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From Cave Art to Cryonics

A quick scan of the books that students carry around in school reveals a plethora of young adult (YA) fantasy and science fiction titles. *Insurgent* (Roth, 2012), *The Scorch Trials* (Dashner, 2011), and *The Rise of Nine* (Lore, 2012) seem to be current favorites. However, some students just do not enjoy science fiction, despite the popularity of books such as *Matched* (Condie, 2011) and *Hunger Games* (Collins, 2010), and the seemingly endless sagas of vampires and wizards. Some students simply prefer to read nonfiction, especially the kind of "true stories" that make them gasp and ask, "Is that really true?"

The good news is that the number of quality, nonfiction books for students is burgeoning. No matter the topic, from cave art to cryonics, a universe of new titles has the potential to invigorate the classroom with fresh perspectives. As with literary fiction, a primary criterion for the selection of nonfiction texts is the quality of the writing. In our classrooms, we like to integrate YA nonfiction with contemporary trade books, selected online articles, videos, news stories, websites, and as much relevant art, music, and sensory stimuli as we can find. Routinely using sensory stimuli (usually from the Internet) in conjunction with print nonfiction encourages students to move from reading to understanding, and at the teacher's discretion, to research and creative projects.

Pondering the Future

Several recent YA dystopian novels postulate about the ways that innovations in microbiology could go awry. For example, in *Wither* (DeStefano, 2011), scientists who are trying to eradicate disease accidentally program a shorter lifespan into the DNA of humans so that women die at age 20 and men die at age 25. In *Pretties* (Westerfeld, 2010), characters pop pills to remain perpetually beautiful and "bubbly." It is a dose of tracker jacker venom that convinces Peeta that assassinating Katniss is the right thing to do in *Mockingjay* (Collins, 2011). While such speculations about trends in microbiology may seem bizarre, they are no more incredible than actual developments, which include tiny brain implants that dramatically increase intelligence and nanoparticles that, once injected into the bloodstream, detect and cure human disease at the cellular level before it starts.

These developments, along with hundreds of others (including spacecraft crafted to the size of a sewing needle) are featured in *Physics of the Future* (Kaku, 2011a). Recently, when I brought a two-page excerpt from Kaku's book, entitled "Life in 2100" (Kaku, 2011b), that proclaimed that "the Internet will be in your contact lens," "cars will be driverless," and "the robot industry will dwarf the size of the current automobile industry" (pp. 45–46) to an eighth–grade English class, students actually attempted to pry the article out of my hands so that they could read it. The article also generated enthusiasm among students in a twelfth-grade Advanced Placement class. In the AP class, one student commented that he hoped a driverless car would improve the road habits of elderly drivers; another student predicted that school administrators would likely prohibit Internet-ready contact lenses, as they had already banned cellphones.

While it can be useful to pair YA literature with YA and adult nonfiction with similar themes (Walther & Fuhler, 2008), the oeuvre of nonfiction is sufficient-

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46-52 ALAN-Fall13.indd 46 8/8/13 12:49 PM

ly compelling to constitute a worthwhile area of study all its own. Researchers interested in student engagement have long established that students are more likely to read when topics are related to their own lives (Gambrell, 2011; Guthrie, Wigfield, Metsala, & Cox, 1999; Wang & Holcombe, 2010). Perhaps nothing is more relevant to the lives of adolescents than the future and their prospective place in it, so we built a unit around an exploration of the future.

Futurist and inventor Kurzweil has written several books (2005, 2012) and created a website as a forum for discussing the future. The KurzweilAI website (www.kurzweilai.net) brims with free articles, books, and videos. The Web address of the site combines inventor Kurzweil's last name with AI or "artificial intelligence," though the site says that AI stands for "accelerating intelligence." Recent offerings include stories about a robot programmed to clean and tidy up, a forthcoming manned flight to Mars in 2033, the benefits and liabilities of a swarm of artillery-enhanced drones, and three-dimensional avatars (one is Princess Leia from *Star Wars*) who are soon going to greet tourists in New York City airports.

