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# EXPLORING

# *Jurassic Park*

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## *A cinematic simulation*

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**T**he tyrannosaur moved around the side of their car. It went to the very spot where Tim had gotten out of the car. Where Ed Regis had gotten out of the car. The animal paused there. The big head ducked down, toward the mud... Their faces were tense as they stared forward through the windshield. The huge head raised back up, jaws open, and then stopped by the side windows. In the glare of lightning, they saw the beady, expressionless reptile eye moving in the socket. It was looking in the car. (Crichton, *Jurassic Park*, p. 186)

Unless your students were out of the country this past summer, they will surely recognize the above scene from the hit movie, *Jurassic Park*. Reading this passage aloud is an excellent way to rivet students' attention as you prepare to embark on an exploration of ecosystems, extinction theories, geological formations and mapping, climate and weather patterns, genetics and genetic engineering, chaos theory, and much more.

In 1990, author Michael Crichton wrote a novel that integrated current genetic technology and theory with the possibility of reconstructing animals that roamed our world millions of years ago. Extrapolating the work of researchers

(such as Poiner at University of California at Berkeley) who are attempting to extract ancient DNA from bees, gnats, and early humans, Crichton based his storyline on the development of an amusement park that featured living dinosaurs. These creatures were reconstructed from pieces of DNA found in extinct organisms and integrated with the DNA of extant related organisms. Thus, a context is set where students can examine themes in *Jurassic Park* built on issues such as the forces driving advances in science and in technology, the portrayal of scientists, the use of a protagonist who is a mathematician, the use of chaos theory to explain the underlying sequence of events and outcomes, and ethical issues in science and technology.

In this article we will describe several student-tested activities built around *Jurassic Park*. The activities feature students engaged in role-playing scenarios, investigative research projects, journal writing and communication skills activities, cooperative learning groups, and learning experiences that make use of reading skills and mathematical models. Using these kinds of activities and teaching strategies, students in advanced, regular, and basic science courses can participate actively in successful learning experiences.

### STUDENT OPINIONS COUNT

*You said these dinosaurs will be patented? Yes. Genetically engineered animals can*

*now be patented. The Supreme Court ruled on that in favor of Harvard in 1987. InGen will own its dinosaurs, and no one else can legally make them. (Crichton, *Jurassic Park*, p. 68)*

In this introductory activity, we ask students to share their opinion on reconstructing dinosaurs. The activity focuses students' attention on the issues surrounding this particular science theme. (If there are students in your class who are unfamiliar with *Jurassic Park*, try to locate a few copies of the book that can be loaned out. If this is not possible, simply provide them with a brief synopsis of the novel.) Ask students to write a brief opinion paper on whether or not they believe dinosaurs should be brought back.

Afterwards, have students brainstorm the benefits of such an endeavor (such as the research possibilities that will be created and the entertainment value of the park) and some minuses (such as the danger of reconstructing extinct organisms and the cost of the technology). Discuss the various student opinions in order to get the creative juices flowing. Now the stage is set for a lesson on science and ethics.

### THE GREAT DEBATE

*If you were going to start a bioengineering company, Henry, what would you do? Would you make products to help mankind, to fight illness and disease? Dear me, no. That's a terrible idea. A very poor use of new*



technology...(Crichton, *Jurassic Park*, p. 200)

At this point, students are asked to turn in their written arguments to place in a file/portfolio for reference at the end of the unit. Students will reevaluate their response to the issue of reconstructing dinosaurs after they have completed additional activities and discussions.

Start the next phase by asking for a show of hands of those in favor of bringing back the dinosaurs. Have these students sit on one side of the room. Have the students who are against reconstructing the dinosaurs sit on the opposite side. If students are undecided, they will be assigned to the Environmental Protection Agency (EPA), the agency that will have the final decision in the development of the park. At this point, take the EPA members aside and try to bribe them with "big bucks" to vote for the park, regardless of the outcome of the debate. This provides an opportunity to introduce some ethical decision-making problems.

