

Grade: Grades 9-12	Subject: Science	Unit: Strand A
Title: Career Connection – An Interview with Dr. Warren Wakarchuk		
<p>Rationale:</p> <p>Teachers are so busy teaching the core content of the curriculum that they do not realize that students are a little lost when it comes to discovering science careers beyond medicine (doctor, nurse, dentist, and physiotherapist) and science teacher. Introducing students to science careers does not need to involve a large, time-intensive project – this five (5) minute career interview, with a student-ready handout, can quickly introduce students to a fascinating and little-known area of carbohydrate research called glycobiology.</p>		
<p>Background Information:</p> <p>The Wakarchuk lab at Ryerson University (under the umbrella of GlycoNet) is a carbohydrate research lab that uses enzymes for therapeutic purposes. These purposes include:</p> <ul style="list-style-type: none"> • The use of enzymes to add sugars to protein drugs to make these drugs last longer (persist) in the bloodstream, thereby reducing dosage, side effects and cost • Adding sugar molecules to cultured neuronal cell surfaces using enzymes, so that these modified neurons will find their way to where they are needed when given to Parkinson’s patients • Researching how to make these proteins using bacteria (rather than maintaining expensive mammalian cell lines) <p>For further information about GlycoNet (or other resources), go to http://canadianglycomics.ca/ and select Training> High school resources. For further information about the research done in the Wakarchuk lab, go to http://www.ryerson.ca/glycoscience/.</p>		
<p>Curriculum Connections:</p> <p>Science Investigative Skills and Careers – all grades 9-12</p> <p>A2.1 identify and describe a variety of careers related to the fields of science under study (e.g., zoologist, botanist, geneticist, ecologist, pharmacologist, farmer, forester, horticulturalist) and the education and training necessary for these careers.</p> <p>A2.2 describe the contributions of scientists, including Canadians (e.g., Colin D’Cunha, Louis Bernatchez, Lap-Chee Tsui, Helen Battle, Memory Elvin-Lewis), to the fields under study</p>		

Lesson Objectives/Concepts: Students will learn about the positives and negatives of a career in glycobiology

Materials:

- projector
- laptop computer & speakers
- “Career Connection Worksheet – SR” copied to distribute to students
- “Career Connection Worksheet” Answer key

Time: 30 minutes

5 minute video and 25 minutes for discussion and/or work on the worksheet

Career Connection Interview – Dr. Warren Wakarchuk, Ryerson University

1. Play the video <https://vimeo.com/227663014#at=0> and stop it after 2 minutes.
2. Have pairs letter themselves Partner A and Partner B.
3. Have Partner A ask Partner B the first question. Partner B answers.
4. A and B switch roles.
5. Play video for another 2 minutes. Repeat steps #3 and #4.
6. Play the rest of the video and repeat steps #3 and #4.
7. Roll a pair of dice (or some other random selection device) and select a few students to share their answers as well as other reactions that they may have to the video.
8. Some additional questions for the teacher to ask the students are:
 - Was there any part of the interview that surprised you?
 - Do you think that you would like to have his job? Why or why not?
 - Is this an area of Biology or Chemistry or Biochemistry?
 - What is Biochemistry?
 - Can you envision yourself as a research scientist?

Summary: Students can listen to the five minute video of GlycoNet Network Investigator Dr. Warren Wakarchuk as he answers questions during this career interview. Students discuss questions from the worksheet and everything is wrapped up after students share some of their ideas from follow-up questions.

Assessment: Informal Assessment of Learning while taking up discussion questions.

Extensions

This career interview can be used as a lead-in or paired with a number of other resources from the GlycoNet website, such as:

- 1) Amazing Lactase-ing – a lesson series which culminates in students creating lactase-embedded sodium alginate beads and using them to remove lactose from milk.
- 2) Envisioning the Career Journey Ahead – a lesson series in which students view video clips of scientists from the Wakarchuk lab, create a career cluster and make an Adobe

Sparks Narrated Slideshow of their chosen career path.

- 3) Separation Exploration – lesson series in which scientists from the Wakarchuk lab talk about the laboratory techniques that they use, followed by an Ink Chromatography Inquiry (Gr. 9) or a DNA Extraction Inquiry (Gr. 11/12 Biology).

