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Year at a glance

Innovating in life science education through:

- Employing more than 60 young research scientists to mentor students and teachers
- Equipment purchases including a desktop Scanning Electron Microscope and Electronic Gels
- Establishing and maintaining ongoing collaborations with research institutions to enhance student experiences through provision of STEM resources, tours of research facilities and the design and development of new programs.
- Specialist staff including a science animator and education staff with research experience

Providing programs to students and teachers across the state:

<table>
<thead>
<tr>
<th>Responding to increasing demand</th>
<th>2015 State-wide participation</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image.png" alt="Graph" /></td>
<td><img src="image.png" alt="Map" /></td>
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| 15,628 Victorian students attended a GTAC program in 2015 | 1,529 Teachers and Lab Technicians attended a GTAC Professional Learning program in 2015 |

New approaches to immersing students and teachers in a life sciences journey of learning and discovery:

- Contemporary website with increased functionality for delivering online courses
- Launch of our online immunology game, Pathogen attack: the fight for immunity
- Collaborating with University of Melbourne to deliver “pathways to biomedical science”
- Education week program delivered in collaboration with AgriBio, La Trobe University
- Epidemiology outreach program delivered to rural and indigenous students in partnership with Zoetis and Marrup Barak, University of Melbourne
- Course delivered for Pre-service primary teachers in collaboration with Melbourne Graduate School of Education
- Focus on maths through programs showcasing predictive modeling in the Life Sciences supported by a grant from the Department of Education and Training
Context

Victoria’s Science and Mathematics Specialist Centres

GTAC is one of the six Science and Mathematics Specialist Centres established by the Victorian Department of Education and Training (DET). This network of six Centres aims to improve student experience and achievement in STEM by providing learning programs that encompass new and emerging scientific thinking, state of the art facilities and cutting edge technologies. The Centres provide specialised programs for all Victorian students and teachers. They have an equity focus on rural and disadvantaged metropolitan schools.

Each Centre is hosted by a government secondary school. The Centres each have an area of specialisation, while operating collectively as a statewide network. The Centres have a focus on the development of partnerships with local organisations, industry and universities.

The Specialist Science and Mathematics Centres Network proudly operates under the following Governance Principles:

- Excellence
- Integrity
- Transparency
- Equity
- Accountability
About GTAC

Science, Technology, Engineering and Mathematics (STEM) are key to future productivity in Australia. To inspire the next generation of science innovators and entrepreneurs, it is important that Victoria’s youth are exposed to STEM-related careers and the opportunity to practice STEM-related skills. GTAC provides opportunities for students and teachers to collaborate with practicing scientists as they apply cutting edge technologies to investigate contemporary life sciences.

GTAC is proud of its reputation as leaders in life science education, with 1000 teachers signed up to our new website to receive updates on student programs, teacher professional learning and to access online teaching resources and student courses. We offer engaging and immersive programs to inspire Victorian students from years 5 – 12 in the life sciences.

The Centre is hosted by the University High School located in Parkville. This places GTAC in the major medical and bioscientific research precinct in Australia that underpins the biotechnology industry. Our science and education partners are The Walter and Eliza Hall Institute of Medical Research (WEHI) and The University of Melbourne (UoM). Our location and partnerships facilitate access to practicing scientists and education experts and strengthen our standing in the Science and Education communities.

Our Mission
To excite Victorian students and teachers in STEM by providing equitable access to leading life science expertise, practices and technologies

Our Vision
Victorian students inspired by STEM through innovation in Life Science education

Our Values
Innovative thinking
High expectations of selves and others
Critical reflection and continuous improvement
Inclusive and encouraging learning environments
Positive communication, collaboration and consideration of ideas
Sharing our joy and wonder of the life sciences

Our partners
**Director’s message**

As I reflect on what we have achieved in 2015 I feel an immense sense of pride in the GTAC team who applied their expertise and passion for life science to design and deliver programs for more than 15,000 students and 1,500 teachers in 2015. They certainly merit the accolade from Sir Gustav Nossal describing GTAC as “A bubbling cauldron of ideas.”

