

The Alberta Science Teacher



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Editor's Message

It is not too late to register for the Science Council's annual conference, to be held November 17–19 in Banff. Go to <https://event-wizard.com/TheScienceofSuccess/0/register/>.

While you're attending the conference, stop by the annual general meeting (AGM), where proposed changes to our council's constitution will be voted on. The AGM will be held at the Banff Centre on Friday, November 18, 11:45 AM–1:00 PM. Please take some time to read the proposed changes at <https://sc.teachers.ab.ca>. If you are looking for a way to be a lead educator in Alberta, the following Science Council executive positions are open and will be elected at the AGM: secretary, elementary science director and assistant conference director.

Our council is not the only one working through changes. As you may have heard, Alberta Education announced a new curriculum development plan to update K–12 programming in six subject areas: the arts, language arts, mathematics, social studies, the sciences and wellness education. This work is to be done simultaneously over the span of six years, and will aim to make better connections across subjects and include First Nations, Métis and Inuit (FNMI) and franco-phone content in all curriculum. If you want to be part of this curriculum development, submit your name to the ATA's Curriculum Name Bank at

www.teachers.ab.ca (under For Members > Forms and Online Services > Other Forms).

This issue of *The Alberta Science Teacher* has me thinking about the words of Carl Sagan (1996, 25): "Science is more than a body of knowledge; it is a way of thinking." Here, you will learn to locate the stars at your specific location, read an account of one biology teacher's use of manipulatives and learn how you can join a provincial citizen science project on earthworms. I hope that reading *The Alberta Science Teacher* has some influence on your way of thinking.

I know that time is precious for educators, but I ask you to volunteer a little time and submit an article for the next issue of *The Alberta Science Teacher*. Do you have some great stories or resources to share? Have you attended a fantastic PD activity? Or have you been doing something creative, innovative or inspiring with your students? If you answered yes, then please share your experience. Send your contributions to trinity.ayres@cssd.ab.ca.

Looking forward to the next issue!

Reference

Sagan, C. 1996. *The Demon-Haunted World: Science as a Candle in the Dark*. New York: Ballantine.

Trinity Ayres

Befriending Your Starry, Starry Night

A number of years ago, I was involved in both the instruction of an astronomy course at Medicine Hat College and the operation of the Sunridge Observatory, home of the Medicine Hat Astronomy Club.

In my work with students and with the public, I was almost daily asked questions such as “What stars can you see in the night sky?” “What planets can I see tonight?” and “When can I see the International Space Station?” Back then, I was familiar with the stars and constellations for the various seasons, knew when meteor showers and eclipses would be occurring, and knew where and when you could spot the naked-eye planets throughout the year. It was always fun to pass along this information to students, family, friends and visitors to the observatory.

Now that I am no longer teaching astronomy, my need to know the day-to-day changes in our night sky is not as immediate. When I do have the opportunity to sit back and revisit the night sky, where do I go? I make a quick trip to my favourite astronomy website, Heavens Above (www.heavens-above.com).

Here is what you need to know to get the most out of the website.

First, find your location. If you do not know your latitude and longitude, click on Change Your Observing Location and then enter your city in the search box. When you click your location on the map, you can see your latitude, longitude and elevation. Click Update and then Bookmark This Location to save your location for all those nights you will be stargazing.

OK, what would you like to see? How about a sky chart for your location? Click on either Interactive Sky Chart or Sky Chart. (I am more familiar with the old sky chart because it allowed me to print with a white background, saving me ink. However, the new interactive format can now be printed with the white background. I will base all information here on the newer format.) Select whatever date and time you would like, click Update, and examine your night sky. On the next page is the sky chart for my location for Christmas Day 2016, at 7:00 PM.

Now, you should recognize some of the constellations you grew up seeing: the pair of dippers toward the north; the twins of Gemini to the east, having just risen a few hours earlier; the great hunter Orion, also in the east, below the twins; the W of Cassiopeia almost directly overhead; and, in the west, soon to set below the horizon, our celestial neighbours Venus and Mars. In the west, you will also notice the three brightest stars in our summer sky—Vega, Altair and Deneb—the corners of the Summer Triangle. Summer has long past by December 25, and this asterism is getting ready to set relatively early in the evening. The dashed line is the ecliptic, the path along which the planets of the solar system travel, cutting across the constellations of the horoscope.

