**Discussion Questions**

The Humanity of Science and Technology theme has been developed with a set of general discussion questions that apply to all books in the theme, as well as sets of specific discussion questions for each of the available reading selections. These questions have been provided to encourage a deeper discussion among participants and to provide general guidance and direction. Facilitators and participants are encouraged to research, prepare, and engage with additional questions for their specific needs.

**General Questions**

1. Experimentation is at the heart of scientific discovery. Scientists must demonstrate that the instruments and technologies used to collect data are accurate. They must also rule out alternate explanations for the conclusions they reach from their data. Other scientists must be able to follow the same procedures and get the same results. Comment on the design of the experiments you read about in light of the importance of scientific accuracy.
2. Most of the books in this theme have photos or diagrams. Sometimes it’s useful to look at all the pictures before reading the text. What images were particularly useful? Are there images that don’t make sense to you? How would you change them to make them more clear?
3. The lone scientist who makes a great discovery is mostly a myth. Science is a vast collaboration. Describe how scientific collaboration works, its range and complexity. A book discussion is also a collaboration. If information seems incomprehensible and daunting, make an effort to understand one small part of a scientific argument or articulate a few questions about where you got stumped. When you pool questions and understandings in a discussion, much more will become clear to everyone.
4. Scientific terminology can sometimes seem like a foreign language. Often you can skip over a new word and still get the gist of what is being explained. Often you can’t. Try putting technical terms into a search engine. You can usually find written explanations, images, animations or interviews that will help you understand. Try pairing scientific terms with other words that might be of interest, such as *covid, history, controversy, future, health, literature, TED.*
5. All of the books in this theme offer new and compelling information and new ways to look at the world. When confronted with a new idea, a scientist asks for evidence that will support or refute it, while a fiction writer asks how they can spin the idea into a story. Choose an idea that you found particularly compelling and think it through both ways—like a scientist and like a storyteller.
6. How do your reading strategies differ when reading science-based fiction and nonfiction? When does it make sense to skip around? What about “spoilers?” How do you manage new vocabulary? How do you connect to the characters or people you read about?
7. Science purports to be objective, but sometimes there is strong cultural resistance to new ideas. Humanity was not quick to accept that the earth revolves around the sun, for instance. Where do you see cultural resistance to new ideas in these readings? Do you think that you might hold beliefs that make you blind to new scientific truths?
8. Perhaps the most important question we can ask when we consider science and technology from a humanities perspective is: Why is this important to me, my family and community, or those who will inhabit the earth after me?

**Mind Fixers**

1. Anne Harrington describes herself as a historian of science. How does this role differ from that of a researcher, a mental health professional or a policy maker?
2. In light of what you learned from reading *Mind Fixers,* how would you define mental health? What questions should a person ask themselves if they think they might have a mental illness?
3. The stigma associated with mental health issues has long prevented frank and open discussions about them. What are some of the fears—real and imagined—associated with mental illness? How have stigma and misinformation hindered progress and understanding?
4. What are the pitfalls in gathering information about mental health? When a person relates their subjective experience about their mental well-being to a mental health professional who then interprets it subjectively, how is it possible to make an objective diagnosis and evaluate the treatment scientifically?
5. Describe some of the complexities of using statistics to understand mental health. Do statistics help us understand more, or do they give us the illusion of understanding?
6. Whose “fault” is it when mental health treatments don’t work? What advice would you give to someone who receives mental health treatment that does not seem effective?
7. Even though mental health and mental illness have not been subjects of pubic conversation in the past, as you read this book and learn about symptoms, diagnoses and treatments, do you recognize past or present experiences of friends or family members? Have you had experiences related to mental health that this book either does or doesn’t account for? Are you willing to share them?