We launched our new website giving us a fresh and contemporary look. Its advanced functionality allows greater scope for designing interactive student online courses and teacher resources, and capacity to measure student and teacher data to analyse our online reach. Special thanks to our website coordinator Chris Szwed, and the web development team, DMax, who worked closely with me to produce this valuable resource for students and teachers across Victoria.

To bring a dynamic and fun element to the study of the specific immune response we launched our new online immunology game, *Pathogen attack: the fight for immunity*. This innovative approach to education resourcing was made possible by Chris Szwed and Dr Tony Chiovitti who collaborated with me on the educational design, our science experts, Professor Lynn Corcoran, Professor Andrew Lew, and Professor Bill Heath, the animator, Mr Jack Parry, and the game developers, Aerion technologies.

A Department of Education and Training grant supported development and delivery of a number of teacher and student programs showcasing application of maths to life science. Collaboration with the Australian Mathematics and Science Institute facilitated design and delivery of programs, including an epidemiology program, applying mathematical modelling and science technologies to predict spread of disease. This was delivered in rural schools having a high indigenous population. Our annual Teacher Symposium featured predictive modelling in the life sciences.

Earlier this year we were saddened at the loss of the founding Director of Ecolinc, Suzanne Clarke. She was an inspirational colleague with a passion for education and ecology. Her legacy will see young people continue to foster a love for the environment. She is deeply missed in the Centre network.

I would like to take this opportunity to thank Mr Rob Newton for his support of GTAC during his ten years as Principal of University High School and to welcome the new Principal, Ms Heather Thompson.

Our partners and collaborators remain integral to providing cutting edge programs for Victorian teachers and students. We have been very fortunate to have Zoetis as collaborators for more than 10 years. Our appreciation goes to Zoetis Principal Scientist, Caterina Colantoni and her team, who assist us to resource immunology programs for students across the state.

Thank you to all of our stakeholders whose continuing support keeps GTAC at the leading edge of life science education in Victoria.

Jacinta Duncan
Message from the University High School Principal

We are proud to be able to provide a home for GTAC because in so many ways GTAC reflects the strength of University High School. As you become immersed in the detail of the GTAC Annual Report for 2015 you will notice the emphasis on collaboration, inspiration, creativity, imagination and challenge.

GTAC fosters connections to the wider community and has at its core equity of access for young people to scientific expertise. This, in turn, creates tangible and meaningful experiences for students and teachers at GTAC in the arena of Science, Technology, Engineering and Maths (STEM).

The staff at GTAC are creative, passionate and dedicated to engaging and inspiring others as they develop and facilitate programs in life sciences at the Centre, on outreach or through online learning programs.

With the passion and expertise of the GTAC Advisory Board we are collectively able to empower young people and teachers so that they can make a difference to the learning of STEM across Victoria.

I look forward to continuing our partnership with GTAC as we invite and encourage fresh thinking so that many more students can confidently step into the world of life sciences, and eventually beyond the classroom, with the scientific capacity to contribute positively to society.

Heather Thompson

Message from the Chair of the GTAC Advisory Board

The seeds of GTAC were sown nearly 20 years ago, as a partnership between The University High School, The Walter and Eliza Hall Institute of Medical Research and the Microbiology and Immunology Department of The University of Melbourne.

The vision was to excite and inform our school students and their teachers about the revolution underway in molecular biology. We wanted to inspire the next generation of scientists. Equally, we wanted to ensure that all students became scientifically literate citizens.

With strong support from the Education Department of the Victorian Government and the founding partners, GTAC has continued to evolve. Today, it reaches ~16,000 students per year from metropolitan and rural regions, including 10,000 disadvantaged students, drawn from years 5 through 12.

GTAC benefits hugely from the experience and dedication of its Board members, who now come not only from academia and education, but also industry. The Board is continually impressed with the energy, commitment, imagination and innovation of the Director and her staff. The programs they develop are second to none in the world.

Having been part of GTAC from its inception, I am incredibly proud of its contributions to science education in Victoria.

Suzanne Cory
Our priorities

Our mission is to excite Victorian students and teachers in STEM through providing equitable access to leading life science expertise, practices and technologies.