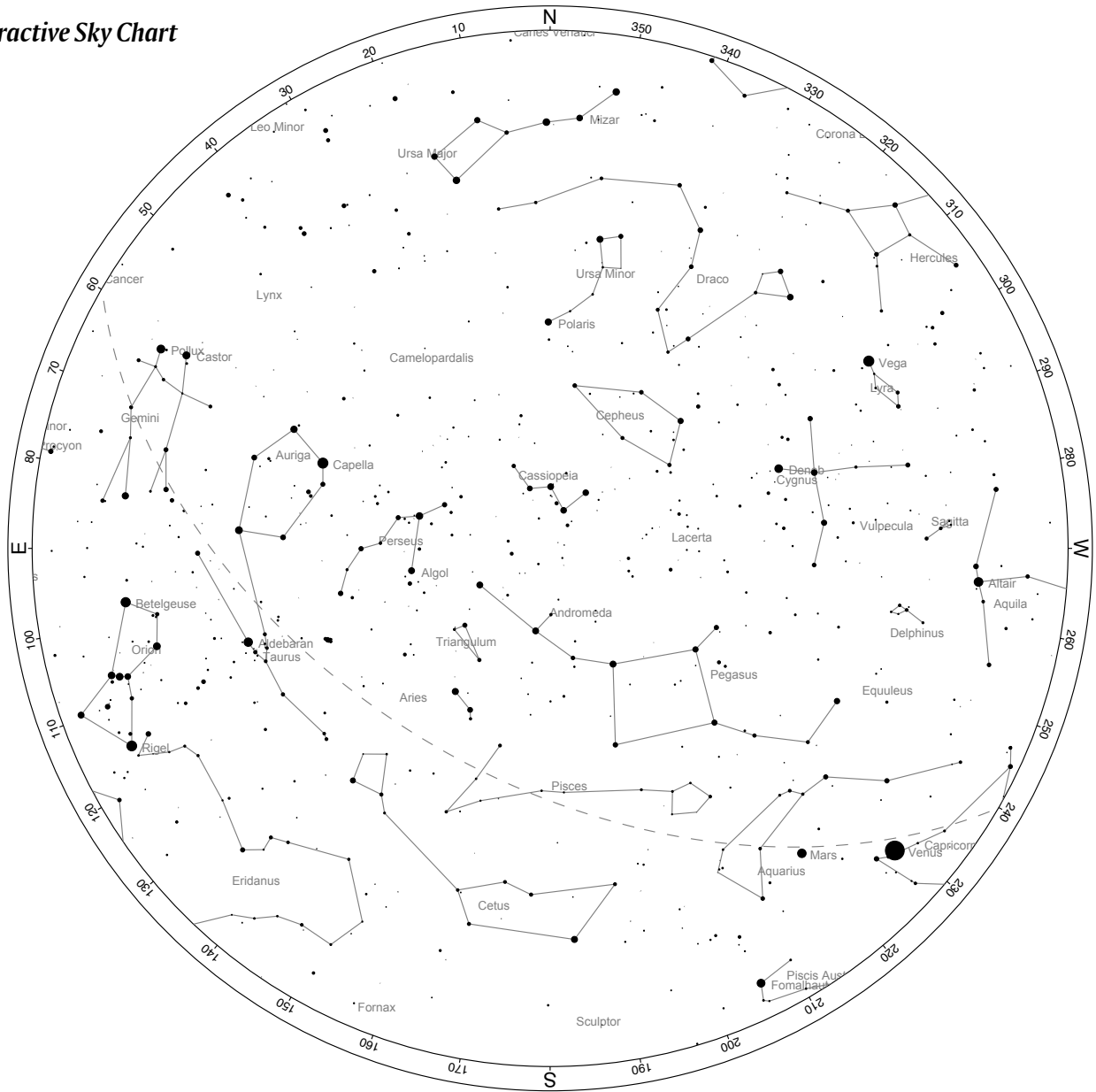
You will notice that as your cursor moves over an object, information regarding that star or planet will pop up. If you adjust the time, you can even find the Sun and the Moon in this map.