**Klara and the Sun**

1. Alan Turing, a pioneer of computer science, proposed what has become known as the “Turing Test” for the efficacy of artificial intelligence. He suggested that if a machine could use language in such a way that a human would not realize it was a machine, that machine could be considered intelligent. How does this idea apply to Klara and the way she “narrates” her story?
2. In *Alone Together,* Shelly Turkle suggests that when a person nurtures a non-human (plant, animal, or object) they begin to bond and respond to it as if it were human. Which characters in the story nurture Klara? What types of bonds seem to develop? As you follow Klara’s story, do you find yourself having hopes or feelings for her? When are you most aware that she is not human? Would it be more correct to refer to Klara as “it?”
3. Is Klara’s perception of the sun naive? Where does her knowledge about it come from and how does it develop? Can you draw any analogies between her bargain with the sun and the ways that humans grapple with powerful things they don’t fully understand?
4. Klara was manufactured with a built-in obsolescence. Eventually her solar cells will stop functioning. As readers, we don’t witness this decline, but we do meet her again at the end of her robotic life. How do you react to this scene? Does it remind you of human decline, or is it different?

**Finding the Mother Tree**

1. *Finding the Mother Tree* is as much a personal account as a scientific one. For you, do the stories about Simard’s marriage, family tragedy, career challenges, and health issues detract from the scientific account or enhance it?
2. Several times Simard makes reference to “learning how to do an experiment.” Choose one of the experiments that she sets up. Describe the planning that takes place ahead of time and all of the difficulties that must be anticipated in order for the results to be valid.
3. Have you explored the forests of the Pacific Northwest? Do you recognize some of the species and landscapes described in the book? Have you ever sniffed (or eaten!) forest soil? Hunted mushrooms? Do you or your family members have experience in the timber industry? How does your personal knowledge influence your understanding of what Simard presents?
4. Simard describes how a mature but diseased tree dies slowly, pumping its nutrients through underground networks into the young trees that will replace it and into the shrubs that will nourish those younger trees as well. Yet any suggestion that acres upon acres of beetle-killed forests should be left untouched are completely at odds with economic considerations as well as fire danger. How do you see a path that can navigate such a conundrum?
5. For centuries *anthropomorphism--*any perspective that describes non-human entities using human traits--was a label that would discredit the work of any would-be scientist. More recently, some scientists have begun to argue that such a notion is *anthrophobic* or that it exhibits *anthropo-denial* by failing to acknowledge the fact that humans are a part of nature and traits we ascribe to humans permeate all creation. Simard uses words like *wisdom, healing, communication,* and *nurturance* in an unabashedly anthropomorphic way. What is your view? Are there certain traits, qualities or behaviors that distinguish humans from other beings? How can they be identified and measured? What is the importance of maintaining—or breaking down—this distinction?
6. Do you think Simard’s career would have unfolded differently had she been a man? What obstacles and/or opportunities did she encounter because of her gender? What can we learn from the way she and her husband balanced career and parenting?
7. Competition or cooperation? Is one more “natural” than the other? Do Simard’s revelations about plant interactions raise new questions about how we consider parks, cropland, urban design, lawn maintenance and home gardens? Could it be possible that there is no such thing as a “weed?”

**Crack in Creation**

1. The first section of the book might seem absolutely daunting for some readers. You have to study it carefully to follow all of its technical twists and turns. If it seems too much for you, don’t give up and skip to the second section immediately. Try to find some small pieces you can follow. See if you can articulate questions about what makes you get stuck. Readers who can pool their understanding in a book discussion will eventually be surprised by how much they can grasp.
2. TED talks, videos, interviews and explanations that you can find online might present information about CRISPR that makes the first section of the book easier to grasp. Did you find any that were particularly helpful?
3. The development of CRISPR grew out of studies of bacterial immune systems. Were you surprised to find out that bacteria even *had* immune systems? Bacteriophages—“phages” for short—are viruses that attack bacteria. The authors tell us that phages are “the most prevalent biological entity on our planet—by a long shot.” (p.47) How does this require you to alter your imagination of living things on earth—or other planets, for that matter? Did you already know that prior to the development of antibiotics, “phage therapy” for curing bacterial infections in humans was an important and promising area of medical research? Do you think it will ever become important again?
4. A laboratory scientist can spend years pinning down the tiniest fact without any idea of a larger picture that fact might fit into. What are some of the serendipitous twists in the detective story that culminates in the invention and use of CRISPR? What are some of the surprising ways that collaborations occurred?
5. *Homologous recombination* and *nuclease* are two terms that are essential in understanding how CRISPR works. How would you define them?
6. ZFN and TALEN are gene editing tools that were developed prior to CRISPR. How do they work? Why are they so inferior to CRISPR?
7. The second section of the book describes how CRISPR technology can be used to tremendous benefit in medicine, animal husbandry, food production, and plant science to name a few. What possibilities intrigue you the most?
8. What could CRISPR become in the hands of a terrorist? How could a CRISPR accident come about? Can CRISPR be used to mitigate a CRISPR disaster? It is easy to imagine scenarios where the use of CRISPR could be unethical. Now that CRISPR is available, are there situations in which *not* using CRISPR would be unethical?
9. What do you think of the comparison between nuclear technology and CRISPR in terms of dangers and benefits? In what areas of the discussion does your opinion and understanding matter?