Access to life science expertise

In all GTAC programs students are mentored by young practicing research scientists as they apply research technologies to explore the life sciences. We employ up to 80 scientist mentors who inspire students through providing narratives about their research and their pathway to research. Collaborating with a young scientist in small groups of six provides the platform for knowledge generation through positive social interactions, and supports students to build the confidence to apply research technologies to investigate problems and analyse results. Our scientist mentors are PhD students drawn from surrounding research institutions. GTAC staff guide our scientists to develop skills in negotiating meaning with students through questioning and use of learning resources, such as models, that promote dialogue.

Using technology to explore contemporary research and issues in life science

Our programs are designed to enable students and teachers to actively participate, collaborate and engage in dialogue as they apply STEM knowledge and skills to explore case studies of positive change involving the application of STEM, and think critically around issues in STEM for active citizenship. All programs immerse students in an investigation of contemporary life science research while aligning with Victorian curriculum priorities and drawing on effective science education theory and practice.

Meeting science heroes

GTAC offers a number of special programs run in collaboration with science institutions. These programs provide students the opportunity to meet scientists whose discoveries have positively impacted society. Through these interactions students come to understand the contributions of scientists to society and can imagine themselves as a scientist change agent.

Scientist mentor: The modelling task allowed these year 10 students to grasp the content with much less guidance from myself. They were able to use models to design an experiment for testing blood type using antibodies which was completely unexpected. The models also create the space for me to prompt the quieter students to participate and they are doing so and feeling a sense of satisfaction with their discoveries.

Student participant: I finally got the chance to see what I really want to work with in the future.
Our reach: Student participation in GTAC programs

GTAC has seen participation from 15,628 students in 2015. We have strong relationships with schools across Victoria, with many schools visiting annually and many accessing multiple program delivery modes.

We offer onsite programs where up to 90 students can participate in a program on a given day. These programs run for an average of five hours. This includes exposure to the University lifestyle as students visit The UoM for lunch.

Our strong commitment to equity of access through provision of free programs for Metropolitan Disadvantaged government (MD Gov) students and free programs and travel assistance for rural government (R Gov) students had a positive impact on almost 10,000 disadvantaged students in 2015. Standard Rate government schools (SR Gov) and independent schools attract a small program cost per student.

Teacher testimonial: GTAC is an amazing organization and centre that gives students the unique opportunity to delve into biological concepts with scientist mentors using technology and equipment that are not common in schools.

Teacher testimonial: GTAC provides hands on experiences for students, consolidates and extends classroom learning, educates and encourages students to consider science based careers and provides resources, opportunities and assistance to staff to extend their knowledge.

We continue to be a leading provider of programs that support Victorian teachers in the delivery of the VCAA Biology curriculum. In 2015, 51% of our student participants were VCE students. This is driven by client demand and an emphasis on inspiring students to enter tertiary studies in the life sciences.

<table>
<thead>
<tr>
<th>2015 student participation by school classification</th>
<th>2015 student participation by student cohort</th>
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</thead>
<tbody>
<tr>
<td>SR NON-GOV, 2712, 18%</td>
<td>VCE, 8002, 51%</td>
</tr>
<tr>
<td>R Gov, 4144, 27%</td>
<td>Years 5 &amp; 6, 3625, 23%</td>
</tr>
<tr>
<td>SR GOV, 2722, 18%</td>
<td>Years 7 - 10, 4001, 26%</td>
</tr>
<tr>
<td>MD Gov, 5581, 37%</td>
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</table>
Our commitment to outreach

We offer outreach programs through three delivery modes.

- School incursion where education officers and scientist mentors visit schools bringing specialist equipment and technologies.
- Video-conferencing where education officers and scientists link with schools using Polycom or Skype. Resources are sent to the school to facilitate a hands-on interactive approach.
- Online courses available through the GTAC website.

### 2015 Outreach delivery mode

<table>
<thead>
<tr>
<th>Delivery Mode</th>
<th>Number</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>MD GOV Incursion</td>
<td>2523</td>
<td>44%</td>
</tr>
<tr>
<td>Online immunology game</td>
<td>515</td>
<td>9%</td>
</tr>
<tr>
<td>R GOV Incursion</td>
<td>1619</td>
<td>29%</td>
</tr>
<tr>
<td>Video-conferencing</td>
<td>1035</td>
<td>18%</td>
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Primary teacher testimonial:

GTAC allows access to expertise and resources that primary schools and primary school teachers cannot access. It promotes science in our lives across the whole school community and inspires both teachers and students. The programs are engaging with incredible resources. We love it!!