Kurzweil is famous for making outlandish predictions about the future, so an initial reaction to his website might be a roll of the eyes. However, for those who bother to track his predictions, Kurzweil's record is quite impressive (Kurzweil, 2013). In fact, in a 148-page update on the accuracy of his predictions, he writes,

> I made 147 predictions for 2009 in ASM [the book *Age of Spiritual Machines*], which I wrote in the 1990s. Of these, 115 (78 percent) are entirely correct as of the end of 2009, and another 12 (8 percent) are "essentially correct" —a total of 127 predictions (86 percent) are correct or essentially correct. Another 17 (12 percent) are partially correct, and 3 (2 percent) are wrong.

Kurzweil is also famous for saying that the individual who will live to be 150 years old is alive today. He confesses that he is trying to stay alive as long as possible because he believes that, relatively soon, new breakthroughs in science will permit humans to live a high-quality life for hundreds of years without the hindrances commonly associated with old age. Indeed, the title of one of his books is *Fantastic Voyage: Live Long Enough to Live Forever* (Kurzweil & Grossman, 2005). According to Kurzweil, if consciousness, personality, and brains could be downloaded, then they could become operable in robots. At the point where humans and machines merge, immortality becomes plausible.

In the book *Ending Aging* (2005), De Grey notes that aging is often the result of mutations of cells. As cells mutate or die, the body begins to shut down. De Grey asserts that by inhibiting cell mutation, a human could live much longer, perhaps to the age of 1000 years old. De Grey has an interesting talk on TED (De Grey, 2012) and articles and videos of his speeches and presentations abound on the Internet.

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An organization called the Methuselah Foundation, founded by De Grey, has as its mission "to significantly extend the healthy lifespan of humanity." The organization's website (methuselahfoundation.org) describes several initiatives, including information about a prize established for the first company that regenerates a complete human organ (Methuselah Foundation, 2012). Also, there is the SENS (Strategies for Engineered Negligible Senescence) Foundation, a clearinghouse on breakthroughs on aging, which lists De Grey as one of its chief scientists (SENS, 2012).

Among the most radical of organizations related to aging is Alcor, a corporation that will freeze you through a process called cryonics, with the promise that you may be revived at some point in the future, preferably after the cure for aging has been discovered. While cryonics might seem outlandish or improbable, as of May 31, 2012, Alcor had 968 members and 111 patients (Alcor, 2013). A patient is an individual who has paid the $200,000+ membership fee for full body cryopreservation or $80,000+ for neurocryopreservation (just the brain). A member has paid an initiation fee and a number of additional fees in the hope of finding enough cash to pay for the preservation process at some point before Judgment Day. Alcor also features a free, slick magazine that is well worth reading.

The premise of cryonics has emerged in recent YA fiction, such as *Across the Universe* (Revis, 2011). Delving into real, science-based speculations about the future can be enlivening for students who might not

i46-52-ALAN-Fall13.indd 47 8/8/13 12:49 PM

be big literature-lovers. Learning about transformative technologies that could dramatically impact the future is a way of giving students a sense of time and place in the midst of tumultuous change.

How Long Will You Live?

An interesting way to begin the *How Long Will You Live?* project is to show how a person's physical features change with time. A photographer from Argentina has a nice website that shows photos of his family over several years (Goldberg, 2012).

Ask students to write down three facts from each of these websites:

- A governmental report on changes in life expectancies (United States Special Commission on Aging, 2013)
- Information on lifespans from countries around the world from the World Health Organization's database (World Health Organization, 2012)
- Facts about causes of death from National Vital Statistics Reports (Murphy, Xu, & Kochanek, 2012).

The *How Long Will You Live?* project requires students to combine readings of Kurzweil and De Grey with knowledge of the claims of Alcor and current data about longevity. The activity in Figure 1 requires students to answer three questions that require critical thinking, close reading, and considerable creativity. For the first question, students turn a table into a graph and make a prediction about trends in aging. The second question requires students to try to understand differences in the average lifespans in various countries. Possible reasons for a longer life include diet, lack of wars, and availability and quality of medical care. The third question asks students to write a story as if they were much older—30, 50, 80, or 100 years old. The idea is for students to work in details about daily life in the future based upon their previous readings. If students need inspiration for what their daily life might be like, the free Corning video available online might help (Corning, 2013).

