

## A TALE OF TWO CITIES: TEACHER GUIDE

**Subject:** Life Science

**Grade Level:** Middle School

**Last Updated:** March 5, 2008

### Case Summary

Strange things have been going on in Greater Atlanta: power outages, lack of trash collection, bad mail service, and more. What could be happening here, and what will solve the problem? The answer is much smaller than you might imagine.

### Credits

This case was written by Amanda Hillman (PhD Student, Anthropology, Emory University, Atlanta, GA) with feedback from Emilie Farmer (Teacher, Chamblee Middle School, DeKalb County, GA). Both were fellows of the Emory University PRISM program (<http://www.prism.emory.edu>). Author may be contacted at [ahillm2@emory.edu](mailto:ahillm2@emory.edu).

This case was adapted from *Cell and the City*:

Boglin, Kirkpatrick, Phillips, & Walton. (2000). Cell and the city. Retrieved October 13, 2007 from <http://www.bioquest.org/bqemory/cellcity.html>

### Learning Objectives

At the end of the case, students should be able to:

1. Identify primary, necessary components of a city and correlate them with cell organelles
2. Name and describe functions of organelles
3. Differentiate between plant and animal cell structures
4. Design/model a cell with necessary structures and functions
5. Determine the fate of hypothetically deficient/malformed cells

### Georgia Performance Standards OR Georgia Quality Core Curriculum

*S7CS1*. Students will explore the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works. (NSES Standard A)

*S7CS5*. Students will use the ideas of system, model, change, and scale in exploring scientific and technological matters. (NSES Standard A)

*S7CS7*. Students will question scientific claims and arguments effectively. (NSES Standard A)

*S7L2*. Students will describe the structure and function of cells, tissues, organs, and organ systems. (NSES Standard C)

*S7L4*. Students will examine the dependence of organisms on one another and their environments. (NSES Standard C)

## **Assessment**

Students will be given the choice of a variety of subjects that  
*Potential Products/Assessments*

1. Create a model that includes the major organelles of the cell
2. Create a postcard from Plansell that shows what the city looks like from a bird's-eye view
3. Create a poster of the different organelles using simile (e.g., the Golgi is "like" the post office)
4. Role-play Scene 3 where it leaves off with Kevin explaining cells and organelles
5. Create a newspaper story as if you were inside the cell and the same disasters were happening that happened in Atlanta. What would you complain about in your cytoplasmic neighborhood?
6. Re-write Scene 1 incorporating more analogs of different organelles. In other words, include centrioles, cytoplasm, and chromatin the way the scene included the post office, city hall, etc.

## **Implementation Strategy**

### Day 1

Read Scene 1	15 min
Data, Questions, Learning Issues (whole class)	15 min
Research learning issues	45 min
Group discussion	15 min

### Day 2

Read Scene 2	15 min
Data, Questions, Learning Issues (whole class)	15 min
Research learning issues	45 min
Group discussion	15 min

### Day 3

Read Scene 3	15 min
Data, Questions, Learning Issues (whole class)	15 min
Research learning issues	45 min
Group discussion	15 min

### Day 4

Group work on assessment	90 min
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## **Case Notes**

When implementing this case to a large class, it worked well to assign each role to a student and read it aloud as a whole group. Ideally, small groups would allow each student to discuss the case more intensively. Some students identified early on the analogy between cells and the cities, so you need to think of how you will urge those students to “test” that hypothesis. This was implemented after students had already begun covering the basic cell structures, but this could be a great introduction.

It might also be helpful to provide the students with prepared index cards for research between scenes one and two. The cards should have city service on one side. Students will brainstorm and write the essential function of the service on the other side.

**Facilitator Guide:**

Scene 1- Kevin, his cousin Mabel, and a group of friends at a lunch table at Chamblee Middle School talk about strange things that have been going on in Greater Atlanta: power outages, lack of trash collection, bad mail service, etc. They've heard about problems with City Hall and conclude that this must be at the root of the problem.

Facts	Hypotheses
<ul style="list-style-type: none"> <li>-There has been garbage everywhere for two weeks</li> <li>-All the libraries are going to be closed because the librarians have quit</li> <li>-There hasn't been any mail for a few weeks</li> <li>-The power has been going out because a power station hasn't been working</li> <li>-The City Hall has shut down</li> <li>-The phones don't work</li> <li>-Mabel is going out of town for the weekend</li> </ul>	<ul style="list-style-type: none"> <li>-The different city workers are on strike</li> <li>-People will have to leave the city</li> <li>-Mabel won't want to come back</li> <li>-Something happened to the mayor or the city leadership</li> <li>-People might get sick from all the garbage and all their food may spoil, causing people to go hungry</li> <li>-The city is run from City Hall</li> </ul>
Interview Questions	Learning Issues
<ul style="list-style-type: none"> <li>-How long has this been going on?</li> <li>-Have there been outages at their school?</li> </ul>	<ul style="list-style-type: none"> <li>-Who controls the garbage collection in Atlanta?</li> <li>-Who controls the power production in Atlanta?</li> <li>-Who is responsible for the libraries?</li> <li>-Why does City Hall control everything?</li> <li>-Who's in charge of the post office, and what happens if they stop working?</li> <li>-Who is in charge of the city?</li> </ul>

*Guide Questions:*

- What seem to be important city services that are not working?
- What seems to be the main problem?
- What do you think would happen if City Hall started running properly?
- Are there any services that a city can function without?
- Why is it important to have mail, power, library, and garbage service?
- Why would it be important to have a place in charge of everything? Is that necessary?
- Using prepared index cards, have students identify which functions each of the key city services perform. (students will later associate each card with an organelle)

Scene 2- Everything is getting worse. Letters of complaint are going to the City Hall, but there is no mail service to deliver them. In the meantime, electricity has been out, the library is out of service, and no one can get any research done. The city is on the verge of shutting down. School lets out for the weekend and Kevin’s family goes on a weekend trip to a new city, Plansell, GA. Kevin and his cousin Mabel are surprised by this strange new city, surrounded by high walls and with a gigantic water tank and many greenhouses. They wonder about things back in Atlanta. On the ride home, they read about organelles in their Life Science textbooks.