Enriching our primary outreach programs

Our four signature primary programs are offered as a school incursion taking place over two visits where students use research grade technologies to explore forensics, genetics, microbiology or ecology. In 2015 we also offered two extended programs for years 5 & 6 students to complement the AusVELS Science curriculum for Biology and Chemistry. These longer programs are designed to have a greater impact on student understandings.

**Rural teacher:** I think our school and GTAC are creating a pathway for rural students - a pathway that is tangible and our efforts will be the start of what you see tomorrow.

### Travelling to rural schools

This year we toured a number of Victorian regions to provide rural schools with access to technologies and scientists. Rural tours ran over 4 – 7 days in the following areas: Wangaratta; Mildura and Robinvale; Gippsland; Warrnambool, Colac and Apollo Bay; and Bendigo, Shepparton and Rochester.

### Video-conferencing with students in schools

Engaging students through the medium of video-conferencing is enhanced by providing schools with activities or experiments that can be performed with guidance from a GTAC scientist mentor. Popular programs in 2015 included:

- In the footsteps of science heroes - students discover the role of Australians in identifying the Hendra virus and producing a vaccine, and they perform a diagnostic ELISA
- Immunotherapy for dogs - students visualize an antibody structure using the computer program Cn3D to explore how immunotherapy is used to treat cancer
- Adaptations - a program for primary students who have a Q&A session with a museum insect expert and then send in specimens from their school yard so adaptations can be viewed using light and electron microscopes.
Growing our online presence

1,600 teachers and students signed up to our new website in its first year of operation. Approximately 71% of Victorian secondary schools now have at least one teacher, laboratory technician or student signed up.

Penetration of GTAC website into Victorian Schools

Website resources

As part of our commitment to inspire Victorian teachers and students in STEM we developed a number of online student courses and teacher resources in 2015. Student online courses feature:

- Scientists at work in laboratories to connect students with research questions, methods and technologies
- Models, animations and interactive activities to support understanding of abstract concepts
- Technologies used by research scientists such as bioinformatics programs
- Rich narratives to engage students in the content and interactive activities

Teacher resources include experiments, activities, models and computer technologies that can be applied in the classroom and assessment tasks that focus on key knowledge and skills in the life sciences. Six new student courses were made available in 2015.
Snapshot of student usage of three new online courses

Course completion by students was approximately 47% which is above the median value for open online courses (12.6%)\(^1\). GTAC School Assessed Coursework tasks have been provided for teachers to use with their students. These tasks include online elements. These elements recorded high usage for the quarter in which data was collected, with half of the student users being from Metropolitan Disadvantaged and Rural Victorian Government schools.

**Student testimonials:**
- I actually love this game so much...so interesting and addictive and really fun!!
- Others (students) should know about this, it is a great way of learning.
- It was very nicely animated and less confusing than the textbook.
- I don’t play games however I will be playing this game, it’s educational and fun!

accessible this resource representing 183 Victorian schools.

Gaming as an educational strategy is gaining momentum in the education arena, as effective games address many learning styles. Teacher and student feedback has indicated that Pathogen Attack is a viable strategy for understanding the complex nature of the immune system. This places GTAC at the forefront of the emerging gaming in education movement.

**Online immunology game**
*Pathogen Attack: The fight for immunity* is GTAC’s online immunology game that was officially released in 2015. In this real-time strategy game, students control the cells involved in generating a specific immune response. Levels are structured to guide students through the sequence of cellular interactions required to eliminate invading bacteria and viruses. In 2015, 950 students accessed this resource.

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Impact: Igniting student interest in STEM

Surveys completed by 6,273 students and their teachers attending GTAC onsite programs reveal the value of our programs to the Victorian education community.

80% of teachers were return visitors

100% of teachers would recommend a GTAC student program

100% of teachers rated student engagement with the program as high to very high

92% teachers have embedded GTAC programs in their subject

98% of students found working with a scientist mentor engaging

95% of students rated GTAC programs as a positive learning experience

Re-igniting interest for disengaged students

Of the 1,473 year 9 & 10 students who completed a survey for an onsite GTAC program, 8% scored their interest in studying science at less than 2 out of 5. Looking at survey data from this disengaged cohort, we can see that the program at GTAC was a positive learning experience and that working collaboratively to solve problems with scientist mentors was engaging.