Next, brief students on the rules of debate. Remind them to be respectful of one another's opinions, even if they do not personally agree with the position being presented. Before students can defend their positions, the proposition to be debated should be clearly defined. By providing limits on what students will have to investigate, the teacher can help them determine the consequences of their position. You may wish to impose the following limits on the park and its inhabitants (suggested by Crichton):

- The dinosaurs will be lysine dependant.
- The dinosaurs will be partially constructed from frog DNA. There are links missing and mended into the DNA.
- The dinosaurs will be genetically made females.
- The dinosaurs will be irradiated to cause sterility.
- The park will be located on a deserted tropical island.

Students should form small cooperative learning groups to discuss the parameters, decide if each limitation is a either a plus or minus for their position, examine the consequences of each parameter on their position, and plan and prepare their agenda for the debate. At this point, the teacher may wish to recommend that students begin reading particular chapters in *Jurassic Park* to help with background preparation.

When the debate begins, there is a great amount of emotion as well as thinking involved. It may be necessary for the teacher to monitor the debate closely to insure that the rules of debate are followed. At the end of the debate, the EPA leaves the room to make its decision. (At this point, the teacher may need to remind them that they need to return with a yes vote in order to continue the exercise.) If the EPA returns with a decision to implement the dinosaur project, then the investigative research can begin.

#### RESEARCH FOR LEARNING AND FUN

*"Look," Wu said, "the fact remains, all the animals are female. They can't breed."*

*Grant had been thinking about that. He had recently learned of an intriguing West German study that he suspected held the answer.*

*"When you made your dinosaur DNA," Grant said, "you were working with fragmentary pieces, is that right?"*

*"Yes," Wu said.*

*"In order to make a complete strand, were you ever required to include DNA fragments from other species?"*

*"Occasionally, yes," Wu said. "It's the only way to accomplish the job. Sometimes we included avian DNA, from a variety of birds, and sometimes reptilian DNA."*

*"Any amphibian DNA? Specifically, frog DNA?"*

*"Possibly. I'd have to check."*

*"Check," Grant said. "I think you'll find that holds the answer."*

*Malcolm said, "Frog DNA? Why frog DNA?" (Crichton, *Jurassic Park*, p. 168)*

Few high school students enjoy conducting investigative research. However, the topic of dinosaurs can often send even your most reluctant students rushing off to the school library/resource center. To help students make informed decisions, it is important for the teacher to discuss where and how students can access pertinent information.

Explain to your students that they have been hired as engineers or curators of the new "Jurassic Park." They are responsible for gathering research about the following dinosaurs: tyrannosaurs, stegosaurs, velociraptors, dilophosaurs, triceratops, sauropods, and pterosaurs. They will have to determine each organism's habitat requirements. For example, students should find out what each dinosaur consumes, the growth potential of each species, how many of each species the park can support, what type of enclosures will be needed, and which animals can be placed together.

When performing this research, students will examine ecological relationships, plant and animal interactions, weather and climate patterns that influence specific habitats, and other critical concepts of ecology and homeostasis. You can suggest or supply sources of pertinent information (see For Further Reading) and discuss how to access additional information. Among the sources available to students are local and state wildlife biologists, scientists, and zoo directors. Thus, students can learn how to use information, and more importantly, where to locate and access information.

#### BUILDING A DINOZOO

*The behavior of dinosaurs had always been a minor consideration for Wu. And rightly so: behavior was a second-order effect of DNA, like protein unfolding...you couldn't look at a DNA sequence and predict behav-*



## FOR FURTHER READING

- Lemonick, M.D. 1993. Rewriting the book on dinosaurs. *Time* (141)April 26: 42-49.  
Corliss, R. 1993. Behind the magic of Jurassic Park. *Time* (141)April 26: 49-50.  
*Discover*. (14)January 1993. [Dinosaur theme issue.]  
Gore, R. 1993. Dinosaurs. *National Geographic* (183)January: 2-53.  
Stewart, I. 1992. Does chaos rule the cosmos? *Discover* (13)November: 56-63.  
Stone, J. 1992. Attack of the dinosuckers! *Discover* (13)May: 82-85.  
Wright, K. 1991. Dinosaur doctors. *Discover* (12)November: 46-51.  
Vogel, S. 1988. The case of the pygmy tyrant. *Discover* (9)August: 54-55.  
*The Macmillan Illustrated Encyclopedia of Dinosaurs and Prehistoric Animals*. 1988. Marshall Editions Ltd.: Lovelov.