By the way, this is a star map, not a road map. Thus, north and south are up and down, as you would expect, but east and west have switched

places, because you are looking upward to the sky, not down at the ground. This can be confusing at first. But if you stand facing south, with north at your back and your chart in front of you with south pointed down, the stars and planets, such as the Sun and the Moon, will rise in the east (to your left) and set in the west (to your right).

On the Heavens Above homepage, click on the Sun, Moon and Planets links to find more information about these bodies. Click on the Comets and Asteroids links for information on these more elusive objects specific to the date and time you have selected. This is helpful if there is a comet that people have been talking about that you would like to spy in the night sky.

Interactive Sky Chart



*Location: Medicine Hat, 50.0009°N, 110.6350°W
Time: 25 December 2016 19:00 (UTC-07:00)*

I love checking out those man-made visitors that pass overhead—satellites. Satellites are easy to recognize because they don't flash red and green (like a plane or jet) and they don't sweep across the sky in a second or two (like a meteor). Moreover, aren't they fun to watch! If you are checking out your night sky from time to time, be sure to catch a meteor shower, such as the Geminids in December (yes, it can be cold) or the Perseids in August (much warmer, but the bugs won't mind staying up with you). Both of these showers offer many shooting stars to observe every hour, as long as the Moon is cooperative. The Daily Predictions for Brighter Satellites section of the website tells you what objects will be passing overhead, including all types of satellites and even the rocket bodies that helped launch them. Click on a highlighted time to see a sky map of the path of the object. Remember that satellites don't produce their own light; they are reflecting sunlight. So when they pass into Earth's shadow, they will quickly disappear from sight, and the path on your sky map will suddenly terminate.

Click on ISS to find out when the International Space Station will be passing over your location. It can be surprisingly bright, so don't mistake it for a UFO! Sometimes you might not have any ISS passes during your evening. Other times you will be able to see the ISS rise in the west and then make its slow pass overhead to the east, taking several minutes to make the trip. If you have an evening pass of the ISS over your location, give the astronauts a wave—but it may be difficult to see them waving back at you!

My favourite of all are the iridium flares. These satellites were named after the chemical element iridium because 77 of the satellites were to be placed into orbit and the atomic number for iridium is 77. They have extremely large solar arrays, which can reflect a lot of sunlight back to the surface of Earth. If you happen to be in the right location on the surface to see the maximum amount of reflected light, you will witness the satellite grow in brightness until it suddenly flashes. The

flash can be extremely bright, perhaps as bright as a first quarter Moon, even though it is coming from such a tiny object. Click on Iridium Flares to see the brightness of each iridium satellite for your location. Perhaps counterintuitively, the smaller the number for brightness (or the more negative the value), the brighter the object will appear, similar to acidity and the pH scale in chemistry. The table even tells you where you can go to see the satellite flash at its brightest. Indeed, the flashes can be so bright that you can even see some in broad daylight! Clicking on the date and time for a particular flare will take you to a sky map that shows you where to look to first spot the satellite and the location in the sky where the flash will occur. For those who have never seen one before, witnessing iridium flares becomes addictive. ("When is the next one?" is what I am often asked.) Even though I no longer teach astronomy, I still post iridium flare details on my office door for my students. After all, I got them hooked in the first place!

There is more to discover at the Heavens Above website. It is a great way to become the expert, in your classroom and with your family, on what is up in the night sky. Tell your students, family and friends, and get them interested in astronomy. Naked-eye astronomy is a free activity. As you and your companions drink your hot chocolate and watch for satellites, you can learn and share stories about the constellations, wonder at the beauty of the aurora, explain the difference between meteors and meteorites, or regale your friends with the story of the night you saw hundreds (nay, thousands!) of shooting stars in a single hour (which, for me, is a true story). Look up at the sky and recall David Bowman's words in Arthur C Clarke's (1968) classic sci-fi novel *2001: A Space Odyssey*—"It's full of stars!"

Reference

Clarke, A.C. 1968. *2001: A Space Odyssey*. London: Hutchinson.

