

THE RIGHT EQUATION FOR AFRICA

How the African Institute for Mathematical Sciences is helping shape the continent's future

POSTED BY NIKI WILSON ON MARCH 15, 2016

As a young Zimbabwean biology teacher about to become a student at the African Institute for Mathematical Sciences (AIMS) in Cape Town, South Africa, in 2004, Tendai Mugwawa had no idea that her time there would radically change the course of her career. Ten months of intense study would fuse her passion for math and biology, and ignite a desire to eradicate the diseases that plague her country. She would go on to earn a PhD in theoretical immunology, and ultimately work for Public Health England, where she now develops mathematical models that are used to understand and control tuberculosis outbreaks.

It's important work, but also a stepping-stone. "My ambition is to be on the team that makes policy to control disease," she says. "For example, in situations like the outbreak of Ebola in North Africa." Like many graduates of the institute, Mugwawa eventually wants to put her skills to work in Africa. She's already taking leaves from Public Health England to teach as a sessional instructor at the Cameroon branch of the institute, in the capital, Yaoundé.

AIMS is the brainchild of Neil Turok, an awarding-winning physicist and the director of the Perimeter Institute for Theoretical Physics, in Waterloo, Ont. Turok grew up in South Africa until his family was exiled for publically opposing apartheid in 1966. As a 17-year-old in the mid-1970s, Turok returned to Africa and became a volunteer teacher in Lesotho. His experiences with bright young students convinced him to create a place where Africans could cultivate skills to solve African problems.

What started out as one facility in South Africa in 2003 has led to four more across the continent, in Tanzania, Cameroon, Ghana and Senegal. This expansion is part of the Next Einstein Initiative, which started in 2008 and is one of the institute's core programs. Its purpose is to open 15 more branches of the institute across Africa by 2023. Through the program, the institute envisions that "people of rare ability — Africa's own Einsteins — will emerge, capable of innovative breakthroughs to transform Africa's future."

Through its International Development Research Centre, Canada is one of many governments supporting this expansion. AIMS also benefits from the support of universities such as Cambridge and Oxford, and academic patrons such as Stephen Hawking.

With increased capacity, the list of successful alumni tackling everything from disease control to economics continues to grow. So far, 960 students from 42 African countries have graduated — 31 per cent of them women. These students



Students from the African Institute for Mathematical Sciences outside the organization's building in Cape Town, South Africa. The institute is a pan-African network of centres of excellence for postgraduate education, research and outreach in mathematical sciences, with locations in Senegal, Tanzania, Cameroon and Ghana. (Photo: AIMS/Yasmin Hankel) (Photo: Yasmin Hankel)

have had the benefit of world-class lecturers, including Jeff Orchard, a computer scientist from the University of Waterloo.

Orchard is interested in how the brain works, particularly in the mechanisms that underlie how the brain is organized and how it moves information around. He studies this at the level of neurons, and develops computer programs to simulate neural activity. In 2012 and 2014, he offered a course at the institute in South Africa that explained the math and computing science behind the programs.

Most students come to the institute with some kind of math background, and lecturers such as Orchard are brought in to build on that in a number of disciplines, he explains. "Last time as I was arriving, a team of scientists from Austria and the United States were just leaving, having taught a course on insurance," he says.

All topics, however broad, are connected through the application of math skills. "Math is the universal language of science," says Orchard. "With a math degree what you get is very careful, abstract thinkers that can take a problem, put it in a broader context and solve a broader problem."

For Orchard, though, the institute is about much more than academics. He says the sense of community that came from eating, working and living with all the other students and faculty was one of the highlights of his time there.

Mugwawa believes her experience at the institute changed the way she viewed science. "Before, I used to see mathematics as a set of problems that needed solving," she says. "But now it is a set of tools that I can use to solve other life problems."

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READING AS THINKING

Answer the following in complete sentences.

1. Find three essential ideas in the article. Include two important details to support each of the main ideas.

ESSENTIAL IDEA	IMPORTANT DETAIL	IMPORTANT DETAIL
1.		
2.		
3.		

