

2015 STAV/AIP VCE Physics Teachers Conference



Day 1: Friday 20th February: Monash University, Clayton, Victoria

**Day 2: Saturday 21st February: Excursion tasters & Medical Physics ISE
Monash University, Wellington Road, Clayton, Victoria**

Each participant will have web access on the AIP website to proceedings from the VCE Physics conference as part of their registration.

The Physics Science Teachers' Conference is an approved professional learning activity.

The Program includes:

- Day and late afternoon sessions. Participants can attend the day and/or the late afternoon sessions
- Opening address on 'Thermodynamics and Climate Change' by Prof David Jamieson, University of Melbourne
- New Physics Study Design: Briefing by Maria James, Science Manager, VCAA
- Report by Bruce Walsh, the Chief Assessor, on the November Exam, during the day program and repeated in the late afternoon program
- Physics Karaoke: Short presentations in three adjacent and linked venues
- Over 70 workshops across five sessions, some on VCE topics, some on general across Years 7 - 12 and others specifically for Years 7 - 10
- A Saturday program of excursions tasters at various venues and a medical physics in-service at Peter MacCallum Cancer Centre

Wireless Internet and laptops at the Conference

Wireless internet is available to participants, a username and password will be needed. Some presenters have invited participants to bring along their own devices including laptops. Check descriptions below for (BYOD). To store laptops during the day, laptop lockers with power are available in the lobby of the S9 - S12 lecture theatres at no cost. Lockers need to be booked on the Application Form. Keys can be picked up at Registration.

Registration information, La Trobe University Map and all conference information is available on the **Science Victoria website: www.sciencevictoria.com.au/conferences.html**

Australian Institute of Physics (Vic Branch) Education Committee.

www.vicphysics.org

Science Teachers' Association of Victoria Inc.

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Conference Program

Friday Day and Afternoon Program

8:00	Day Registration
9:00	Conference Opening
9:10	Opening Address
10:10	VCAA Update
10:50	Morning Tea / Displays
11:35	Workshops: Session A
12:35	Lunch / Displays
1:25	Workshops: Session B
2:30	Workshops: Session C
3:30	Afternoon Tea / Displays
3:30	Afternoon Registration
4:00	Workshops: Session D
5:00	Workshops: Session E
6:00	Finish

Saturday Program

9:00	Choice of Venues - 1 hour presentations
11:00	Choice of Venues - 90 min or 2 hour presentations
1:30	One Venue - 90 minute presentation

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Opening Address
9:10am – 10:10am

Opening address on 'Thermodynamics and Climate Change' by Prof David Jamieson, University of Melbourne

VCAA Update
10:10am – 10:50am

VCAA Update: a new VCE Physics Study Design

Maria James, Science Manager, VCAA
Implementation of the revised VCE Physics Study Design will begin from 2016. What is the rationale for the changes? How has content changed in the Study Design? How do the key skills build on skills developed in earlier years, and how do they relate to the process of inquiry and to the selected content? How will assessment change? What do the changes mean for students and for teachers? Where does the new study design fit in the international education landscape? These questions form the focus of this interactive session which also allows for audience questions and comments. Please bring copy of the revised VCE Physics Study Design.

Morning Tea/Displays
10:50am – 11:35pm

Descriptions of Workshop Sessions
B: Beginning, G: Years 7 - 12, M: Yrs 7 - 10, V: VCE, 11: Units 1 & 2, 12: Units 3 & 4,
C: Commercial, BYOD: Bring your own Device (optional)

Session A **11:35pm – 12:35pm**

A1 Tricks and Tips for Inexperienced Physics Teachers

(B) Repeated in E13

Colin Hopkins, Bialik College

This session is a series of tried and true activities to engage students in VCE Physics. It is aimed at teachers new to VCE Physics. A resource package will be provided to participants.

A2 Using Google Earth in the Physics Classroom

(V), (Computer lab, so BYOD optional)

Repeated in D14

Catherine Bellair, St Bernard's College

Google Earth is a free program with numerous applications in the Physics classroom. In addition to discussing some of these applications, this session will also help you create your own Google Earth files by teaching you some of the basic features of the program.

A3 Climate Change - What happened to the Science?

(G)

Keith Burrows, AIP

The 'debate' continues to rage. The Abbott government and the Murdoch media continue to imply that climate change is not a threat - at least not yet, while the Fairfax/ABC/Guardian side warns that it is. What's missing in all this? The SCIENCE of climate change! There are arguments about whether temperatures have risen in the last decade or how fast ice is melting, but these are actually side issues. Where is the basic science? Fundamentally, climate science is about the physics and chemistry of the atmosphere and about what the geological record tells us about changing climates. Let's try to fill this gap.

A4 Space Camp

(G) (repeated as a shortened version in Karaoke session: C5)

Paul Natoli, Ballarat High School

Looking at the journey of putting a space camp trip together. From getting students to fundraising and finally the trip itself.

A5 How to Photograph the Moon and Stars with your DSLR.