**Mama’s Last Hug**

1. What do you think of the long-held view in scientific studies that animals do not have feelings? While many pet owners would strongly disagree, a common response is that humans are projecting intelligence and emotion onto their pets. What kind of evidence would settle this question once and for all?
2. Which of these stories of primate behavior did you find particularly compelling or surprising? Did you find you had emotional reactions to any of the anecdotes de Waal relates?
3. A scientist will seldom accept a plausible claim as being true if it is based solely on anecdotal evidence, yet *Mama’s Last Hug* could be described as a book full of anecdotes. What does it take in order to extract scientific truth from observations and anecdotes?
4. What are some of the ethical considerations that must go into primate research? How can animal suffering be measured or quantified? How does one balance such suffering against the value of the human knowledge that can result from it? What should happen with animals who have outlived their research value? Who should be responsible for making—and paying for—these complex decisions?

**The Water Knife**

1. Other books in this theme consider competition and cooperation in nature from a scientific viewpoint. How do competition and collaboration play out in this novel?
2. Fictional characters are rarely purely good or purely evil. Do you find this to be true in *The Water Knife?* How do the various characters change or grow during the course of the story? If you were in this story, who would you likely be? What about other people you know or know of?
3. Do you recognize actual locations and geographic features in the story? Are you familiar with the institutions and occupations that play a role? Which are entirely fictional, or used, as the disclaimer says “in a fictional way?”
4. Several times a character will say that it’s impossible to think about something if you don’t have the vocabulary for it. How is this true in the story? Is it true in real life?
5. In nonfiction, new words are defined as soon as they are used. In *The Water Knife,* it’s up to you to figure them out from the context. What is an arcology, a clearsac, a journo, a ghost, a Zoner? What other new words did you discover?
6. Is this a dismal doomsday story? A cautionary tale? Is it speculation about a difficult moment, a blip in human history, or the dawn of new directions for humanity?
7. *The Water Knife* was published in 2015. If it were to be “updated” with present knowledge and situations, what would be different? In the summer of 2021 when the American West experienced deadly heat waves and extreme drought, the water level in Lake Mead dropped to an unprecedented low. Do you think we are closer to realizing the type of future outlined in this book? Why or why not?