Average survey results of all onsite middle years students (n=1,473) and a subset of this group who indicated they have a low interest in studying Science (n = 109).

Engage: To occupy or attract someone’s interest or attention.
Impacting student outcomes through teacher programs

Our scope to inspire students extends beyond student programs to providing professional learning programs for teachers. These programs reconnect teachers with their discipline and enrich their pedagogy, through insights into the technology and knowledge driving recent advances in life sciences. In enriching teacher practice we aim to enhance student experiences in studying life science.

GTAC delivered 14 Professional Learning events for Teachers, Laboratory Technicians and Pre-service Teachers in 2015. Many events focused on Predictive Modelling and other mathematical disciplines that are relevant to the life sciences, as part of the Centre wide strategy to make explicit the relevance of mathematics in Life Science education.

Highlights of Professional Learning events included:

- A presentation on “A day in the life of the brain” by Baroness Susan Greenfield CBE FRCP
- Collaborations with the Australian Mathematics and Science Institute (AMSI) to support teachers in explicitly teaching mathematics in the life sciences
- Collaborations with Dr Barbara Kameniar, The UoM Institute for Indigenous Affairs, Indigenous Academic Enrichment Program, to support teachers in rural Victoria in engaging indigenous students in STEM
- Collaborations with the Melbourne Graduate School of Education (MGSE) in delivering three courses: the Masters of Teaching Primary Science Specialism, the Masters of Teaching Secondary Biology Method, and the School Experience as Breadth course for undergraduate science students
- The 11th annual GTAC Teacher symposium: Predictive modelling in the life sciences, where eminent scientists shared their research with teachers
- Full day overviews for each of the four Victorian Curriculum Assessment Authority Biology Units, supporting teachers to incorporate contemporary STEM narratives and practices, and apply effective pedagogies in their teaching practice.

Pre-service teacher participation was high (22%) as a result of our strategy to share effective practices in STEM education with future Victorian teachers through collaborations with The UoM and Deakin University. These professional learning events also increase state-wide awareness of Victoria’s six specialist Science and Mathematics Centres.
Providing University courses in collaboration with MGSE

This year we co-developed and delivered two UoM courses offered by the MGSE as part of our joint commitment to the Reconceptualising Mathematics and Science Teacher Education Programs (ReMSTEP) initiative.

Masters of Teaching Primary Science Specialism

At GTAC, MGSE students met with museum expert Dr Ken Walker and trialed resources developed by GTAC staff, Dr Nicole Webster and Dr Frazer Thorpe, to explore adaptations of bees and flowering plants for pollination. Discussion followed on the value of European honey bees to the Australian economy and the emerging issue of colony collapse. MGSE students adapted resources for delivery to year 5 and 6 students at Abbotsford primary school. The MGSE student experience of working alongside science experts to develop and deliver curriculum was overwhelmingly positive as evidenced in student interviews presented at the 2015 annual ReMSTEP conference.

Scientists in Schools

This breadth subject for The UoM undergraduate science students is designed to encourage science graduates to consider a career in teaching. The UoM students join GTAC staff to mentor primary students as they investigate states of matter in their schools. This program was developed by Jacinta Duncan and Chris Szwed to support UoM students to practice effective skills in promoting dialogue and negotiating meaning when mentoring students, and to enrich primary teacher practices in delivering chemistry content.

Extended research program for year 10 students

In 2015 a number of year ten students were invited to spend a week at GTAC to gain experience in using a variety of research technologies and to gain a sense of what it might be like to work in a research science environment. Students performed mini research projects in genetics, microbiology and microscopy. They practiced skills in science photography and science communication to produce blogs on their experiences for the GTAC website.

Teacher testimonial: GTAC professional learning programs are outstanding - they have experts in the field who are passionate about their research and present information at the perfect level for teachers to understand and improve their knowledge.