(G) Repeated in C2

Phil Hart

With just a Digital SLR and a tripod, award winning photographer Phil Hart can teach you how to capture wide-field scenes of the night sky and long-exposure star trail images. Night sky photography also opens up several avenues of science exploration - the physics of how cameras and lenses work and astronomy science topics that can be explored through simple images of the night sky.

A6 The Zooniverse and Beyond: Engaging Students Using Real Data

(G) (BYOD)

Robert Hollow, CSIRO Astronomy and Space Science

Astronomy is an excellent context for developing students' investigation and ICT skills. There is wealth of readily accessible real astronomical data, much of it available via Citizen Science programs such as the Zooniverse. Participants will be introduced to the concept of Citizen Science and explore a range of projects and data. Examples of how these projects and data can be incorporated into structured learning tasks and open-ended investigations will be developed

A7 Find Higgs Boson candidate events using HYPATIA in the classroom

(12) Repeated in D16

Frank de La Rambelya, South Oakleigh Secondary College

The presenter attended a three week teacher's course at CERN in 2013, bringing back an easy to use data analysis tool called HYPATIA, as used in international physics masterclasses. After answering the questions "how does the Large Hadron Collider work?" and "what's the 'standard model'?", the presenter explains how the ATLAS detector enables particle track identification and demonstrates using HYPATIA with real ATLAS data to identify candidate Higgs events. Links are provided for downloading HYPATIA and ATLAS data. Find out how to bring CERN scientists into the classroom to converse with your students.

A8 Increasing student and teacher participation with scientists to increase student numbers in STEM

(G)

Eroia Barone-Nugent Santa Maria College, Diana Hides, University of Melbourne

The uptake in science has declined, and most noticeably in the stagnation or

declining number of girls taking physics at secondary school. However, student engagement in science is improved by relevant experiences with professional scientists. By increasing the interaction of scientists from all disciplines with secondary school students the interdisciplinary nature of science and the enabling power of the physical sciences can be promoted. The value of career opportunities can be highlighted to help students make empowered decisions about choosing to do science to year 12. Come and learn more about increasing girls participating in physics and science in general.

A9 Easy and Engaging Light Pracs

(C) Repeated in D3

Spiro Liacos, Cheltenham Secondary College and Liacos Educational Media

This hands-on session will introduce you to a series of practical activities that cover Reflection and Mirrors, Refraction and Lenses, and Total Internal Reflection. You will be provided with all the prac sheets that you need to teach the topic of Light to Year 9s and you will have a chance to carry out the pracs.

A10 Paul Hewitt? Who is he and what is his connection with Conceptual Physics?

(G) Repeated in E15

Gary Cohen, AIP Education Committee

Is physics just about formulas, and are 'good' prac results the most important thing that students learn from their Physics lessons? What about the concept development that occurs with effective practical investigations and demonstrations? In this discussion session Gary Cohen will share some of his experiences based on many years teaching physics using analogies and imagery from real-world situations that can help students build a strong conceptual understanding of physical principles ranging from classical mechanics to modern physics. This session will give participants an insight into what Conceptual Physics is.

A11 The use of scientific posters in communicating science

(V) Repeated in B6 and D10

Maria James, Science Manager, VCAA

Scientific posters are used universally to communicate science findings in both educational and research settings. How can scientific posters be used at a senior secondary level to structure, stage and assess student investigative work? Can authentication be assured? How can assessment in this mode become

assessment for, as well as of, learning? This session explores the use of the scientific poster in supporting the development of students' science inquiry and communication skills.

A12 Sound In Practice

(12) Repeated in B7

Adrian Alexander, Soundhouse Music Alliance

This session will guide teachers through a range of demonstrations, experiments and links with the theory and practice of sound as it applies in the Unit 4 detailed study. It will illustrate some software and apps that teachers will find readily accessible and applicable in their own classrooms, as well as outlining the details of the Sound In Practice excursion, which has been extremely popular, and will be available again in 2014. For a full listing of what is covered, please go to <https://sites.google.com/site/vcesoundinpractice/home>

A13 Building DC Motor from a Kit

(12)

Gracie Saxena, Manor Lakes P 12 College

The workshop shows how students can construct a working DC motor from a simple kit and investigate the physics principles involved. Participants will be able assemble a motor. An image of the kit and the worksheet for students can be downloaded from <http://www.vicphysics.org/power.html>

A14 Glowing Graveyards

(11)

David Hoxley, Bob Aikenhead, La Trobe University

A century ago, radioactivity was promoted as a health-giving, revitalising force for good health. Now perceptions are more mixed. In this practical session, you will measure and analyse radioactive decay from several sources, including an observation of half-life. This activity is available as part of the La Trobe University future students program, and can be integrated into a VCE SAC. Please bring your laptop, fully charged.