**A Briefer History of Time**

1. Chapter 3 describes the quest for a comprehensive and unified theory of everything. What are some existing contradictions that such a theory would need to resolve? Do you see major benefits to such a theory? Do you think it will ever be attained?
2. "Imagine you are playing Ping Pong on a train . . ." What might you learn from doing that? How can shifting perspectives alter your understanding of rest and motion? Of absolute and relative speed? Of absolute and relative time? (see p. 33) As the author says, "These are not easy ideas to grasp," but if you feel up to it, try explaining "the local flow of time."
3. This book describes a view of the universe that has changed radically from ancient times to the present, from a time when Earth was thought to be the center of the solar system to today when Earth is believed to be a small planet orbiting a rather ordinary star on the edge of one of many galaxies in a vast and ever-expanding universe. Is such knowledge important? Does it have any impact on how you live your life?
4. Despite its brevity, the book includes some technical scientific discussions that are hard for a general reader to follow. Fortunately, precise understanding of many concepts is not essential to grasping the broad relevance of the big picture. Take, for instance, Werner Heisenberg's famous *uncertainty principle*, discussed in Chapter 9. What, in your own words, does this principle tell us, and why is it important in quantum mechanics? Why did this principle bother Einstein? Does it bother you?
5. Chapter 10 explains how particles may be seen to move backward and forward in time and then goes on to consider whether it will ever be possible to create time machines in which people can visit the past and the future. What are the main arguments for and against such a possibility? How might this affect the concept of history? Or is it just too "far out" to imagine?
6. Chapter 11's discussion of the quest for a unified theory of the forces of nature tells how the effort appeared stalled due to the absence of a quantum theory of gravity. Currently the most promising way forward is *string theory*, which requires that the universe have either 10 or 26 dimensions, which we can't see, perhaps due to the *anthropic principle* (p. 180). What is this anthropic principle, and how does it relate to the *uncertainty principle* and to the three possibilities listed on p. 134?
7. Consider the image on page 21. Some people might say that it is sexist or an example of the “hostile environment” that women experience in male-dominated fields. Others would say the imagery is outdated, but otherwise appropriate. How could you change this image to illustrate Hawking’s point about gravitational attraction without the sexual overtones?
8. The Conclusion is in some ways a reflection on both the potential and limitations of scientific discovery. And the book ends with a call for discussion of this topic by "philosophers, scientists, and just ordinary people." Why are such discussions important?

**Alone Together**

1. The Introduction speaks of our time as a "robotic moment." What is meant by this? Can you imagine having a relationship with a "companionate" robot? Could you imagine a robot as a pet? As a friend? As a romantic partner? What are the advantages and disadvantages of companionate robots?
2. The book makes much of childhood experiences as shapers of adult attitudes and beliefs regarding technology. Do you believe this applies to you and to members of your generation? How do the games and toys of your childhood differ from those of today? Have you ever experienced a Furby, a Tamagotchi, or an Aibo? Are the boundaries between machines and living creatures becoming blurred?
3. It is sometimes said that because there are not enough human caregivers to serve our growing population of seniors, sociable robots should be used, as in Japan, to help close this gap. Do you agree? In what circumstances? Would you want one? What would it do? Can robots care? What about Paro the harp seal? What arguments does Turkle give for and against their use?
4. One more question on robots: "When the brain in your phone marries the body of your robot, document preparation meets therapeutic massage. Here is a happy fantasy of security, intellectual companionship, and nurturing connection. How can we not be tempted?" (p.142)
5. In discussing Pete and Jade's online relationship in Second Life (p.160), Pete speaks of his "life mix." What is this "life mix"? Is it a new idea? How does his marriage fit in? How common is such complex intermingling of online and offline identities? How does this blending affect traditional bonds with friends and family? Are online relationships and traditional ones more likely to conflict or to complement each other?
6. Many online communities, like Facebook, encourage the creation of a virtual identity, projected through avatars, profiles, photo albums, favorites lists, and so forth. Is this a healthy way of developing a sense of identity and sharing one's life experience? Or do such activities encourage relatively superficial relationships and stunted growth?
7. This book returns often to the paradox that the new social technologies offer increased opportunities for contact, but decreased opportunities for meaningful, satisfying communication: a text is less than a phone call; an email less than a handwritten letter; a chat room less than a face to face meeting. But is it really so clear? If we truly find the new connectivity choices less satisfying than more traditional ones, why do we continue to choose them?

**Animals in Translation**

1. In My Story, Temple Grandin tells about how her autism gave her a special interest in and bond with animals. What new insights did you gain into autism and animal behavior from her story?
2. In discussing animal behavior, the author focuses on the role of the cortex, claiming that the larger cortexes of humans actually limit their perceptual abilities. What is her rationale for this, and where does autism fit in? What other factors are involved in extreme animal perception? Have you ever witnessed it?
3. The book contains an extensive discussion of animals' feelings, their various types, causes, and manifestations. What information about animal emotions was new to you and what was familiar from personal experience? Does any of this contradict your personal experience? How do animal emotions resemble or differ from human emotions?
4. The chapter on animal aggression raises the issue of how much aggressive behavior is determined by genetics and how much by environment. What are some key determiners of animal aggression, and why is it important to understand them
5. In discussing animal pain and suffering, Grandin devotes a lot of space to fear. Why? How does fear relate to animal suffering and to animal behavior in general? What can people do to prevent and counteract fear and suffering in animals? How does fear in animals compare with fear in normal and autistic humans?
6. What are the main arguments about whether animals can use language or make music? Do the examples of prairie dogs, starlings, dolphins, humpback whales, and Alex the parrot persuade you that animals can use music and language in ways that are comparable to humans?
7. Throughout the book, but especially toward the end, connections are drawn between animal thinking and autistic thinking. What are the major similarities and differences? In what ways might increased understanding of animals lead to improved lives, not only for animals, but also for autistic people, and for all humans?