2. The title of the article is “How the African Institute for Mathematical Sciences is helping shape the continent's future.” Provide evidence from the article that supports the idea that AIMS is shaping Africa's future.

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3. Become an image detective. Look at the picture and complete the following.

PICTURE	DETECTIVE WORK
What do I observe? (Some ideas include who is in the picture, where it was taken, poses, colours, locations of objects and size of objects.)	
What personal connections can you make to the picture? What does it remind you of?	
Write down one word that you think of when you look at the image.	
Why do you think this picture was chosen for the article?	

4. Design a Twitter post promoting AIMS as an educational option for students in Africa. The post should include:

- One hashtag (#)
- One relevant mention (@)
- One idea for a theme for a powerful picture to include with your tweet

5. Defend the importance of applying mathematics to solve African problems. Support your answer with at least one quote from the article.

6. Assess the importance of bringing in lecturers from a number of disciplines to teach at the institute.

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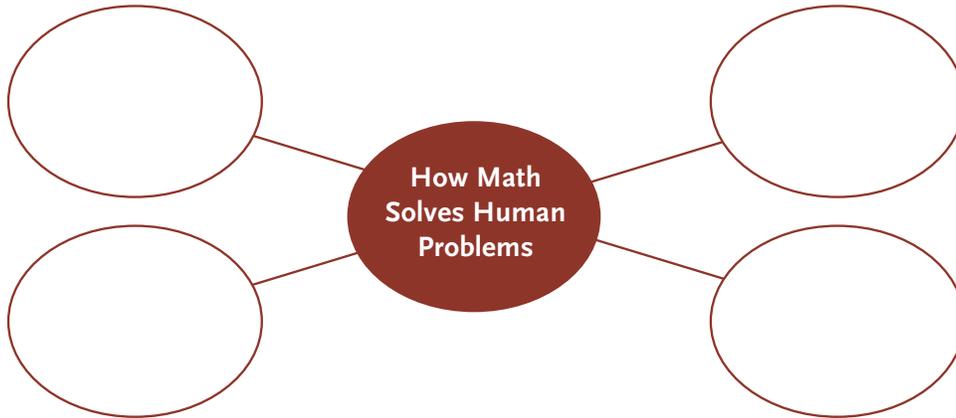
7. One of Neil Turok's goals is to expand the AIMS centres geographically. What is the significance of this expansion for Africa?

Think-Pair-Share

8. *Think*

- a. How has this article changed your perspective on the application of mathematics to solve real-world problems?

- b. Brainstorm a number of ways that math is being used around the world to tackle human problems.



- c. Create your own definition of geography. Keep in mind that geography is multi-faceted. Explain two ways that math and geography are connected.

Pair

Share and discuss your answers in a small group.

Share

Discuss your answers as a class.