A15 Discovering Physics at Ecolinc

(C) (Computer lab, so BYOD optional) Repeated in C5

Suzanne Clarke & Carolanne Glynne, Ecolinc Science

Ecolinc is a (DEECD) Science Specialist Centre situated in Bacchus Marsh (www.ecolinc.vic.edu.au) Ecolinc is a unique educational facility, demonstrating a range of award winning ecological sustainable design (ESD) features. In addition Ecolinc's online CSIRO designed Weather Wall and Building Management System (BMS)

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provide the opportunity for Physics students to explore the efficiency of the building design. This session will overview Ecolinc's Units 1 & 2 Detailed study 3.5 to initiate or conclude an investigation into sustainable energy sources.

A16 Improve student learning using formative assessment in the digital environment.

(V) Repeated in E10

Catriona McKenzie, Doug Bail, Cara Perry, Pearson Australia,

Pearson has developed Pearson Lightbook - a new senior secondary digital resource for the VCE Physics Study Design based on best practice teaching and learning research. Pearson Lightbook combines traditional offline content including textbook content, workbooks, study guides, exam preparation material and more into an interactive learner-focused digital resource. Hear how our research has led us to develop a product focused on improving learning with formative assessment, instant feedback and content presented in multi-modal formats to best suit all types of learners. Participants will see a demo and be able to interact with the product during the session.

A17 Lessons from America translated to Australia

(V)

Barbara McKinnon, John Monash Science School

The last two decades have seen the rise of the "Modelling Instruction" pedagogy for high school Physics in the USA. Significant gains in student conceptual understanding have been reported by schools that use this approach. In addition, the method appears to increase student engagement and participation in higher level physics courses. Following a three-week teacher-training workshop in Mechanics modelling instruction in July 2013, the presenter implemented the approach in her VCE Year 11 Physics class. In this seminar she will explore the basis of the success of the approach and review the outcomes of her first attempt at implementing the method here.

A18 Using High Speed Cameras and Tracker to study motion

(G) (BYOD) Repeated in E12

David Vaughan, Woodleigh School

Find out how to use high speed cameras and the Tracker software to analyse motion in a practical context. This workshop will show where to purchase cameras capable of shooting up to 1200fps that are affordable. A basic introduction into the Tracker software and how to use it

to obtain displacement, velocity and acceleration data. Also a demonstration of how I am using high speed cameras and the Dynamic Science rocket kits along with tracker to teach motion graphs and Newtons second law of motion to my Year 10 and Year 11 classes.

A19 Free body Diagrams

(V)

Amos Freeman, Christian College, Geelong

A workshop on the use of freebody diagrams to analyse forces and motion. This would benefit the Motion units of study in years 11 and 12 as well as the Materials and Their Use in Structures unit in year 12. There will be supporting lesson plans and worksheets for participants to take home in hard copy and electronic form. The techniques and scenarios are a product of the work of Arnold Aarons and Jim Minstrell in Seattle, the Physics Education Group at the University of Washington, the physics teachers of Bothell High School and then the presenter.

A20 Algorithms in solving physics problems

(V) Repeated in E14

Yuriy Verkhaty, Carwatha College

In many areas of Physics solving problems can be organised in certain order of steps applicable if not to all but to most of them. If students will follow those steps they will most probably avoid mistakes and get it right. I have developed algorithms for solving motion problems in many areas of physics. This presentation is addition to 2014 presentation and includes new algorithms - gravitational field problems, wave properties of light, wave properties of particles, photoelectric effect, induced EMF problems and problems involving diodes as well as areas covered in 2014.

A21 Use of Inexpensive Micro-controllers in a Physics Classroom

(G)

Milorad Cerovac, The King David School

The arduino microcontroller is a cheap and simple way of engaging students in science, technology, engineering and mathematics. Teachers can easily integrate the arduino microcontroller into many practical activities in the Physics and non-Physics classroom. The King David School has been using the arduino microcontroller as part of their CanSat (satellite in a soda can) program and more recently in the Physics classroom. This session will introduce teachers to the arduino microcontroller through a series of hands-on activities which will have

teachers programming the arduino to control LEDs, motors, and a few different type of sensors. The benefits to the students will also be covered.

A22 Teaching Plans for Unit 1 in 2016

(11) Repeated in D15

Three members of the AIP Education Committee

Each person would talk about how they would plan the Unit, including topic sequence, practical activities, assessment tasks, etc.

A23 Teaching multiple Focus studies concurrently

(11)

Jane Coyle, Albert Park College

The new Unit 2 Focus Studies offer a large range of physics applications for student to investigate. It would be wonderful to let the student choose a topic they like the look of but how do we manage a classroom with students studying different content? How do we offer choice without having to write 11 courses. In this session I will give ideas on how to achieve both of these using Google to create a portal and Google classroom to enable content delivery and tracking. Collaboration is also the key. A web enabled device would be handy but not required for this session.

A24 Australian Synchrotron Tour

(12)

Jonathan de Booy, The Australian Synchrotron

A one-hour tour of the Australian Synchrotron located in Blackburn Rd around the corner from the conference venue. Transport to the Synchrotron will not be provided. Participants will be given an opportunity to arrange a ride and should leave the University about 10 minutes before the session.

**Lunch/Displays
12:35pm – 1:25pm**

Session B

1:25pm – 2:30pm

Workshops B1 to B5 will also form part of the Physics in General Science (PIGS) Conference for Years 7 - 10 teachers seeking to improve their physics skills.