**Born in Africa**

1. This book offers a scientific perspective on *Homo Sapiens*. How much of this detective story were you familiar with before starting the book? How important is an understanding of human origins to living in today's world? Does it really matter to you how humans originated? Why or why not?
2. The term "missing link" is often used to refer to an intermediate species between ape and human. Various candidates have been proposed for this role. (See especially chapters 16 & 17.) Which of those candidates, if any, do you consider the best fit for the term? Might there be more than one "missing link"? Or is the term itself outdated and misleading?
3. What traits are most important when trying to distinguish humans from pre-humans -- brain size, brain structure, upright stance, advanced tool making, articulate language, capture of fire? Or some combination of the above? Or something else entirely?
4. Besides discussing scientific theories and discoveries, the book describes several scientists and their rivalries, struggles, and triumphs. Which figures stand out for you, and what do their stories reveal about the challenges and rewards of "making" or "doing" science?
5. Disagreement, dissent, argument, debate, exaggerated claims, fraudulent schemes -- these, too, are part of the story, as the scientific community seeks to examine the evidence and separate the false from the true. How rigorous is the process by which this verification is ultimately done? Consider the case of Piltdown Man, for instance.
6. The chapter "Hadar" tells the story of Lucy's discovery by Donald Johanson. Why was this important? What do you think of her reconstructed head as pictured in the book?
7. Recently there has developed a clash between the paleoanthropologists, or bone hunters, and the biochemists and geneticists, who do their work in the laboratory analyzing DNA. Which of these paths offers the greatest promise of understanding human ancestry?
8. On p. 116 we see the statement, “There was no human consciousness inside that human body.” How might one make determinations about consciousness from fossil remains? What criteria might one use to identify a human consciousness?
9. How can the intellectual/cultural climate of an era influence the acceptance of scientific ideas?
10. What social or political implications might the multiregional evolution hypothesis have had if evidence would have supported it?

**Physics of the Impossible**

1. Michio Kaku points out in the Preface that "many highly accomplished scientists originally became interested in science through exposure to science fiction," and throughout the book he considers ways in which ideas taken from science fiction have helped scientists frame questions and solve problems. What features of life today, which were once considered impossible, have roots in science fiction?
2. Part I of the book examines ten Class I impossibilities that are familiar components of science fiction. How many of these had you heard of? Based on your reading, which of these, if any, do you believe will become possible in the next hundred years? Are you aware of any recent research developments in these areas?
3. The question of robots and artificial intelligence is especially contentious these days, as there is a tremendous amount of work going on in this area. What is the difference between a "true robot" and a "pre-programmed robot"? How close are we to true robots? Do you see any dangers in building them? Could humans end up as their servants?
4. The book spends two chapters on the subject of interstellar travel, as done by the Starship Enterprise in *Star Trek*. Given the vast distances involved, which of the many possible solutions, from nuclear rockets to suspended animation to nano-ships to anti-matter rockets, seem the most promising? Or is there even any point in considering such interstellar travel? Do you see any benefits?
5. From Charles Dickens's *A Christmas Carol* and Mark Twain's *A Connecticut Yankee in King Arthur's Court* to Kurt Vonnegut's *Slaughterhouse Five*, writers have speculated about time travel. Do you believe it could ever happen? What are the chief obstacles? If you could visit another time, when would it be? Would you prefer to travel forward or backward in time? Or are you quite content in the here and now?
6. Does it seem counter intuitive that perpetual motion machines and precognition would be listed as Class III impossibilities, beyond even time travel and parallel universes? If both perpetual motion machines and precognition are so completely impossible, why do they always seem so nearly with reach?
7. What is the "theory of everything"? Do you believe it will ever be formulated, tested, and proven? And if so, what difference will it make? Will the ultimate meaning of the universe finally be revealed?