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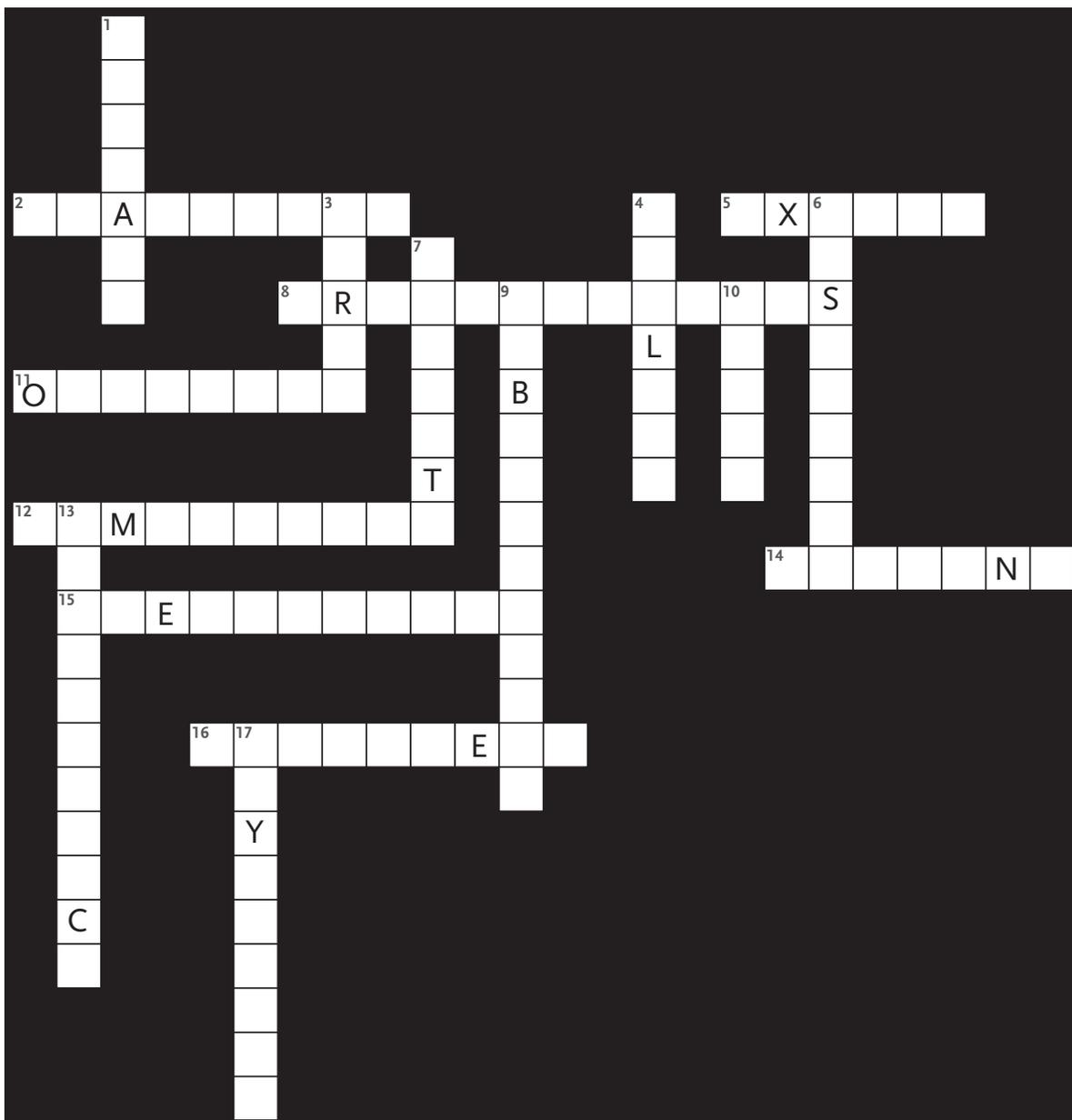
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ONLINE

1. Learn about the partnership between the [IDRC](#) and AIMS. Be sure to watch the video [AIMS Global Alumni Reunion 2013](#).
2. Learn more about [AIMS](#). In which city is the Canadian AIMS-NEI chapter located in?
3. Watch the TEDx talk, [Neil Turok: My wish: Find the next Einstein in Africa](#).
4. Read about Neil Turok winning the [2016 Tate Medal for International Leadership in Physics](#).
5. View the video [AIMS for Africa Movie](#).
6. Jeff Orchard, from the University of Waterloo, speaks about his time [teaching at AIMS](#) in this video.
7. Using Google Maps, find the African countries where the AIMS centres are located: [Cameroon](#), [Ghana](#), [Senegal](#), [South Africa](#), and [Tanzania](#). Notice the geographical distribution of the centres.
8. Learn one new thing about [Tendai Mugwawa](#).

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CROSSWORD:

Across

2. To eliminate
5. Being kept away from their own country
8. Important discoveries
11. A sudden appearance of a disease
12. The study of how the body fights disease
14. Brain cells that send and receive messages
15. Based on theory
16. A former system of racial discrimination in South Africa

Down

1. A Zimbabwean who researches tuberculosis outbreaks
3. AIMS is the brainchild of this award winning physicist
4. The scientific study of the natural processes of living things
6. African _____ for Mathematical Sciences
7. Group of teachers
9. An infectious disease that can attack the lungs
10. One of the AIMS facilities is located in this country
13. The science of numbers, shapes, and space
17. A person who studies physics