Answer Key:

Curriculum connections:

Connects to Strand A of any science course but probably best shown in Gr. 9 Science, Gr. 10 Science or Gr. 11 or 12 Biology. All of these have expectations around careers and current research.

Overall expectation Gr. 9-12

A2. Identify and describe careers related to the fields of science under study, and describe the contributions of scientists, including Canadians, to those fields.

Watch the video <https://vimeo.com/227663014#at=0> and answer the following questions:

1. **Dr. Wakarchuk's area of study is described as glycobiology. What is this? What do the sugars that he researches do and why are they important?**

Glycobiology is the study of how sugars are important in biology. These sugars are cell surface markers that mediate communication between cells.

2. **What are biofuels? How can they be used as a source of energy?**

Breaking down cellulose produces fermentable sugars that could be turned into a fuel source in the form of ethanol.

Students can research about the gasoline oil crisis of 1979 where there was a decrease in the production of oil after the Iranian Revolution, which led to increased prices and oil shortages. Biofuels could be the answer to the gasoline crisis because it became clear that it would be good to have other sources of fuel so that the world would not have to be so reliant on oil from the Middle East. Also, at some point fossil fuels will run out since they are a non-renewable source of energy.

3. **What does he mean when he says that "building them up (molecules) is far more interesting than breaking them down?"**

Dr. Wakarchuk thinks that adding glycans to proteins for therapeutic use (medical use) is more interesting than breaking them down to release energy for fuel consumption.

- 4. Does it surprise you that Dr. Wakarchuk says that a PhD is a minimum for his job but the discipline is not crucial (Biology, Chemistry, Biochemistry, Medical Physics)? Why does he say this?**

He says that you need to have done independent research for 4-5 years in order to hone your own ideas about how to do research. Also, he doesn't say this in the video but a large part of his job with the research team is to guide their research and provide mentorship.

- 5. There are two skills that Dr. Wakarchuk mentions as being important to being a principal investigator. What are they and why are they important? Do you possess these skills? Are they appealing skills to have?**

He asserts that mental skills are the most important: curiosity and perseverance. He says that one needs to be driven by curiosity and you need to be able to keep going despite challenges to "get to the next level."

The rest of the answer will vary depending on the student.

- 6. What is medical physics? Use the Internet to search for the answer.**

Answers may vary. Generally, medical physics is the application of physics concepts in a medical setting. In a hospital setting, a person would be involved in diagnostics, radiology or oncology.

- 7. a) Dr. Wakarchuk says that the best part of the job is that he works with people that are interested in "finding out stuff." Is that a driving force in your life? In your life as a student, what is the motivating force? b) Reflect: As you move into the working phase of your life, what do you want the motivating force to be?**

Answers will vary.

- 8. When asked about the best and worst aspects of the job, Dr. Wakarchuk mentions that he is an introvert. Do you think that certain jobs involving people are best done by extroverts? What is an introvert (do some internet research to answer this)? What is an extrovert? Who role does this characteristic play in your choice of career?**

Answers may vary. Generally, extroverts gain energy from interacting with people and introverts need time to themselves to restore their energy. That said, introverts can be excellent in careers that involve interacting with people a lot, if they have enough time by themselves. They tend to be good listeners and very reflective and that is an important part of managing people, for example. There is not one type of person that would excel at any particular job. That said, an extrovert would find the people part of a job like teaching very

fulfilling. People often do not consider personality type enough in choosing careers. It should be considered along with strengths and interests.

9. Describe the moment that turned Dr. Wakarchuk onto science. Do you love science? If so, what do you love about it? Did you have a moment like his?

He describes a moment in Grade 9 Science where his teacher, Mr. Haliwell, did a cloud chamber experiment with an alpha particle radiation source. At that moment he realized that science is so cool and decided to make a career out of it.

Answers will vary for the rest of the questions.

10. What is the role of failure in science and the scientific method, according to Dr. Wakarchuk?

It comes back to testing something. If something that you are testing isn't true, then it will fail. Alternatively, sometimes you have to tweak something and try again. Failure is an integral part of the scientific method.