**The Botany of Desire**

1. Very likely each reader will prefer one of the four chapters of this book to all of the others. Which one do you like best, and why? Do you find yourself trusting Pollan’s science throughout this book, or do you find it more credible in one chapter than in the others? From which of the chapters do you think you learned the most?
2. Is this book of much interest to the non-botanist and non-gardener? Probably a botanist or gardener will feel more comfortable with this book, just as a fly fisherman (or any angler, for that matter) would with Norman Maclean’s *A River Runs Through It*. But what might you argue in “in” this book for nearly everyone?
3. Some readers will doubtless think the chapter on marijuana is Pollan’s riskiest in several respects. For example, he makes political assertions that are sure to offend some readers, and he appears to approve of a controlled, and at least technically illegal, substance. In an interview, however, he shied away from expressing support for its legalization. Do you think he shows that he knows enough about this controversial subject to take a firmer stance on it? Should he have opted for some safer “desire”?
4. What do you make of Pollan’s frequent return to the tension between the Apollonian and the Dionysian poles or modes of human nature or thought processes? The terms come to us from Friedrich Nietzsche’s *The Birth of Tragedy From the Spirit of Music* (1872), sometimes called simply “the Birth of Tragedy.” You might find it useful to investigate this subject. Do you think this dichotomy is of much relevance, or do you think it amounts to an oversimplification?
5. The fourth chapter of Pollan’s book, part of which took him to huge potato farms in southern Idaho, may be the most troublesome. At one point he eats potatoes and asks himself whether the genetically engineered spuds or the ones treated with dangerous chemicals (organophosphates) would be the more hazardous to his health. Why does this perplexing question arise? What alternative does there appear to be?
6. What would you say Pollan accomplishes in his half-dozen or so pages of epilogue? Does this book strike you as “important” in some ways, or simply as “of interest”? Do you detect an ethical stance toward the environment in this book? Certain other books in this series deal with wilderness, but this one does not, or at least it does not do so directly. Does that make it less pertinent to the issues of this theme, or in some ways even more pertinent?

**The Control of Nature**

1. Just considering the book's title by itself, what was your first impression upon seeing it? Did you think of controlling nature as possible? Desirable? How have personal experience or knowledge shaped your response?
2. In "Atchafalaya," McPhee says, "the Corps has been conceded the almighty role of God." What does he mean by this? What are some of the powers and capabilities that have been assigned to the Corps of Engineers? Do you believe these are Godlike? Realistic? Why, or why not? What do you make of Mark Twain's quoted comments? Does any of this have any relevance in Idaho?
3. Given all the ambitions, benefits, risks, variables, and losses, do you believe that the Old River Control Project can be considered an example of humans successfully controlling nature? Or is that something that remains to be determined by future events?
4. In "Cooling the Lava," a small group attempts to save an Icelandic settlement by pumping water onto an advancing lava wall, igniting a controversy over whether efforts were heroic, pointless, or simply wrong-headed. Given the volcanic instability there and the ever-present dangers, why did residents stay and try so hard to combat the lava? Contrast this with the approach taken in Hawaii with Mauna Loa and Kilauea.
5. Throughout the book, and especially in "Los Angeles Against the Mountains," McPhee juxtaposes stories of people like the Genofiles with technical discussions of hydrology and geology. How does this narrative strategy affect your interest and understanding as you read? How does it affect your understanding of the underlying issues?
6. As McPhee chronicles the people and events along the San Gabriel front, he also questions the decision-making process of individuals and communities that build and live there. What are the trade-offs that they consider? How well informed are they? What do you think of the resulting situation?
7. In at least one respect, the entire book, taken as a whole, might be regarded as a cautionary tale. But what is the caution? What do we need to know and do in our efforts to manage and control nature?
8. *The Control of Nature* was published in 1989 before the word “geoengineering” entered the popular vocabulary as a possible response to the climate crisis. What types of geoengineering projects have been proposed as possible solutions to global warming? Based on your understanding of the geoengineering projects in *The Control of Nature,* which climate-related geoengineering projects do you think could be effective?