Of course, there are many literary works that invoke the idea of immortality. In fact, one of the earliest stories on record, *Gilgamesh*, which was written on clay tablets, is about a king who strives to live forever. A superb, free graphic novel that describes the process of creating a new translation of *Gilgamesh* is available online (McAlpin, 2013).

Immortality is a theme in many Norse and Greek ancient myths, an obsession with the Romantic poets, and it shows up frequently in novels such as *The Picture of Dorian Grey* (Wilde, 2013), *Tuck Everlasting* (Babbitt, 1975), and current dystopian YA literature, such as *Incarceron* (Fisher, 2011), *The Postmortal* (Magary, 2011), and *The Declaration* (Malley, 2008). These fictional works should prove especially engaging to students after perusing the landscape of the factual future-in-progress.

Every Bone Tells a Story

Before Ancient Greece, and perhaps even before the development of language itself, there was art. Mithen (2005), in his provocative book *The Singing Neanderthals,* posits that singing, dancing (of a sort), and art actually preceded language. Anyone who has seen primitive "cave art," or at least Herzog's documentary film *Cave of Forgotten Dreams* (Nelson & Ciuffo, 2010), knows the power of the image to communicate across thousands of years. A discussion of cave art appears in the pages of the entertaining and sometimes irreverent *Every Bone Tells a Story* (Rubalcaba and Robertshaw, 2010), a finalist for the YALSA nonfiction award in 2011. *Every Bone* is the account of four ancient hominins—Turkana Boy, Kennewick Man, Otzi the Iceman, and Lapedo Child—who, by the power of the mysterious trail of history, left behind their fossilized remains. Containing encyclopedic-grade information, this text is written for students in a way that is both accessible and intriguing. In essence, students walk in the shoes of a scientist, archaeologist, adventurer, and artist, examining artifacts from characters who died millions of years ago.

Archaeologists debate whether or not Turkana Boy had the ability to speak and use language while he was alive. While it was finally deduced that no, he did not use language, the subject of art as symbolic expression and a form of language arose among anthropologists. Students who are drawn into discussions of "What ifs" will be deeply interested in how characters like Turkana Boy used art to communicate.

In reference to the cave art found at archaeological sites, Rubalcaba and Robertshaw write, "Cave art has some of the most mysterious examples of symbolic art. There are rows of dots, zigzags, V shapes, and grids. What do they mean?" (2010, p. 35). Students

i46-52-ALAN-Fall13.indd 48 8/8/13 12:49 PM

1. Look at the table below on US Life Expectancy. Draw a graph of the average lifespan of Americans from 1900–2100 using intervals of 20 years (1900, 1920 . . . 2080, 2100). Data is available to 2020, but you will have to predict American life expectancies for 2020–2100. What are the trends? Write a rationale for your prediction.

US Life Expectancy at Birth, by Sex, in Selected Years (in years)

Year	Average age	Males	Females
1900–1902	49.2	47.9	50.7
1909–1911	51.5	49.9	53.2
1919–1921	56.4	55.5	57.4
1929–1931	59.2	57.7	60.9
1939–1941	63.6	61.6	65.9
1949–1951	68.1	65.5	71.0
1959–1961	69.9	66.8	73.2
1969–1971	70.8	67.0	74.6
1979–1981	73.9	70.01	77.6
1989–1991	75.4	71.8	78.8
2003	77.5	74.8	80.1
2015 (predicted)	78.9	76.4	81.4
2020 (predicted)	79.5	77.1	81.9
2050	?	?	?
2100	?	?	?

Data gathered from Shrestha (2006) and US Census Bureau (2012).

2. Compare life expectancies among three different countries. Write a summary of the differences in life expectancies and comment on why you think these differences exist.

Rank (of 221 countries)	Country	Average lifespan (rounded)
1	Monaco	90
3	Japan	84
12	Canada	81
28	Germany	80
30	United Kingdom	80
50	United States	78
95	China	75
144	Iraq	71
199	Congo	55
221	Chad	49

3. Assume that Kurzweil is correct and that people will live to be 150. Watch the video about the future at http://www.corning.com/news_center/videos/ADayMadeofGlass2.aspx (Corning, 2013). Imagine that you are one of these ages: 30 50 80 100. Tell a story about a typical day in your life.

