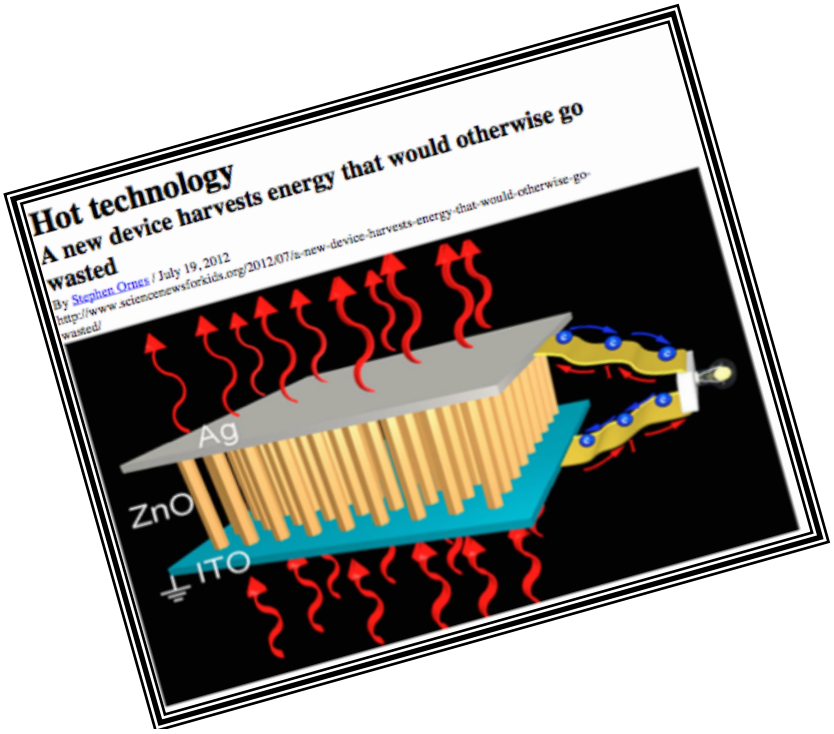
Close Reading and Text Dependent Questions in Science
Hot Technology (Physics – HS)

The text selection, *Hot Technology,* can be found at the following link: http://www.sciencenewsforkids.org/2012/07/a-new-device-harvests-energy-that-would-otherwise-go-wasted/

We apologize that we cannot include this reading directly; it is copyrighted material and we do not have special permissions that would allow us to post it publically. If you have difficulty accessing this article at the site above, please check the **Science Page of Aspen/SIS** for assistance accessing it.



Look in the Student Learning Outcome (SLO) Documents for guidance on when this should be taught. These can be found on the BPS Science Department's website: http://bpsscience.weebly.com/ You will find the Student Learning Outcomes documents organized there by grade level.

Hot Technology (Physics – HS)
Student Questions

1. Describe the author's use of language in the title and state why you think he decided to use such language.

2. The opening paragraph presents several examples meant to illustrate the same thing. How does the author relate the ideas in paragraph 1 to paragraph 2?

3. What phenomenon provided the inspiration for Wang to create his device. Explain the purpose of Wang's device and how it works.

4. What was Wang's motivation for making the device?

5. What is the relationship between temperature and the flow of electrical current in the device highlighted in this article, and relate this to why zinc oxide is a crucial material in the device.

6. What explanation for zinc oxide's properties does the author offer?

7. Compare how we will currently be able to use Wang's innovation to how companies and industries will utilize Wang's device in the future as the technology advances and improves? Justify your answer with evidence from the text.

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Sample Answers

1. **Describe the author's use of language in the title and state why you think he decided to use such language.**
   The author uses catchy familiar terms like hot technology, and terms such as harvest and wasted, which readers can connect with other concepts they know, and to concepts explored in the article. The author does this to try to make the article appealing and approachable to the reader.

2. **The opening paragraph presents several examples meant to illustrate the same thing. How does the author relate the ideas in paragraph 1 to paragraph 2?**
   Paragraph 1 gives several examples that inform the reader that much energy is often "wasted" as heat (i.e. that energy is not used for work). Paragraph 2 addresses how the researcher is attempting to create a device to be able to use this wasted heat energy.

3. **What phenomenon provided the inspiration for Wang to create his device? Explain the purpose of Wang's device and how it works.**
   Some energy in a device is converted to heat that cannot be used by the device to power it. Wang wanted to be able to use this wasted heat energy to power the device some more. He came up with a device that looks like a double-backed hairbrush, with wires attached to the device's flat metal backs. The material used is zinc oxide that is pyroelectric and generates electricity from changes in temperature. This current of electricity can be used to power small devices.

4. **What was Wang's motivation for making the device?**
   As energy is used by device, much of that energy is converted to heat, which is not used to do any useful work. Wang was motivated to create this device so that the heat energy that is normally wasted can be used to do more work.

5. **What is the relationship between temperature and the flow of electrical current in the device highlighted in this article, and relate this to why zinc oxide is a crucial material in the device.**
   Temperature changes in pyroelectric material create an electrical current. As it heats up, electricity flows in one direction. As it cools, electricity flows in the opposite direction. Zinc oxide is a pyroelectric material, thus making it a necessary material for incorporation into this device.

6. **What explanation for zinc oxide's properties does the author offer?**
   It has an unusual arrangement of atoms in its molecules. This gives it pyroelectric properties.

7. **Compare how we will currently be able to use Wang's innovation to how companies and industries will utilize Wang's device in the future as the technology advances and improves? Justify your answer with evidence from the text.**
   The text states that currently, the device can only produce a "trickle" of electricity, so it can only be used to power very small devices. In the near future Wang hopes to be able to power cameras, cell phones, etc., and, as technology advances perhaps we may someday be able to power large appliances such as refrigerators or even cars!