**The Immortal Life of Henrietta Lacks**

1. This book's author places herself right in the story. No distant, objective, third-person narrator, Skloot writes in the first person, getting involved with the people and issues, sharing her feelings, even shaping events. Do you like this way of writing? Does it impact her credibility in discussing the scientific and social issues at the center of the book?
2. Why are the Hela cells so important to science? What benefits do they have for scientists over other cells that might be used? What benefits have they yielded for society in general? Had you ever heard of them before reading this book?
3. Many chapters tell stories, and in the process introduce incidents, places, and people from Henrietta's past. How do these stories relate to the other more technical parts of the book? Do they compete for attention with the medical and scientific information? Or do they help provide a larger context for understanding the technical issues? For instance, who is Keenen Kester Cofield, and what does his story contribute to the book?
4. What major ethical concerns were raised by the manner in which Henrietta's cells were obtained and used? Do you think she was treated fairly by George Gey and Johns Hopkins? Should her family have been compensated for what happened? Does the good done by the cells outweigh the harm done to Henrietta and her family?
5. In the course of events, Skloot finally gets to know Henrietta's daughter Deborah quite well. What is the basis of the strong bond that develops between them? Do you think it compromises the author's ability to be fair and objective?
6. Should cells remain the property of patients, or should doctors be allowed to harvest cells from patients without their consent and use those cells for research to advance medical science? "When you leave tissues in a doctor's office or lab, you abandon them as waste, and anyone can take your garbage and sell it." Is this fair and reasonable?
7. What role did the fact that Henrietta and her family were poor, uneducated blacks in the 1950's play in the way they were treated? How much have standards and practices changed since then? Can you imagine similar events happening today?
8. Race and racism are woven throughout the book, both in the story presented and in the process of the research for the book. Skloot was yet another white person asking the Lacks family about Henrietta. Did race help or hinder Skloot in the writing and researching of the book? Both?
9. Was it a good thing for the members of the Lacks family that the author wrote this book? What did they gain?
10. What role did the deferential attitude toward doctors in the early 20th century play in the interaction between Henrietta and her family and Johns Hopkins? Has that attitude toward doctors changed over the decades? Do patients’ socioeconomic differences affect that relationship today?

**The Lives of a Cell**

1. The book's first paragraph claims, "Man is embedded in nature," a concept developed more fully in the essay "Natural Man." Is this an obvious, indisputable truth? What are the implications of seeing humans in this way?
2. How does the building of a termite's nest resemble doing science? Why is science a social activity? Is there such a thing as a "hive mind" or a "superorganism"? How might this relate to the Internet? Consider especially websites like Wikipedia, Facebook, and Twitter.
3. If we are going to send out signals to other possible life forms in remote space, Thomas recommends music, especially Bach, or possibly paintings by Cezanne. Why? What do you think of these choices? What do they tell about humans and about life on Earth? What would you choose to send?
4. In "Autonomy," Thomas says, "I have never really been satisfied with the operation of my brain, and it might be fun to try running it myself just once." What's his point? How does it relate to Zen archery?
5. What are the major suggestions for improving health care delivery in "Your Very Good Health"? How many have been implemented? Has the system changed for the better or the worse since then? What is "the great secret, known to internists and learned early in marriage by internists' wives, but still hidden from the general public"?
6. Thomas has a special interest in, and affinity for, language. He discusses it in several essays. What are his main sources of interest? How does this interest in language relate to his work as a biologist? See especially, "Living Language."
7. This book was published in 1974, ages ago in terms of scientific discovery. What notable developments have taken place in the intervening years that might undermine or confirm ideas advanced here?
8. Some of the chapters of this book are dense with arcane scientific vocabulary. Must you look up every single unfamiliar word to understand what Thomas is trying to communicate? What if you interpreted them poetically? Try reading an especially dense passage aloud. What do the sound of the words (which you might have to practice saying!) convey about the choreography of the tiny elements that make up the cell’s machinery?