TED Connection:
The shark-deterrent wetsuit

Overview
Mensa for Kids' TED Connections are short, easy to use guides that help teachers, parents and youth use TED talks in a classroom or home setting. Rather than a lesson plan format, they have a list of discussion questions, all at higher levels of thinking.

Ocean swimmer and businessman **Hamish Jolly** shares how his company used science to create a shark-deterrent wetsuit. What sharks see influences what sharks attack, and delving into the science of what sharks see can save lives.

A message from Hamish Jolly:

G'day guys. There's something about sharks and about science that really captures the imagination, even more so when you combine the two. I was very fortunate that the TED Talk team found this talk worthy of TED.com, but I think part of the reason might be that the talk highlights how a simple solution can sometimes be hiding in plain view — especially when it comes to taking cues from evolution and biomimicry.

I reckon what's also really important is that a breakthrough in thinking often happens, not by diving ever more deeply into an arcane, narrow technical subject, but through the collaboration of different disciplines to bring about a whole new perspective. Think Leonardo da Vinci and some of the history's most pivotal inventions. Da Vinci was a master of this multi-disciplinary approach.

It's early days with this new technology, but we're on a journey testing theoretical science and ideas with some of the world's biggest predators. Science applied in one of the coolest ways possible. Enjoy.

WATCH THE TED TALK AT:
ted.com/talks/hamish_jolly_a_shark_deterrent_wetsuit_and_it_s_not_what_you_think
or bit.ly/shark-wetsuit

Think about it

1. Hamish Jolly says, "Science starts with observation, but the trick is to identify the patterns and signatures we might otherwise dismiss as myth or coincidence, and test them with scientific rigor. And when we do, the results will often surprise."
What can you think of that once seemed like myth or coincidence and now is known to be true? How can scientists avoid dismissing seemingly coincidental data?

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2. They were motivated by five fatal shark attacks in a 10-month period in Western Australia, as well as the rising rate of shark engagements. Australia has the highest rate of fatalities from shark attacks of any country. Think about where you live. What are challenges faced in your area that might motivate people there to look for unique solutions?

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3. Jolly says that they were led to the science of what sharks see, and that science can be as powerful as a translator as it can be for invention. In what ways was science a translator between humans and sharks in this situation?

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4. After the first two fatal attacks, Jolly was having dinner with Harry Butler, a famous naturalist, and Jolly asked him, "What's the solution?" Butler suggested banding a black wetsuit in yellow, mimicking species that use this to warn possible predators. That ended up leading to the development of one of the two kinds of suits. What is a possible lesson here for other scientists and researchers?

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5. Professors Nathan Hart and Shaun Collin were the researchers who explored how predatory sharks find prey. Dr. Hart is an expert in comparative neurobiology of the retina, and Dr. Collins studies comparative neurobiology and vision. Both of these areas of interest are very narrow. What are the pros and cons to having to narrow your field of expertise as you advance in your discipline?

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6. The suits come in two designs: the "don't eat me" suit that confuses the shark, and the cryptic suit that hides the wearer, causing them to disappear fully or partially, designed for swimmers in deeper water. Can you think of another kind of suit that would be useful? Who else might encounter sharks?

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7. According to Jolly, the three main predatory shark species are the Great White, the Tiger, and the Bull. They mapped the characteristics of these types of sharks, looking at what they could see at different depths, under different conditions, and in differing levels of water clarity. They wanted to discover what patterns would hide the wearer or provide contrast to break up the profile. What else could they do that would disguise or confuse a shark?

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8. Jolly said that they could not use even fake humans to test the suit. Why would that be?

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9. To test the efficacy of the suit, they put bait in a neoprene skin. The control rig was a black neoprene rig that looked like a regular wetsuit, and in the video you see the Tiger shark attack that. The Great White shark circled the bait in the rig that mimicked the new design because it could smell the bait, and then it swam to the bottom and came up, but did not attack. After seeing this video, how comfortable would you be swimming in one of the suits where you knew there were sharks?

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10. Ray Smith, the original Quicksilver brand designer, designed the suit, interpreting the science into the suit. How do you think designing this kind of suit would be different from designing a typical wetsuit? What do you think the design challenges would be in both scenarios?

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11. Jolly says the Wright brothers didn't invent flight, they replicated in way that humans can use. What is something that animals do that you think humans could replicate if adapted?

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12. The suits were designed to protect swimmers. How do they also potentially benefit sharks?

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Do it

● Read through the statistics about shark attack at bit.ly/shark-attack-stats. Using Infogr.am or another infographic creator tool, create an infographic about shark attacks. Include at least one map and two images, in addition to the statistics. Watch a tutorial at bit.ly/infographic-tute.

● In addition to the wetsuits, they also have accessories such as surfboard stickers in the same patterns. What accessories do you think swimmers or surfers might need with shark-deterrent designs? Describe and sketch one.

● Make a shark out of origami. Find directions at origami-instructions.com/origami-shark.html.

● TEDCO Toys makes a makes a 4D Vision model of a Great White shark that you can build.

● Visit the Global Shark Attack File at sharkattackfile.net. Read the list of recommendations and the species involved in attacks. Create a poster or brochure sharing this information geared to an audience of young people. Use either paper or an online poster maker such as postermywall.com.

Read about it

● *Discovery Channel Sharkopedia: The Complete Guide to Everything Shark*

● *The Shark Handbook: The Essential Guide for Understanding the Sharks of the World* by Greg Skomal

● *Sharks and People: Exploring Our Relationship With the Most Feared Fish in the Sea* by Thomas Peschak

● *Sharks of the World (Princeton Field Guides)* by Leonard Compagno, Marc Dando and Sarah Fowler

Watch it

- Watch the video of the shark test of the suits at bit.ly/shark-test.

- National Geographic has two videos you can watch on its website about sharks and people. The first is called *Jaws — The Real Story* (bit.ly/natgeo-jaws), and the second is called *Death Beach* (bit.ly/natgeo-deathbeach).

- Discovery Channel celebrates Shark Week each year, and you can watch a number of videos on its site at bit.ly/disc-sharkweek.

Surf it

- Visit Jolly's company's website: sharkmitigation.com. Be sure to read more about the science behind the suits at sharkmitigation.com/the-science.html.

- The National Oceanic and Atmospheric Administration shares a full range of information about sharks on its website bit.ly/noaa-sharks.

- Visit the Shark Research Institute website (sharks.org) to find out more about how people are working to protect sharks, along with lots of other information about sharks.