Connor, a year 10 student: I have learnt things that I could never have learnt from school. It has been an extremely memorable experience that has sparked my passion in biology, and has helped me to see what it is really like to be a scientist and also how I could get there. I think that this work experience has not only opened up what career pathways I can take in science, it has made me want to learn a lot more as I realised that there are always new discoveries and problems which arise and I find that really cool.
Making Connections with The Florey

Making Connections is a student program run in collaboration with The Florey Institute of Neuroscience and Mental Health. This collaboration enables students to gain insights into careers in science as they experience the progressive neuroscience research emerging from The Florey.

Rarely are members of the public provided opportunities to visit working science institutions. This can result in limited understanding of how scientists work and of the opportunities a science career affords. By providing students and teachers access to the dynamic research environment at The Florey we aim to demystify the role of scientist and to excite young people to consider a career in neuroscience research. The program offers exclusive opportunities for Victorian students in Years 10 and 11 and their teachers including:

- Meet and interact with practicing research scientists
- A tour of The Florey to view scientific equipment and practices used in neuroscience research
- Experience in the GTAC laboratories using research technologies to investigate:
  - Alcohol addiction
  - Motor Neuron Disease (MND)

Biosecurity with AgriBio

In 2015 we formed a new collaboration with AgriBio to showcase innovations in Australian research that address the issues of food security, invasive pests, and environmental management. This collaboration provided students access to leading biosecurity scientists to discuss methods to protect our agricultural industry from national and global threats.

The collaboration also allowed for GTAC staff to develop three workshops to immerse students in the shoes of an AgriBio scientist. Students applied molecular methods to diagnose an introduced bacterial pathogen of citrus crops. They predicted the spread of mosquitoes as vectors of arboviruses using computer modelling. They also used biochemical techniques to investigate the physiology and genetics of milk nutrient content in dairy cows, applying their knowledge to breeding programs used to improve milk products in the dairy industry.
Outbreak! Stopping the spread of disease with Zoetis

At our 2015 GTAC annual Teacher Symposium Professor Emma McBride presented on the use of mathematical models to predict the spread of disease. In response GTAC staff developed a program to immerse students in the role of epidemiologists. Students used models and performed experiments to unpack the $R_0$ equation for predicting the spread of a disease outbreak in their town. This program includes the use of an ELISA to determine the average duration of infectiousness. The team at Zoetis developed and provided resources for this protocol.

A DET grant supported the delivery of this program to rural schools in the Mallee region having a high Indigenous population. Students in year 9 & 10 worked with scientist mentors to predict the spread of this disease in their town and to suggest methods for limiting the spread of disease. While students were working, their teachers observed their practice to inform methods of igniting student interest and passion in STEM.

Student testimonial for our Outbreak program: *That was the most awesome experience of my life!*}

Barcoding parasites with the faculty of Veterinary and Agricultural Science

Barcoding parasites is a citizen science project run by GTAC in collaboration with the Australian Society for Parasitology and the faculty of Veterinary and Agricultural Science (FVAS), The UoM.

At GTAC, students isolated and amplified DNA from tapeworm specimens collected in the 1990s. The DNA was then sequenced by the Australian Genome Research Facility (AGRF). Students used bioinformatics tools to analyse the resultant DNA barcode and they discovered a new tapeworm species. Their sequences will be uploaded to the international gene sequence database of the US National Centre for Biotechnology Information (NCBI), with recognition given to the students for their contribution to science.

Their research is contributing to characterization of the genetic diversity of parasites infecting livestock in south-eastern Australia over the last 25 years.
Pathways to Biomedical Science

In 2015 the School of Biomedical Science (UoM) approached GTAC to collaborate on a special program to increase student awareness of the possible career opportunities in biomedical science, and the pathways to study biomedical science at the University.

There was an overwhelming response from teachers requesting to send students to this program. This reveals the value placed on increasing student awareness of STEM careers and tertiary study pathways. Over 200 students applied for 60 places. Invited students represented 29 Victorian schools with rural students given preference and travel assistance.

The program featured an overview of the School of Biomedical Sciences by the Head of the school, Professor Fabienne Mackay, and a discussion forum with UoM student ambassadors sharing their experiences of university life. Students interacted with researchers from the School to investigate emerging biomedical research and photograph specimens using fluorescence, light and Scanning Electron Microscopes. Students modified their images at home for entry into UoM’s Under the Microscope competition. Students also had the opportunity to visit the Harry Brookes Allen Museum of Anatomy and Pathology where they were given drawing lessons. Students then chose an item of human anatomy to sketch and enter into a drawing competition.