Brad J Pavelich
Medicine Hat College

Hands-On Science: Biology Manipulatives

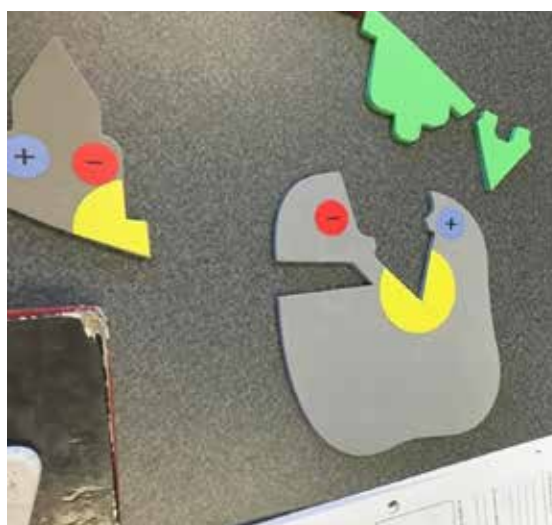
Biology is an amazing subject that teaches students about life and life processes. Some of these concepts we can experience through our eyes and ears; with other concepts, it is hard to get hands-on experience with manipulatives.

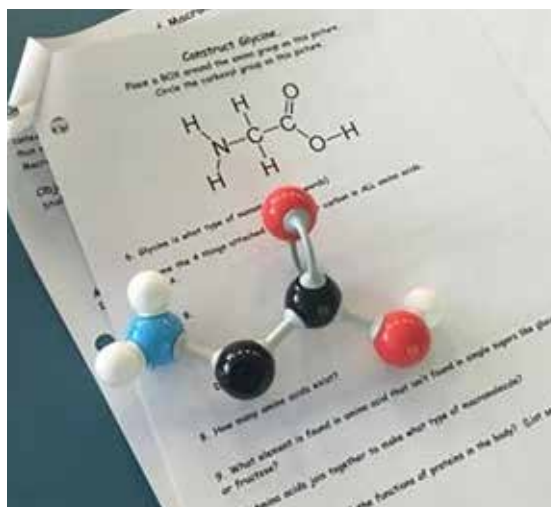
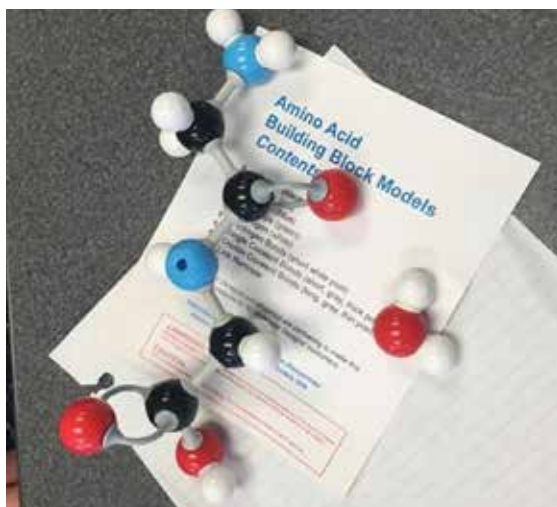
I received Devon Canada's grant for educators, Science Giants, and used it to buy 3-D kits that focus on processes in biological systems. Through moving around the pieces of the kits, students gain understanding of the geometry and orientation of the substrates and molecules involved in the processes. This kinesthetic approach takes students through the processes involved in biological concepts step by step.

The kits are available from 3-D Molecular Designs (www.3dmoleculardesigns.com).

Enzymes in Action Kit

The Enzymes in Action Kit allows Biology 20 students to see the shapes of activation sites for enzymes, how competitive inhibitors block an activation site from enzymes and how noncompetitive inhibitors change the shape of the enzyme surface so that enzymes can no longer bind at the site. Students manipulate the enzymes and molecules to experience a hands-on activity that can usually only be visualized through step-by-step pictures.



