrew Hansen, Ringwood Secondary College

This session reviews the key learnings from student responses to the 2022 exam. I carry out a question by question analysis and bring to you the principal take-home messages from the exam. This is an opportunity to engage in a discussion of strategies for improved student performance in 2022 and beyond.

Hybrid

ATC101

C10 Tips and hints for beginning teachers and teachers returning to Physics

Colin Hopkins OAM retired

Colin will share tips and hints for engaging students in VCE Physics. Useful resources will be shared. The presentation will conclude with a question and answer session. The session is aimed at teachers new or returning to teaching VCE Physics.

Hybrid

EN205

C11 Constructing and analysing motors for assessment

Campbell Wilson & Loukia Andrews, Montmorency Secondary College

Obtaining deep conceptual understanding of how motors operate from the line diagrams typically presented can be challenging for students. This session explores how construction of a single loop motor, incorporating electromagnets, commutator, brushes and rotor, in the form of an extended SAC with associated analysis can engage students in a hands on way that supports stronger outcomes.

Hybrid

EN202

C12 Opportunities and challenges in renewable electric generation transformation

Rick Zhang, Tilt Renewables Pty Ltd

Australia, alongside most countries in the world, is transforming the traditional thermal power generation to a hybrid generation of renewables generators and Battery Energy Storage System. With an increasing penetration ratio of renewable generations, the power grid also faces new challenges from many aspects such as unstable power source and lack of inertia which triggers the frequency issues and voltage stability concerns.

To reach our 2050 carbon target, engineers and scientist are working on various solutions to provide reliable power generation and a stable grid to transmit the power.

This presentation will review the principles of major renewable generations including wind turbines and solar panels. It will explore project designs and design challenges in the real-life

projects which have been successfully connected to the National Electricity Market.

This presentation will conclude with a discussion of the advantages and shortcomings of each generation mode and the reasons massive battery energy storage system will support the clean generation revolution.

Hybrid

EN101

C13 Relative Motion and Frames of Reference

Spiro Liacos, Cheltenham Secondary College

The two related concepts of Relative Motion and Frames of Reference form an essential part of a deeper understanding of vectors, Newton's Laws of Motion, and, of course, relativity. It makes sense therefore to take some time to explicitly teach these concepts fairly early on in any motion unit (before some of the more challenging concepts are introduced). In this session, we will look at some demonstrations, activities, and worksheets that will help students to quickly grasp the basics of these concepts. (And, for what it's worth, your students will be fascinated by actually seeing that at any given moment an object can be travelling at different speeds AND in different directions!)

Live & Recorded

EN308

C14 Innovative ways to teach fundamental physics concepts

underpinning the production and use of medical radioisotopes

Julie Mulholland, ANSTO

The field of nuclear medicine has recently seen major advances with the development of new radiopharmaceuticals, called theranostics, which are suited for both diagnostics and therapy. ANSTO is part of this frontier research in Australia. In this workshop, we will explore hands-on activities you can use with your students which examine some of the fundamental physics concepts and models behind the production of medical radioisotopes at ANSTO, including nuclear stability and fission chain reactions. We will also investigate radioactive decay using authentic science data to determine the half-life of medical radioisotopes. These activities address content from Unit 1 Area of Study 2 as well as ICT skills, critical and creative thinking, and problem-solving.

Hybrid

EN313

C15 Virtual Reality Astrotour and Nanofabrication and Laser laboratory walking tours

This excursion taster consists of a 20 minute Astrotour in the 3D virtual reality theatre followed by a walking tour of the Nanofabrication and Laser laboratories.

Live only

AR103

3:10 pm – 4:00 pm Closing Keynote

ATC101

Physics experiments that changed the world

Dr Suzie Sheehy, Senior Lecturer in Accelerator Physics, University of Melbourne and University of Oxford

From the serendipitous discovery of X-rays in a German laboratory, to the scientists trying to prove Einstein wrong (and inadvertently proving him right), to the race to split open the atom, physicists have shaped innumerable aspects of how we live today.

In this talk, accelerator physicist Dr Suzie Sheehy will uncover how our curiosity-driven determination to understand the microscopic brought about a revolution in physics, and will show how experiments – not just theory – let us delve into the real world. Through stories linking curiosity to modern physics-based technologies, this talk will show you how to inspire your students by bringing physics down to Earth and putting it firmly back where it belongs, in the hands of the people.

An award-winning public speaker, presenter and science communicator, Suzie is dedicated to sharing science beyond the academic community. She has delivered professional lectures and keynote presentations, written, and delivered, live shows to tens of thousands of students, is an expert TV presenter for Impossible Engineering on Discovery Channel and in 2018 delivered her first TED talk as part of TEDx Sydney, which has been viewed over 1.8M times. Her first popular science book is 'The Matter of Everything: Twelve Experiments that Changed our World'.

4:00 pm

**Post conference drinks
(sponsored by anzuk education)**

On Demand – PROGRAM

O1 Connecting with our students on climate change

Keith Burrows, retired

The news from climate science seems to get worse every day: Tipping points closer than we thought, Greenland and Antarctic ice melting faster than predicted. It's scary and we can't pretend otherwise. Our senior students can feel confused, frustrated and often angry about this issue. If they don't they aren't awake! To add to the confusion, the largest news corporation in

Australia often tells lies about climate science. So how can we build connections with our students, and our colleagues, in a meaningful way that brings some sense of optimism? There IS good news! Australia could reduce the WORLD'S emissions by 8%. That's just one conclusion from new work by Ross Garnaut and leading climate scientists. Other recent reports are also pointing to a more positive future. The aim of this workshop is to share these ideas, and build connections, around tackling this huge and critical issue.

Pre recorded

Saturday 25th February - PROGRAM

Saturday morning offerings of "excursion tasters" to

- Australian Synchrotron
- Medical Physics In-Service at the Peter MacCallum Cancer Centre
- Victorian Space Science Education Centre (VSSEC)

Each excursion taster starts at **9:30am**, with a maximum of 25 participants

The Australian Synchrotron (90 mins) [Secondary Education | ANSTO](#)

Participants will have a guided tour of the facility as well as an opportunity to see the range of practical activities that are available for secondary students to do as part of an excursion.

Location: Blackburn Rd, Clayton

Medical Physics In-Service at Peter MacCallum Cancer Centre (2 hours)

The program will feature a one-hour talk on: the physics aspects of the effect of radiation on the human body and of the medical technology at Peter Mac, how the technology is used in diagnosis and treatment, as well as information on the training and career paths associated with medical physics. The second hour will be an extensive tour of the facilities at Peter Mac.

Visitors to the hospital will still be required to abide by any expectations regarding COVID vaccinations for any entry to the hospital.

Victorian Space Science Education Centre (90 mins) [Home - VSSEC](#)

The tour explains the various student programs that VSSEC offers. Their programs provide a sensory rich, hands-on, scenario-based science experience for students from primary to senior secondary. There are also programs on Flight, Radio Astronomy, What are Stars? And the origin of Atoms.

[Register here](#) for the conference

Exhibitors



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