Graeme Clark Oration by Sir Paul Nurse

The Graeme Clark Oration is an initiative of the Convergence Science Network that promotes an understanding of science to the community by inviting World science leaders to share developments in convergence science. In 2015, GTAC was very pleased to work collaboratively with the Convergence Science Network and Quantum Victoria to organize students to attend the Graeme Clark Oration schools presentation by Sir Paul Nurse. Over 500 students heard Paul share his story from school days through to his achievements in science. Students were particularly inspired by his humble beginnings, asking Sir Paul questions relating to ‘first in family’, the first in the family to attend university.

Congratulations to Maffra Secondary College who were presented with the inaugural Graeme Clarke award for Science Innovation in Schools, recognizing innovation that has transformed the science program across a number of disciplines. A selection of teachers and students also attended the Public Oration and a lucky selection were invited to attended the oration dinner, getting the chance to meet some of Victoria’s top scientists and entrepreneurs.
**Igniting STEM aspirations in Indigenous students**

**The Residential Indigenous Science Experience (RISE)**

This five day camp for Indigenous students in years 9 & 10 aims to increase the future representation of Indigenous students in tertiary STEM subjects through:

- Immersion in contemporary practices in STEM
- Promotion of Indigenous cultural leadership, and
- Exposure to university and city life.

Now in its fourth year, RISE raises the aspirations of Indigenous students, their teachers and schools through access to role models such as Dr Misty Jenkins and Indigenous UoM undergraduate mentors. Residing at Trinity College, the students come to appreciate how colleagues and programs provided by the Murrup Barak Institute for Indigenous Development (MBI) can support their tertiary life and study.

This year, 24 Victorian and five interstate students participated in RISE. They applied a variety of technologies to solve problems across the STEM disciplines as they visited laboratories at GTAC and The UoM, and premier Victorian STEM facilities including the Australian Synchrotron and the Swinburne Virtual Reality Theatre.

This collaboration between four faculties at The UoM, GTAC and The MBI is proving effective in raising student aspirations. A student who attended the first RISE camp enrolled in STEM tertiary studies with The UoM this year. They will now add their voice to the role models demonstrating where high aspirations can lead.

**The Indigenous Academic Enrichment Program (IAEP)**

The Indigenous Academic Enrichment Program (IAEP) is a three year program coordinated by Dr Barbara Kameniar of MBI. The program is designed to enhance the academic attainment of a group of Aboriginal and Torres Strait Islander young people, particularly those of low SES backgrounds.

GTAC involvement in this program includes:

- The development of STEM focused educational programs aimed at enhancing the academic attainment of a cohort of Aboriginal and Torres Strait Islander secondary school students and their non-Indigenous peers.
- Travel to rural schools with Dr Kameniar to deliver student programs and teacher professional learning.

At schools we share with teachers our approach to designing student programs including the pedagogical approaches chosen to engage students in STEM. We then deliver programs while teachers participate in professional learning with Dr Kameniar, observing and discussing their students’ learning successes and challenges. Teachers rated this professional learning experience highly. In particular, the opportunity to observe their students and notice the pedagogical approaches that allow students to experience success; the power of hands-on experiences and curiosity as learning tools; and alternative methods to formatively assess students other than through written responses.
Collaborations enrich student experiences

GTAC maintains strong community, industry and government links, through our partnerships and collaborations. Collaborations with science, education and industry organisations enhance our ability to showcase the latest innovations in life science to deliver authentic programs for teachers and students, and to apply evidence based pedagogies in the design and delivery of programs. In particular, it helps us to connect students and teachers with practicing research scientists, and provides access to resources and technologies that enrich our programs. In this way students are exposed to the skills and knowledge applied in STEM careers and to emerging career pathways in STEM. GTAC currently collaborates with the following science, education and industry organisations:

- Zoetis, a global animal health company
- Royal Melbourne Zoo
- The Florey Institute of Neuroscience and Mental Health
- Museum Victoria
- Centre for AgriBioscience, La Trobe University
- Australasian Society for Immunology
- Australian Genome Research Facility
- Australian Society for Parasitology
- Stem Cells Australia
- Marrup Barak, UoM
- Faculties of Medicine, Dentistry and Health Science; Engineering; Science; & Veterinary and Agricultural Science, UoM
- Melbourne Graduate School of Education, UoM
- Deakin Education
- Australian Mathematical Sciences Institute (AMSI)
- School of Biomedical Sciences, UoM
- The Australian and New Zealand Association for the Advancement of Science.