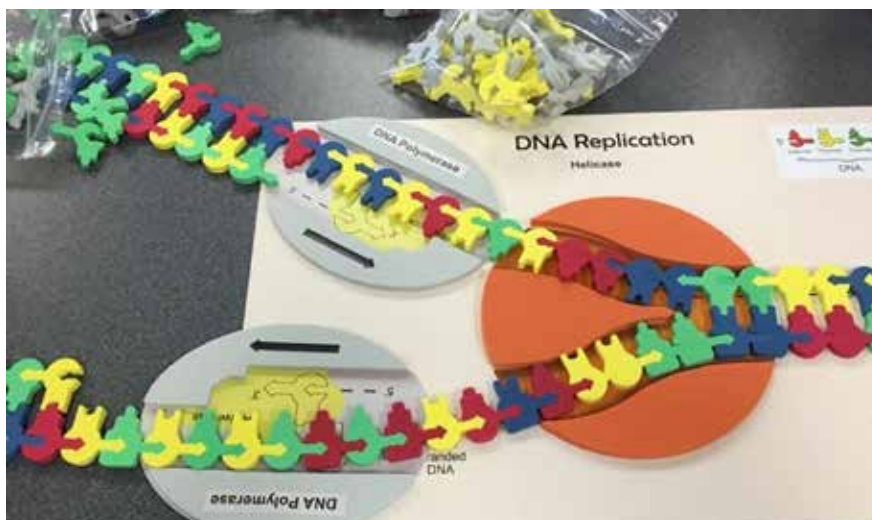


Amino Acid Building Block Models

The Amino Acid Building Block Models are designed to create amino acids, which can then be anabolized to create proteins. They can also form proteins and then be catabolized into amino acids. In Biology 30, students learn about protein synthesis at a molecular level. These models allow them to build the amino acid structures that are synthesized through this process and to work with elements and the bonds made between them. The elements have a different number of holes to represent the bonding sites based on the number of lone pairs available to bond with in their outer (valence) shell. The kits also show students the correct orientation and angles of the elements after they make bonds. This kit can be used in Biology 20 and 30 (the catabolic and anabolic reactions of amino acids) and Chemistry 20 and 30 (bonding of molecules and organic compounds).

Flow of Genetic Information Kit

The Flow of Genetic Information Kit is amazing for breaking down the steps involved in protein synthesis in Biology 30. Students start in the nucleus to build a DNA strand and then make its complementary strand (DNA replication). They then slide the DNA strand along DNA helicase to simulate the breaking of the hydrogen bonds made between the nitrogenous base pairs. Then, they take two pieces representing DNA polymerase to show how nitrogenous bases are added to DNA in the 5' to 3' direction. The shapes of the pieces restrict students from building in the opposite direction, reemphasizing this concept. Students learn that the leading strand runs smoothly, whereas the lagging strand creates Okazaki fragments that must be joined together later.





The next step is transcription. Students transcribe the DNA into mRNA, noting that there are no thymine RNA nucleotides, and will find that pieces of uracil RNA bind with adenine nucleotides, unlike with DNA, where adenine binds with thymine.

Students end their journey on the ribosome, which is located outside of the nucleus in the cytoplasm, to translate their mRNA molecule code into a polypeptide (protein). They must find



the initiator codon in the sequence to begin the protein synthesis. After they find the first AUG codon in their mRNA, they find the anticodon (UAC) that comes to bind with the mRNA. The anticodon carries the amino acid that the mRNA coded for, and a chain of amino acids begins to form as students work together to understand the different processes involved.

Phospholipid and Membrane Transport Kit

Students get hands-on experience working with the cell membrane, phospholipids and the phospholipid bilayer. Biology 30 students also get a look at how the sodium-potassium pump works with gated channels that have slots for three sodium molecules and only two spots for potassium to represent the ratio of exchange on ions in an action potential. This kit is useful for Science 10 and Biology 20 and 30 (cell transport and cell membrane).

I found these manipulatives to be beneficial for my students, and my students had fun too.

Keep engaged, keep moving, keep learning!

Danika Richard
Biology Director



Worm Trackers Needed

Attention Grade 7 teachers in northern, central and southern Alberta.

Are you looking for a way to engage your students in a locally relevant science project that is connected to Alberta's curriculum? Then consider participating in the Alberta Worm Invasion Worm Tracker project.

Worm Tracker is a citizen science project that engages students in gathering and analyzing data for research on invasive earthworms in Alberta. Using a mobile app or the Worm Tracker website (<http://worms.educ.ualberta.ca>), students enter data about earthworm sightings. The data is then immediately available on the website for download and analysis.

The data your students collect will help researchers understand how human activity influences distributions of invasive earthworms, including both the abundance and the types of earthworms. As well, the data will increase our understanding of how earthworm abundance and diversity differ between habitat types (for example, forests, fields and urban areas), as little information is available on earthworm distributions in Alberta.