## REFERENCES

- Berube, J., S. Harrison, S. Neuman, M. Shams, and T. Boteler. 1991. *Jurassic Park interdisciplinary unit*. Presentation at the State Science Teachers Association.  
Crichton, M. 1990. *Jurassic Park*. Ballantine Publishers: New York.  
Johnson, D.W., R.T. Johnson, E. Holubec, and P. Roy. 1984. *Circles of Learning: Cooperation in the Classroom*. Association for Supervision and Curriculum Development: Orlando.  
Joyce, B. and M. Weil. 1986. *Models of Teaching*. Prentice-Hall, Inc.: Englewood Cliffs, NJ.

ior. *It was impossible*. (Crichton, *Jurassic Park*, p. 334)

Once the research phase has been completed, the new engineers (working in groups of 2 to 3) are now ready to create a working model of their park. Students need very little information at this point to start thinking about constructing an actual map (the more rules, the less creativity). Students do need to know that the dinozoos will be located on a teardrop-shaped island, with a mountain at one end, and a river flowing down the middle.

With this information they create a rough drawing to be turned in the following day. This allows you to offer suggestions and to monitor students' progress. If your students are reading *Jurassic Park* for class, you can ask them to reconstruct the park based on the descriptions provided in the novel. In this way, students are forced to examine the descriptions and translate that information into a model (something we rarely ask our students to do).

The first day of the dinozoos activity consists of brainstorming ideas on what a dinozoos park could be—a great opportunity for students to express their creativity. As hard as it may be for the teacher to step aside, he or she should refrain from offering any help during the brainstorming. After a day of planning and thinking, students should use the following guidelines to create their final model:

1. The model should be on a small poster

board or ply-board, no larger than 1.3 m by 1.3 m.

2. The model should contain appropriate safety features for each dinosaur (such as tall fences, backup safety system in case the electricity goes off, a dome system or cage for pterosaurs, and a source of food for carnivores).

3. Maintenance buildings and access roads must be included.

4. Other recreational activities besides dinosaurs should be available for tourists.
6. A hotel, club house, and airport need to be located away from the dinosaurs.

If construction materials are in short supply, students have the option of constructing a map on poster board. If students construct a model, some sources of inexpensive materials include modeling clay, papier-mâché, pieces from old game sets such as Monopoly, toothpicks, and so forth.

At this point it is appropriate to pause and discuss the logistical and planning concerns of zoos, wildlife parks, or national/state parks. You may wish to invite a zoo director or wildlife conservationist to class to discuss student questions. Ethical issues associated with a zoo's treatment of animals can also be discussed at this point.

After students have constructed their models, have them explain to the rest of the class what they attempted to do with their model and their reasons for putting the model together as they did. The careful thinking and planning put forth by students in constructing models is amaz-

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ing. Many students, even those with poor academic records, are often very creative and industrious. We found that a number of students appeared after school and during lunch time to work on their models.

Previously, students in the "basic" biology classes expressed minimal interest in science and in learning. With the *Jurassic Park* activity, they felt more involved and motivated to learn biology.

They constructed rivers with water flowing to planned pastures and areas for raising food on the island. One group of students constructed their island with a working siphon to demonstrate water flow.

After the student presentations are finished, ask students to review their original position statements to see if their opinions concerning the recreation of dinosaurs have changed in any way. Students should also try and answer the following questions: What are some of the problems you encountered as you constructed your model?; What did you learn about models and how they are used in science?; Is it possible to have a *Jurassic Park* occur now, 20 years from now, or 50 years from now?; and, What are some of the ethical decisions that were made by certain characters in the novel—would you make these same decisions?

## SUCCESS

This activity is a welcome break from the typical biology curriculum. It provides students with an opportunity to succeed and achieve in biology class, which are the greatest student motivators of all. Turn your students on to science, and into better students, by taking a *Jurassic* field trip this semester!

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