Evaluation:
20 points = Details (Specifics about the future are interesting and seem plausible, based upon your reading, current trends.)
40 points = Quality (Story starts in the midst of you doing something. Tell your story so that the realities of the future are revealed. Include an ending.)
20 points = Smooth transitions and good organization
20 points = Technique, grammar, mechanics, word choice

Figure 1. How long will you live?

i46-52-ALAN-Fall13.indd 49 8/8/13 12:49 PM

can ponder the same question: what is the intention behind ancient cave art?

A free, online article (Thompson, 2013) reveals that thousands of "flutings" were made by children's fingers in the soft clay walls in French caverns over 13,000 years ago. The finger marks range from straight lines to "hectiforms"—hut-shaped symbols. The discovery gives credence to the theory that children were frequently contributors to the galleries of cave art that continue to be uncovered. Pertinent questions to ask students might include:

1. Were children taught to draw these lines and symbols, or were they a natural instinct?
2. Why aren't the drawings more detailed?

The Bradshaw Foundation (2013) is a rich source of cave art from all over the world. Although the cave art discussed in the flutings article did not incorporate traditional artistic components, such as the use of color, many cave drawings featured on The Bradshaw Foundation's website are incredibly colorful.

Of course, symbols are important in cave art just as they are in everyday life. Ask students about contemporary symbols used to designate no smoking, the girl's bathroom, handicapped parking, and other areas. Indeed, an important job of the anthropologist is determining the meaning of found symbols.

Symbolism and Critical Thinking

After viewing a variety of cave art, ask students to imagine themselves as ancient cave painters. What drawings would they create? What message would the drawings communicate? Choose a compelling image from the Bradshaw Foundation website to discuss as a class and pose the following questions:

- How did these artists express ideas through art?
- What can you deduce about the artists and how they lived?
- Why do people use art to communicate?
- Why was art important to prehistoric peoples? (There were no computers or paper.)
- How is art used to communicate history?
- How can symbols help tell a story without using words?
- What would a symbol look like for a predator, a cold day, or for food?

Have students select a different cave drawing and try to discern possible meanings. Ask them to put themselves in the place of an ancient cave painter—what story or sentiment did they want to tell? Have students think of a story and then use a series of only three symbols to represent it. Encourage students to use simple symbols, but to make the message clear. For example, someone who wants to communicate, "It's cold outside of our dwelling. We need to build a fire," might use the three, simple symbols in Figure 2.

A useful reference for how symbols work is *Picture This!,* a book that tells the story of *Little Red Riding Hood* through a series of simple shapes (Bang, 2000). Once students create symbol stories, the series of symbols are presented to the rest of the class. Students attempt to guess the story behind the symbols.

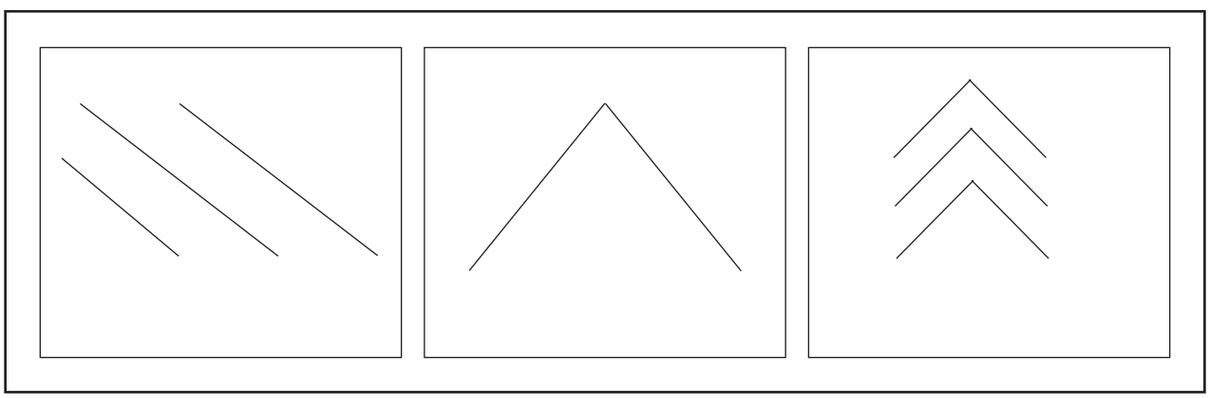

Figure 2. Using simple symbols to tell a story can help students ponder the use of symbols in cave art and other contexts.