Facts	Hypotheses
<ul style="list-style-type: none"> <li>-Plansell is not having the same kinds of problems</li> <li>-Plansell has a large, strong wall around it</li> <li>-There is a giant tank of water in the city</li> <li>-The city makes all of its own food</li> <li>-There are greenhouses everywhere</li> <li>-Chamblee Middle School almost burned down</li> <li>-City Hall will be having a meeting soon.</li> <li>-Kevin has to read about organelles for homework.</li> <li>-The family had a great time in Plansell, and are going back to Atlanta on Sunday</li> </ul>	<ul style="list-style-type: none"> <li>-Plansell needs a wall or else it would fall apart</li> <li>-Atlanta will be destroyed if the problems are not resolved soon</li> <li>-Plansell runs out of water sometimes, so needs to store lots of it</li> <li>-Plansell is a better city than Atlanta</li> <li>-Plansell doesn’t want to buy food from other cities, therefore they make their own</li> <li>-The family will move to Plansell</li> <li>-The Atlanta City Hall leadership will/will not be able to resolve the problems in the city</li> <li>-Plansell may have some of the same problems as Atlanta soon</li> </ul>
Interview Questions	Learning Issues
<ul style="list-style-type: none"> <li>-Why did Plansell build the wall?</li> <li>-What kind of food are they growing in the greenhouses?</li> <li>-Why is Plansell so much cleaner and nicer than Atlanta?</li> </ul>	<ul style="list-style-type: none"> <li>-How does it help a city to have a large wall?</li> <li>-Why does Plansell need to store water in a building the size of half the city?</li> <li>-What is a greenhouse, and what does it do to produce food? Can everything that is necessary be grown in greenhouses?</li> <li>-Why isn’t Atlanta fixed yet?</li> <li>-What are organelles?</li> </ul>

*Guide Questions:*

- What will the City Hall meeting have to accomplish? What are the problems that Atlanta is still facing, and why do they need to be fixed?
- What did Kevin and Mabel notice about Plansell that was different from Atlanta?
- Think about the different things that organelles do inside the cell. Why do you think these jobs are important?

Scene 3- Having returned to Atlanta, the students find that things are actually better. The issues at City Hall have been resolved, resulting in adequate power, mail, and disposal services. Kevin and Mabel share information about their trip to Plansell. In their Life Science class, the students begin to learn about cells, and relate their organelles to the recent problems/entities in their cities.

Facts	Hypotheses
<ul style="list-style-type: none"> <li>-Things in Atlanta are improving</li> <li>-The power, postal, garbage, and library services are getting back to normal</li> <li>-Ms. Shizzle’s class is about cells today</li> <li>-Cells are the building blocks of life, the smallest living things</li> <li>-Cells have organelles inside</li> <li>-In French, some words that end in <i>-elle</i> mean something is small</li> <li>-There were two kinds of blobby things in the science book they were looking at</li> </ul>	<ul style="list-style-type: none"> <li>-City Hall got its act together and things in Atlanta will be great</li> <li>-The class is learning about organelles</li> <li>-Kevin might think that the cells and organelles are like cities somehow</li> <li>-In their books they are looking at cells</li> <li>-There may be two different kinds of cells</li> </ul>
Interview Questions	Learning Issues
<ul style="list-style-type: none"> <li>-Why do you (Kevin) think cells are like cities?</li> <li>-Is the power still going out in Norcross?</li> <li>-What other words in French or English end in <i>-elle</i>? Is there a similar ending in Spanish?</li> </ul>	<ul style="list-style-type: none"> <li>-What power does City Hall have that they were the ones able to get things done?</li> <li>-What does it mean that a cell is called a <i>building block of life</i>? Life is built of smaller things?</li> <li>-What are organs, and what exactly are organelles? What are examples of organelles?</li> <li>-How is a cell like a city?</li> <li>-Are there different kinds of cells? If so, what are the different types and their characteristics?</li> </ul>

*Guide Questions:*

- It seems City Hall was able to resolve the problems in Atlanta. What does that say about how important it is?
- What do you think Kevin realized at the end of scene three?
- (Kevin seems to think that cells are like cities. How could you compare a cell to a city, thinking about what went on throughout the story?)

## Resources

Boglin, Kirkpatrick, Phillips, & Walton. (2000) Cell and the city. Retrieved October 13, 2007 from <http://www.bioquest.org/bqemory/cellcity.html>

Rusconi, J., et al. (1998). The virtual cell web page. Retrieved October 19, 2007 from <http://www.ibiblio.org/virtualcell/>

Sullivan, J. (2006). Cells alive. Retrieved October 19, 2007 from <http://www.cellsalive.com>