B1 Toys, pracs, challenges

(M)

Dianne Wilkinson, Box Hill High School

Learning as you play is the fun way to understanding ideas and concepts. Using familiar toys and language enables difficult concepts to be discussed without fear of failure. Often this approach opens the way for further student lead investigations. Eight challenging concepts will be presented with suggestions to conquer understanding. This hands-on workshop session is aimed to stimulate ideas for teachers to use in junior science (years 6 to 10). E5 is a Years 10 to 12 version of this workshop.

B2 The Science of Magic

(M) Repeated in D2

Peter Razos, Trinity Grammar School

Magic has always fascinated us and done properly can develop into a great unit of work in science where physics and chemistry takes on a whole new meaning. This workshop is based on a semester length, year 9-10 unit of work at Trinity Grammar. We encourage teachers who like to think outside the square and who would like to be more engaging in the science classroom to attend. It is guaranteed that participants will come away, if not with an entire new unit of work, with ideas to engage and motivate their students. Much more will be made available and we will discuss how the ASC is integrated in the Science of Magic. A great way to start and see if this workshop can truly benefit you is to go online and login with the details below. Check it out by visiting www.dynamicscience.com.au/tester. Enter as a student with the details below: organisationid=dynsci password= robots.

B3 Year 10 & 11 Motion Experiments

(M) Repeated in E4

Frances Sidari, Lakeview Senior College and Terry Tan, John Monash Science School

In many government schools, resources are scarce. Access to data loggers and motion sensors are limited. This series of experiments works around these constraints with everyday items. Students would be using their mobile phones and stopwatches to record the entire motion practical, and transferring it to their computers to analyse the information.

This series of experiments would also include students' experiences, which they can use to construct their knowledge and understanding for the concepts in Motion.

B4 Demonstrating Electricity and Magnetism in Rural Schools

(M) Repeated in E3

Paul Millard and Jo Holdsworth, Science Discovery Project

Science Discovery Project is a rural touring program which presents to students from P-7 in schools across Australia. We have been operating since I retired as a Physics teacher in 2013. Our demonstration gives students the opportunity to see and participate in lots of interesting and dynamic demonstrations in the concepts of Circuit Electricity, Magnetism, Electricity Generation and Static Electricity. Great for the ideas I have accumulated over 30 years of teaching Physics.

B5 Language modelling in developing a conceptual understanding in Physics

(G)

Dr Murray Anderson, Camberwell Grammar School

In this workshop a discussion about the use of language and the role it has to play in the development of a conceptual understanding in Physics will be given. The session will be reflective in nature and detail a personal journey in the art and science of teaching Physics.

B6 The use of scientific posters in communicating science

(V) Repeat of A11 and repeated in D10

Maria James, Science Manager, VCAA

B7 Sound In Practice

(12) Repeat of A12

Adrian Alexander, Soundhouse Music Alliance

B8 Motivational Tools for Modeling Instruction in the Physics Classroom

(C) Repeated in D11

Phil Jones, The Logical Interface (Computer lab, so BYOD optional)

Sophisticated technology is now within the reach of every science educator. Such technologies motivate students and provide the perfect platform for modeling instruction techniques. In this workshop we will examine: 1. Physics modeling with i) Video Analysis of Motion - This technology is an excellent application of the computer to data acquisition and analysis, ii) Krucible - revolutionary software for creating simulations and demonstrating experiments that are impractical in the secondary science

lab, iii) Interactive Physics, a superb tool for creating simulations in physics from Kepler's Laws through to Electromagnetic simulations, is also ideal for predictions and to perform what if analysis. 2. Computer Based Science Equipment with i) Krucible's Ripple Tank, ii) TLI WaveLab PC Based Signal Generator and Oscilloscope. iii) Data Logging Technology which has dramatically expanded the range of experiments available to physics educators.

B9 The Virtual Physics Course - VCEPhysics.com

(V) (BYOD) Repeated in E7

Justin Vincent, Warrnambool College

This session will provide an explanation and discussion of a number of online resources for Physics classes; in particular VCEPhysics.com. Participants are encouraged to register their students to this free resource. Please bring a list of your students in an Excel file - first name, surname, email. This will be used to create accounts on the site.

B10 Under the hood of FAR Labs: How remote laboratory access work

(V)

Callum Anderson & Andrew McDonald, La Trobe University

The FAR Labs project enables students and teachers to access research and teaching equipment from anywhere in Australia via a robust web interface with minimal bandwidth requirements. How is this done? This presentation includes a description of the workings of the website, the virtual machines and how the experiments were enabled for remote access. The session will include a remote access session to the Optical Diagnostic Beamline at the Australian Synchrotron.

B11 SACs, Pracs and Resources for Units 1 and 2 Detailed Studies

(V) Repeated in E16

Paul Fielding, Billanook College, Paul Fitzgerald, Ivanhoe Girls' Grammar School

In this workshop we will present SACs, practical experiments and general resources applicable to the Detailed Studies from Units 1 and 2.