i46-52-ALAN-Fall13.indd 50 8/8/13 12:49 PM

The student (or group) that interprets the symbols correctly (matching the story) should be declared the champion story storyteller.

What Is Your Story?

The stories of Turkana Boy, Lapedo Child, Kennewick Man, and Otzi the Iceman are deeply engaging, and students tend to connect to these characters as strongly as they might to a favorite fictional character. It helps that the fossilized remains of these individuals are portrayed in great photographic detail throughout *Every Bone Tells a Story*. The ways that archaeologists can piece together stories from scraps of evidence are remarkable. Rubalcaba and Robertshaw note, "Most people think the dead are silent, but to an archaeologist they're boisterous storytellers. . . . Of course the dead don't leap out of their graves and give away their secrets. It takes scientists from every field imaginable to coax the details out of them" (2010, p. 1).

Ask students to consider what kind of story they would tell if they were discovered thousands of years into the future, as marvelous treasures, to scientists who studied their artifacts and bones. Would scientists be able to tell if they were an excellent athlete or an avid reader? Perhaps a soccer player might have sustained a shin injury that left tell-tale marks on his bones. Or maybe a fashionista's bones would be found along with gems and jewelry.

The last pages of *Every Bone* describe "Iceman" Otzi (pp. 125–162). Found with Otzi was a 5,300-year-old ax, a quiver of arrows, straw-stuffed shoes, clothes, and a backpack (Ives, 2003; Ker, 2011). Ask students to make a list of things that, if they were to be preserved for the rest of time, they would likely have with them. What would the artifacts reveal about their hobbies and interests?

After lists have been made and you notice eyes wandering to neighboring lists, ask students to share artifacts and write lists on the board so that the entire class can see the diverse types of objects archaeologists might find. If someone put "boots" on their list, for example, what are some inferences about that person that an archaeologist might make?

Finally, ask students to pretend that their fossilized remains have been found, surrounded by their ancient possessions, by an archaeologist. In a narrative report, ask students to write about themselves from the point of view of the archeologist who discovered them. Reports should include:

1. The location of the discovery
2. The situation of the bones (Were the bones scattered or intact? Was the skeleton laying down/jumping?)
3. What artifacts were found with the bones, and what can the archaeologist deduce from the artifacts? (Does a bicycle helmet on the skull say that the student rode a bike or that they had a weird fashion sense?)
4. The tone should be appropriate for the narrator—excited, irritated, elated, or confused—depending on the type of person that the narrator might be. The tone should be communicated in word choice as well as in the oral delivery, as reports are read aloud.

Encourage students to be creative in their "findings." The anthropological reports in *Every Bone Tells a Story* provide students with professional, real-life models (pp. 53, 108) for their report writing.

Conclusion

Most teachers still associate symbolism, inference, and characterization with fiction. However, these literary elements can be readily applied to nonfiction texts as well. "Good nonfiction books are as rich in possibilities for deep, thoughtful discussion as any good novel" (Sullivan, 2001, p. 45). The edict that teachers should integrate more nonfiction texts into instruction, plan for more multimedia interactions, assign more research projects, and tackle more challenging texts will require a re-thinking of the traditional curriculum, not only in English, but also in social studies, science, and even mathematics (Common Core State Standards Initiative, 2013). From cave art to cryonics, nonfiction offers compelling opportunities for students to read new stories, to make new connections, and to build their knowledge in new ways (Common Core Literature, 2013).

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i46-52-ALAN-Fall13.indd 51 8/8/13 12:49 PM

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i46-52-ALAN-Fall13.indd 52 8/8/13 12:49 PM