We have developed curriculum resource materials for the Grade 7 science unit Interactions and Ecosystems. These are available at <http://worms.educ.ualberta.ca/forteachers.html>. Through the lessons, students learn about earthworms, invasive species and Alberta's ecosystems. The lessons also address Alberta's science, technology and society (STS) skill and attitude outcomes. Although targeted at Grade 7, these materials could be adapted for other grades.

Thanks to a grant from the TD Friends of the Environment Foundation, we will be providing a project start-up package to the first 25 classes in the northern, central and southern regions of Alberta that register on our website ([The image shows a screenshot of the 'Worm Tracker' website. At the top, it says 'Alberta Worm Invasion'. Below that, the words 'WORM TRACKER' are written in large, bold letters, with 'WORM' in red and 'TRACKER' in black. The background is a light green map of Alberta. A magnifying glass with a black handle is positioned over the map, focusing on a small orange worm. Below the map, there are two green buttons with white text: 'Start Sighting' and 'About Worm Tracker'.](http://worms</p></div><div data-bbox=)

[.educ.ualberta.ca/group-signup.php](http://worms.educ.ualberta.ca/group-signup.php)). The package will include a class set of materials for conducting earthworm surveys. Participating teachers will be asked to complete a survey at the end of the school year to evaluate how the project is being used in schools and to provide us with feedback on how the project and resources could be improved.

By signing up, you will also have the opportunity to join our project mailing list, to participate in online conversations with earthworm researcher Erin Cameron and to download your class's data.

If you have any questions or would like more information, please contact Jerine Pegg at worms@ualberta.ca.

Jerine Pegg
University of Alberta



Diversity • Equity • Human Rights Diversity • Equity • Human Rights

Specialist councils' role in promoting diversity, equity and human rights

Alberta's rapidly changing demographics are creating an exciting cultural diversity that is reflected in the province's urban and rural classrooms. The new landscape of the school provides an ideal context in which to teach students that strength lies in diversity. The challenge that teachers face is to capitalize on the energy of today's intercultural classroom mix to lay the groundwork for all students to succeed. To support teachers in their critical roles as leaders in inclusive education, in 2000 the Alberta Teachers' Association established the Diversity, Equity and Human Rights Committee (DEHR).

DEHR Committee aims to assist educators in their legal, professional and ethical responsibilities to protect all students and to maintain safe, caring and inclusive learning environments. Topics of focus for DEHR Committee include intercultural education, inclusive learning communities, gender equity, UNESCO Associated Schools Project Network, sexual and gender minorities.

Here are some activities the DEHR Committee undertakes:

- Studying, advising and making recommendations on policies that reflect respect for diversity, equity and human rights
- Offering annual Diversity Equity and Human Rights Grants (up to \$2,000) to support activities that support inclusion
- Producing Just in Time, an electronic newsletter that can be found at www.teachers.ab.ca; Teaching in Alberta; Diversity, Equity and Human Rights.
- Providing and creating print and web-based teacher resources
- Supporting the Association instructor workshops on diversity



We are there for you!

Specialist councils are uniquely situated to learn about diversity issues directly from teachers in the field who see how diversity issues play out in subject areas. Specialist council members are encouraged to share the challenges they may be facing in terms of diversity in their own classrooms and to incorporate these discussions into specialist council activities, publications and conferences.

Diversity, equity and human rights affect the work of all members. What are you doing to make a difference?

Further information about the work of the DEHR Committee can be found on the Association's website at www.teachers.ab.ca under Teaching in Alberta, Diversity, Equity and Human Rights.

Alternatively, contact **Andrea Berg**, executive staff officer, Professional Development, at andrea.berg@ata.ab.ca for more information.



The Alberta Teachers' Association

www.teachers.ab.ca

The Science of Success: Reaching Potential



ATA Science Council

November 17-19, 2016

Banff Conference Centre

Register at: [event-wizard.com/
ScienceOfSuccess/0/welcome](http://event-wizard.com/ScienceOfSuccess/0/welcome)



**Hayley
Wickenheiser**

4x Olympic Gold Medallist
Motivational Speaker

 @ATASciCouncil



Dr. Maria Sirois

Positive Psychologist
Author



Program Highlights:

- New format featuring IDEA talks and workshops
- Friday evening social with banquet, awards, and live music
- Organized activities including yoga, volleyball tournament, nighttime astronomy, and more!

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