B12 Women and Physics: Increasing the number of girls doing Physics

(G)

Giselle Lobo, Camberwell Girls' Grammar School

This session is aimed at Physics teachers mainly teaching in an all-girls or co-ed schools. Physics is often an unpopular subject choice among most female students. This session will review the

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reasons for low enrolment levels in Physics among girls, and will look at strategies that can be adopted by Physics teachers and science faculties to engage girls and make physics fun and more accessible across all levels, with a view towards boosting VCE Physics enrolments in the future.

B13 Demonstrations in the Modern Age

(C) (BYOD)

Doug Bail, Ciderhouse ICT

Ticker timers, galvanometers, CRO's. In past years these were the tools that let us demonstrate to our students. In the 21st century we have access to new tools that can more readily highlight key ideas, engage students and clear up misconceptions. This session will demonstrate a range of tools that can assist the classroom teacher in lifting their classroom into the modern, digital age. No previous experience necessary.

B14 Flipping Physics!

(11)

Michael Rosenbrock, Wodonga Senior Secondary College

The notion of flipped learning is very popular at the moment, but a very real barrier to its implementation is teachers working out how to make it work for them. This session will explore the presenter's experience of trying to answer that question by implementing flipped learning in a Year 11 Physics class at Wodonga Senior Secondary College. Examples of the different forms that flipped learning can take will be outlined. The session will then explore a range of teaching strategies, software tools and online resources that can be used to assist teachers to easily integrate aspects of flipped learning into their teaching. The software featured is free or very low cost and includes options for Mac/PC/iPad.

B15 VCE Systems Engineering: Physics at Play

(V) Repeated in D12

Colin Chapman, Caroline Chisholm Catholic College

Physics teachers may be interested in adding the 'Systems Engineering' string to their bow. The study design 'Systems Engineering' has much physics content drawn from computer science, machines, electricity and electronics. The study design offers teachers and learners an open learning environment that allows participants to pursue an individual project that both draw upon and augment their studies in Physics. The workshop will outline the course and assessment tasks, emphasising the similarities and

differences with VCE Physics. The speaker is very experienced with the subject and has spoken at STEM conferences, both locally and internationally.

B16 Electric Power SAC at Earth Ed

(12)

Grant Henderson, Earth Ed

Earth Ed is a DEECD funded specialist science centre located at Mount Clear College in Ballarat, providing programs to engage and inspire students in the key themes of Earth Science and Energy. Programs are provided without cost for Victorian Government Schools. Earth Ed's Electric Power program is designed to provide students with a hands-on approach to understanding VCE Physics Unit 4 concepts including magnetism, electromagnetic induction, generation of emf, transformer action, transmission loss and DC and AC motors. Students perform a range of experiments and collect data to complete their Electric Power SAC.

B17 2016 Study Design: Units 1 and 2: Planning a course and units

(11)

Neil Champion, Buckley Park College

The "backwards by design" approach to curriculum planning will be used in this Workshop to unpack and develop Units 1 and 2 in the 2016 VCE Physics Study Design.

B18 Did Albert Einstein discover the special theory of relativity?

(12)

Shane McLean, St Margaret's School

We learn about the special theory of relativity as being developed and pronounced by Albert Einstein in his miraculous year of 1905. As part of these introductory courses about special relativity we learn the Lorentz transformations. Yet there is generally no discussion or consideration as to why these transformations should be referred to as Lorentz transformations as opposed to Einstein transformations. Some may even recall vaguely in lectures descriptions of Fitzgerald contraction being associated with special relativity. Yet there is rarely a mention of Poincaré in discussions of special relativity, indeed why should there be? This presentation will discuss the rich and complex development of the special theory of relativity leading up to 1905 and look to answer the question, did Albert Einstein discover the special theory of relativity?

B19 Teaching Modern Physics using resources from Perimeter Institute

(12)

Nathan Hanns, Wanganui Park Secondary College

Nathan was the recipient of the 2014 AIP Travelling Scholarship. He attended the Einstein Plus workshop at the Perimeter Institute in Toronto. The Institute has a strong outreach program. They have many resources available to help in the teaching of many modern physics areas, such as Special Relativity, Cosmology, Dark Matter, Standard Model and Quantum nature. He will share some of the resources, as well a practical activity on measuring Planck's Constant, for which a kit was provided.

B20 Teaching Plans for Unit 2 in 2016

(11) Repeated in E11

Three members of the AIP Education Committee

Committee

Each person would talk about how they would plan the Unit, including topic sequence, practical activities, assessment tasks, etc.

B21 Physics at Quantum Victoria

(C)

Joel Willis & David Smith, Quantum Victoria

Quantum Victoria is an innovative centre bringing science and mathematics education to life for students, teachers and the wider community. Participants attending this session receive an overview of Quantum Victoria's VCE physics programs, which include the Physics of Angry Bird, Transmission of Power, Voltage Amplifiers, Photonics in Communications Systems and the Physics Online Digital Resource. All Quantum Victoria VCE physics programs have an associated SAC, which is linked to the VCE Physics study design.