Thank you Zoetis for ten years supporting GTAC programs

This is our tenth year collaborating with Zoetis to deliver immunology programs to Victorian students. These programs showcase research emerging from Zoetis that has led to improved health and agriculture outcomes while meeting Victorian curriculum priorities. Principal researcher, Caterina Colanoni and her team at Zoetis have developed robust protocols that allow students to perform ELISAs in a short period of time and to analyse results. They have prepared and sent resources to schools for use in outreach programs. At times, members of the Zoetis team have volunteered as mentors, and in the early years Zoetis contributed to financing travel for rural schools. Programs in which Zoetis have supported GTAC include:

- **Upping the Ante against infection** – an onsite VCE Biology program where students determine an effective antibiotic dose for treating mastitis in cattle and perform an ELISA to determine if cattle have memory against the tetanus toxin.
- **In the footsteps of science heroes** – a video conferencing program where an ELISA is sent to schools for use by students investigating how to prevent the spread of Hendra virus.
- **Outbreak! Stopping the spread of infection** – providing year 9 & 10 students with experiences as epidemiologists in their school environment.
Staffing a World Class Centre

The integrity of a Specialist Science and Mathematics Centre and its ability to deliver high quality learning and professional development programs is reliant on its ability to attract, employ and retain suitably qualified and experienced staff. GTAC staff are highly skilled practitioners and support staff who deliver programs that cannot be replicated in the ‘normal’ classroom. GTAC currently employs 11.4 Equivalent Full Time staff and up to 80 casual staff.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Role</th>
<th>EFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leading teacher</td>
<td>Centre Director</td>
<td>1</td>
</tr>
<tr>
<td>Teaching staff</td>
<td>Deputy Director and Education Officers</td>
<td>7</td>
</tr>
<tr>
<td>Education support class</td>
<td>Administration Manager, ICT Manager,</td>
<td>3.4</td>
</tr>
<tr>
<td></td>
<td>Laboratory Manager, Science Animator</td>
<td></td>
</tr>
<tr>
<td>Casual staff</td>
<td>Scientist mentors and Certified Replacement Teachers (CRT)</td>
<td>80</td>
</tr>
</tbody>
</table>

Ensuring program quality

The Director and all Education Officers are qualified teachers who design, develop and deliver onsite and outreach programs in teams. This includes the development of online resources and teacher professional learning programs. This is often carried out in collaboration with education, science and mathematics experts to ensure contemporary and effective STEM and education practices are applied. Our education staff have rich and diverse backgrounds in research science with many having completed doctorates and run research laboratories prior to entering the teaching profession.

Our highly capable education support staff is integral to enriching our programs through support with administration, technology and protocol development, and through the provision of animations that help ignite the imagination and decipher the abstract nature of molecular biology. Animations developed by Jack Parry with finishing touches by Maja Divjak were utilised in 2015 to support program delivery. These animations include the dynamic cell, the life cycle of an apple tree, and two chemical signaling animations exploring the role of insulin and anti-diuretic hormone (ADH).

Teacher testimonial: All the GTAC resources are amazing, well structured, and pitched to cater for all students. I love how a variety of modes are used to develop student understanding such as the plasmid restriction digest models that decipher what is happening in real experiments, pulling many concepts together. I can't recommend GTAC highly enough. Thank you for being an amazing provider and role model of Biology as a discipline, I know I and our students are highly grateful and appreciative of all they are gifted with. Thank you!
GTAC Annual Report 2015

Learning by Immersion, Inspired by Life

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GTAC is a Life Sciences Education Centre supported by the Victorian Department of Education and Training and hosted by the University High School in Parkville, Victoria.

Our partners are The Walter and Eliza Hall Institute of Medical Research and The University of Melbourne.