B22 Bohr Model of the Atom

(12)

Theo Hughes, Monash University

This workshop will investigate the semi-classical theoretical model of the atom which Bohr first proposed, the visible emission lines for Hydrogen that are predicted by this model, and use spectroscopy to see what one can observe in reality. This will provide some theoretical and practical background for teachers related to the quantum aspects of the atom that students study at VCE - either some new knowledge and/or a refresher."

B23 Using X-rays to see into the nanoworld

(G)

Jonathan De Booy, The Australian Synchrotron

Powerful new x-ray techniques offer a unique window into the nanoscale world, enabling researchers to investigate structures so small that thousands of them could fit across a single human hair. Understanding how materials behave at the nano level is rapidly advancing our ability to determine how molecular and atomic structures affect the behaviour of these materials in real world environments. This session discusses how researchers are using the Australian Synchrotron to investigate materials at the nano level in fields such as medicine, mining, materials science, agriculture and environmental science, and to assist the preservation of our cultural heritage and the physics behind the techniques.

B24 AstroTour at Swinburne's 3D theatre

(C)

Assoc. Prof. Christopher Fluke, Swinburne University

Abstract: For over a decade, Swinburne University's Centre for Astrophysics & Supercomputing has operated the 3D AstroTour education program. Here, a professional astronomer or research student, leads the audience on a journey into the Universe. AstroTour sessions are highly customisable, featuring a combination of short 3D movies (e.g. "Our Sun: What a Star!" and "Telescope") and interactive demonstrations (e.g. supercomputer simulations of galaxy formation). The Centre's work was recently taken to the world-stage through the successful IMAX documentary "Hidden Universe 3D". I will discuss how both AstroTour and "Hidden Universe" can support the VCE Physics Astronomy and Astrophysics detailed studies.

Session C

2:30pm – 3:30pm

Workshops C1 to C4 are from the Physics in General Science Conference are designed for middle school science teachers without a physics background. The C5 workshop below, 'VCE Physics Karaoke, is designed for physics teachers.

C1 Model Rocketry in the science classroom

(M) Repeated in E2

Peter Razos, Trinity Grammar School

Model rocketry is an exciting way to present the science of flight and space travel. Participants will be encouraged to build and launch their own model rocket. We will discuss themes such as forces and energy transformation and see first hand the engaging nature of the resource. Online worksheets and curriculum material will also be presented and can be viewed at www.dynamicscience.com.au/tester enter as a student with the details below organisationid=dynsci, password= robots.

C2 How to Photograph the Moon and Stars with your DSLR

(M) Repeat of A5

Phil Hart

C3 Introduction to electricity and electric circuits

(M)

Michael Foster, Thornbury High School & Graham Foster, Retired

Basic theory of electricity and electric circuits for teachers with little or no background in basic electricity or Physics. The workshop will be divided into 3 areas: 1. Basic theory of electricity, 2. Electric circuits, 3. Measuring instruments. Teachers learn Basic properties of atoms: Electric charge, Electrical current, Electrical resistance. Energy: Force on charges, Electrical potential energy, Comparison of electrical potential energy to other forms e.g. gravitational potential energy etc, Voltage. Circuits: Series & Parallel, Current and potential difference in series and parallel circuits, Power. Measuring instruments: Use of a multimeter to measure current, voltage and resistance for series and parallel circuits.

C4 Engineering student learning

(M)

Robyne Bowering, Step Up Education

Engineering themes and activities provide engaging hands-on, minds-on learning for students. Engineering provides students with authentic reasons to want

to understand many science, maths and design and technologies concepts, as well as developing effective student teamwork, problem-solving, communication and reflection skills. This is a hands-on session using cheap, every day materials to inspire teachers to include engineering in their classrooms.

C5 Physics Karaoke

(V)

Several physics teachers

In three linked rooms, each teacher will be speaking for about 15 minutes about some aspect of physics teaching. The final list and grouping of speakers will be released prior to the conference. Participants will be free to move from room to room during the workshop.

**Registration, afternoon tea and tea/
coffee 3:30pm**

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Late Afternoon Sessions

Session D

4:00pm – 5:00pm

Workshops D1 to D5 will also form part of the Physics in General Science (PIGS) Conference for Years 7 - 10 teachers seeking to improve their physics skills.

D1 Physics Practical Activities for Year 10 Science

(M) Repeated or continued in E1

Dan O'Keeffe AIP, Helen Lye ACER and Svetlana Marchouba Camberwell Grammar School

A hands-on, self paced session in which participants work through a series of activities on electronics and DC motors. There are sufficient activities to do over the two adjacent sessions, D1 and E1. Participants can attend either or both sessions.

D2 The Science of Magic

(M) Repeat of B2

Peter Razos, Trinity Grammar School

D3 Easy and Engaging Light Pracs

(C) Repeat of A9

Spiro Liacos, Cheltenham Secondary College and Liacos Educational Media

D4 The Big Universe

(C)

Neil Champion, Buckley Park College

This is a chance to unpack the design, structure and riches of Unit 5, The Big Universe, in Nelson iScience10. Starting with the design features, based on "backwards by design" principles, the unit will be explored with respect to student practical work (SIS), student knowledge building: BBT, astrometry (SU, SHE), and comparisons about different cultural understandings of origins (SHE).

D5 Introducing Forces with Inquiry

(M)

Associate Professor Peter Hubber, Deakin University

Recent Australian Research Council (ARC) funded classroom based projects exploring the role of representation in teaching and learning science have produced a 'guided inquiry' approach, called Representation Construction, which has proved successful in terms of improved learning outcomes for students. This session will outline the main features of this approach that has an emphasis on student construction and negotiation of representation drawing

on findings from the research into the teaching of forces in the new Australian Science Curriculum. It will also discuss key issue students have in understanding the forces and the manner in which this inquiry approach resolves them.

D6 Barbie Bungee Jumping

(M)

Dr Moses Khor and Jonathan Davies, Camberwell Grammar School

Barbie is an adventurous girl and into extreme adventure sports. You operate the RDAC (Really Dangerous Adventure Company) and need to find the length of the bungee cord that Barbie needs to make a successful and thrilling jump. This involves Barbie getting close to, but not hitting the ground. Too long ... and disaster awaits. This workshop will consider ways to use this activity for students to develop graphing, analysis and reporting skills. Ohh ... and we have some Kens too.

D7 Chief Assessor's Report on 2014 Units 3 & 4 Exam

(12) Repeated in E6

Bruce Walsh, Xavier College

The chief assessor will present a report on the 2014 examination. The report will include statistics from the examination and information on where students performed poorly. While general questions about the exam will be answered, specific queries about questions should be directed to VCAA.

D8 Video Analysis

(V)

Doug Bail, Ciderhouse ICT

Video analysis is a far from new but generally under utilised tool for investigating particularly motion. This session will provide hints, tips, tricks and tools for engaging students with real motion studies. Bring your own Mac or Windows computer to develop your own student starting points or collect the DVD at session end to carry on back at school.

D9 Australian Synchrotron: The Physics of the Machine

(12)

Jonathan De Booy, The Aust Synchrotron

The Australian Synchrotron is a landmark national research facility enabling the study of materials and biological processes at the atomic and nanoscale. The synchrotron is a circular machine, about the size of an AFL ground, which produces a light source tens of thousands

of times brighter than conventional sources. It accelerates electrons to close to the speed of light, under ultra-high vacuum conditions, and directs their path with powerful electromagnets to produce the intense beams of light. Synchrotron techniques are used worldwide in many important areas including new materials, agriculture, biomedics, environmental health, food technology, oil and gas, mining and nanotechnology. This session details the physics behind the accelerators, the production of x-rays and how this ties to the senior physics curriculum.

D10 The use of scientific posters in communicating science

(V) Repeat of A11 and B6

Maria James, Science Manager, VCAA

D11 Motivational Tools for Modeling Instruction in the Physics Classroom

(C) Repeat of B8

Phil Jones, The Logical Interface

(Computer lab, so BYOD optional)

D12 VCE Systems Engineering: Physics at Play

(V) Repeat of B15

Colin Chapman, Caroline Chisholm Catholic College

D13 What is FAR Labs and how do I get involved? Remote access and a virtual tour of the experiments

(V)

Guido Cadenazzi & David Hoxley, La Trobe University

The development of high-speed internet access in Australia, in particular the rollout of the National Broadband Network (NBN) has created a range of opportunities that have never been possible before. Central to these opportunities, is the capacity to build online tools that enhance science education among high schools. The Freely Accessible Remote Laboratories (FAR Labs) project represents next-generation teaching methods by providing online access to modern research equipment within a guided, professionally supported environment. Developed in direct consultation with high school teachers, FAR Labs is a flexible, online environment for students, teachers and parents to interact with cutting-edge research equipment.

Late Afternoon Sessions

D14 Using Google Earth in the Physics Classroom

(V) Repeat of A2

Catherine Bellair, St Bernard's College

D15 Teaching Plans for Unit 1 in 2016

(11) Repeat of A22

Three members of the AIP Education Committee

D16 Find Higgs Boson candidate events using HYPATIA in the classroom

(12) Repeat of A7

Frank de La Rambelya, South Oakleigh Secondary College

D17 PhysCasts

(G)

Dr Brenton Hall, Swinburne University

We use anonymous remote polling (using clicker technology) to exploring physics concepts in lecture theatres. While clicker based questions can further in class engagement with physics, and provide valuable immediate feedback to both student and lecturer, they absorb significant class time. Unfortunately class time is a zero sum game requiring the reduction of worked physics problems typically shown. PhysCasting, is a peer reviewed recording of worked physics problems with audio annotation, a venture initiated at Swinburne in 2014. PhysCasts are produced under a creative common licence and are publically accessible using iTunes U or YouTube.

Session E

5:00pm – 6:00pm

Workshops E1 to E5 will also form part of the Physics in General Science (PIGS) Conference for Years 7 - 10 teachers seeking to improve their physics skills.

E1 Physics Practical Activities for Year 10 Science

(M) Repeat or Continuation of D1

Dan O'Keeffe, AIP & Helen Lye, ACER

A hands-on, self paced session in which participants work through a series of activities on electronics and DC motors. There are sufficient activities to do over the two adjacent sessions, D1 and E1. Participants can attend either or both sessions.

E2 Model Rocketry in the science classroom

(M) Repeat of C1

Peter Razos, Trinity Grammar School

E3 Demonstrating Electricity and Magnetism in Rural Schools

(M) Repeat of B4

Paul Millard and Jo Holdsworth, Science Discovery Project

E4 Year 10 & 11 Motion Experiments

(M) Repeat of B3

Frances Sidari, Lakeview Senior College and Terry Tan, John Monash Science School

E5 Toys, pracs, challenges

(M)

Dianne Wilkinson, Box Hill High School

This session is an ideas factory. It is aimed at teachers of physics from Years 10 to 12 physics but many of ideas could be adapted for junior levels. By using everyday equipment and toys to model concepts, even the difficult ideas can be made more understandable to the bottom end of the market. Connecting classroom theory to everyday experiences helps to make the concepts understood and provides memory hooks for later reference. Ways of developing worksheets which are relevant, interesting, quick and easy will be shown. In addition, with the return of the poster to senior physics, ideas to think about and methods of approaching the task will be covered. B1 is a Years 6 - 10 version of this workshop.

E6 Chief Assessor's Report on 2014 Units 3 & 4 Exam

(12) Repeat of D7

Bruce Walsh, Xavier College

E7 The Virtual Physics Course - VCEPhysics.com

(V) Repeat of B9

Justin Vincent, Warrnambool College

E8 Remote access to the synchrotron: a scientific Agora

(12)

David Hoxley & Guido Cadenazzi, La Trobe University

In this hands-on session, teachers will remote access the Australian Synchrotron visible-light beamline and see how it can be easily integrated into their teaching at both senior and junior levels. The Synchrotron is as much about collaboration between scientific disciplines and the clash and synthesis of ideas as it is about stainless steel and near-light-speed particle acceleration. Students can get a feel for the way scientists work in teams to

solve problems that are both challenging and important to society.

E9 2016 Study Design: Units 3 and 4: Planning a course and units

(12)

Neil Champion, Buckley Park College

The "backwards by design" approach to curriculum planning will be used in this Workshop to unpack and develop Units 3 and 4 in the 2016 VCE Physics Study Design. Particular attention will be focused on the Student-Designed Practical Investigation.

E10 Improve student learning using formative assessment in the digital environment

(C) Repeat of A16

Catriona McKenzie, Doug Bail, Cara Perry, Pearson Australia,

E11 Teaching Plans for Unit 2 in 2016

(11) Repeat of B20

Three members of the AIP Education Committee

E12 Using High Speed Cameras and Tracker to study motion

(G) Repeat of B18

David Vaughan, Woodleigh School

E13 Tricks and Tips for Inexperienced Physics Teachers

(B) Repeat of A1

Colin Hopkins, Bialik College

E14 Algorithms in solving physics problems

(V) Repeat of A20

Yuriy Verkhatsky, Carwatha College

E15 Paul Hewitt? Who is he and what is his connection with Conceptual Physics?

(G) Repeat of A10

Gary Cohen, AIP Education Committee

E16 SACs Pracs and Resources for Units 1 and 2 Detailed Studies

(V) Repeat of B11

Paul Fielding, Billanook College, Paul Fitzgerald, Ivanhoe Girls' Grammar School

Friday Program ends 6:00pm

STAV/AIP VCE Physics Teachers' Conference 2015

Saturday Excursion Taster and Medical Physics In-Service

Session F

9:00am

F1 Australian Synchrotron (1 hour) Clayton

The Australian Synchrotron (<http://www.synchrotron.org.au/>)

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.

Session G

11:00am

G1 Medical Physics In-Service at Peter MacCallum Cancer Centre (2 hours) East Melbourne

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.

G2 Quantum Victoria (60 min) Macleod

Quantum Victoria (<http://www.quantumvictoria.vic.edu.au/student-programs/>)

The tour will showcase the facilities of one of Victoria's newest Specialist Science and Maths Centres which specialises in the delivery of programs across the STEM disciplines. Delegates will receive an overview of the student and teacher programs that support the teaching and learning of the Physical Sciences and Mathematics across P - 12. Our blend of onsite, online and outreach programs incorporate cutting-edge technology with an emphasis on 3D Printing and Modelling, games-based learning, virtual and augmented reality experiences, robotics and mechatronics.

Session H

1:30am

H1 Victorian Space Science Education Centre (90 min) Strathmore

Victorian Space Science Education Centre (<http://www.vssec.vic.edu.au/>)

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 Astronomy (co-ordinate systems, solar system and telescopes) and Astrophysics (models of the nature and origin of the Universe, and the life cycle of stars)