Professor: OK, now. Let’s think about what large cities were like in the 19th century, that’s the late 19th century, 1880, circa 1890, around then. So, you’ve been reading about the living conditions of residents living in large cities back then. Urban areas at the time, you remember, were dirty, smelly, and noisy; the people who lived there were impoverished, and they suffered from poor health. So what we know of modern cities grew out of disgust and unhappiness with that situation. At the time, city planners believed that it was the city itself that created these horrible conditions: they thought cities were evil, unsafe, and offensive to nature. Therefore in reaction to those conditions, new ideals, new visions emerged of what a healthy city might be. And these ideas have influenced city planning for over a century.

Lecture: Visions of the Modern City

Professor: OK, now. Let’s think about what large cities were like in the 19th century, that’s the late 19th century, 1880, circa 1890, around then. So, you’ve been reading about the living conditions of residents living in large cities back then. Urban areas at the time, you remember, were dirty, smelly, and noisy; the people who lived there were impoverished, and they suffered from poor health. So what we know of modern cities grew out of disgust and unhappiness with that situation. At the time, city planners believed that it was the city itself that created these horrible conditions: they thought cities were evil, unsafe, and offensive to nature. Therefore in reaction to those conditions, new ideals, new visions emerged of what a healthy city might be. And these ideas have influenced city planning for over a century.

OK, now. One of these solutions was proposed by Howard, by Ebenezer Howard… Ebenezer Howard. He was English. Uh, Howard looked at the… at all the problems of London, and in 1898, he proposed building new cities in the countryside—he called them “Garden Cities.” He thought that the Garden City would be a solution to the problems of big cities, big cities like London. His idea was to take city residents and spread them out over the countryside. The idea was that the poor people of the large city would be able to live close to nature. It’s not that they would just lounge around, no; they would still have to work. So, in these cities, the industry would be grouped together in one specific place. I mean, schools, housing, cultural activities, each would have their own separate places, and a garden—or a public park, something like that—would be in the middle, in the middle of the city. The population of each city would be limited to 32,000 people or so; so essentially, this meant that the Garden City would never become another London. What he, what Howard was doing was separating the different functions of a city into areas, so housing was separate from industry, industry from cultural activities, and so on. You get the idea. In fact, this was the first deliberate planning of a suburban area. For example, Stockholm, Stockholm Sweden, is built this way. And so is Vancouver.

So what about this plan? Sounds pretty good. But let’s think about it for a moment. Now, once the town was built, it wasn’t easy to make changes. Because it wouldn’t account for growth or any kind of changes. So if the industry changed, or the population grew… That’s a problem. And because the homes, the residential areas, are separate from the workplaces and from the cultural activities and the like—large suburban areas are empty during the day. And what does that mean? It’s the perfect place for property crime.

OK. Now, another approach to the problems of large cities was the “Radiant City.” This was developed, this idea was developed by a Swiss architect named Le Corbusier in the 1920s. Got that? His dream city—the Radiant City—was composed of mainly, mainly of skyscrapers, skyscrapers within a park. It was a vertical city—with about 1,200 people per acre—that’s 300,000 people per square kilometer. Now that’s an extraordinarily high population density. But, here’s the key thing… the buildings would occupy only 12% of the ground. And the rest of the land—that’s 88%—would be open, remain open for parks and recreation. The idea was to bring the country into the city. City into the country—Howard. Country into the city—Le Corbusier. Le Corbusier’s plan also included wide highways for express one-way traffic and underground streets for heavy vehicles. Now, there wouldn’t be many small streets because he—Le Corbusier—thought pedestrians should be off the streets…and in the parks. The downtown cores of Toronto, Hong Kong, São Paulo are all examples of this Radiant City idea.

Now, this was a creative solution, but it definitely created some problems. We can see, this makes sense that, it became the basis of our “car culture” of today. Streets were not pedestrian friendly—the spaces were so wide and large that no one could walk anywhere, and most of the roads were highways, so it wasn’t safe to walk along them anyway. And Le Corbusier created the same problem that Howard did—he separated out the functions of the city—work from home, etc. creating unsafe city zones.
OK. Another idea, the last one we’re going to talk about today, is “The City Beautiful,” proposed by Daniel Burnham—Burnham—of Chicago…in 1909. Now his idea was that the inner-city slums, which were the only residential areas in the downtown core, should be cleared away and people should build their cultural center—the civic center—in the middle of the city. Tear down the slums and rebuild. All the important buildings and monuments would be arranged along a single boulevard. The idea was to create the grandest impression possible. Which meant residences were moved into the suburbs, and streets were gently curved, they would be curved, not organized along a grid. Brasilia, Paris, Lisbon, these are all examples of the “City Beautiful.” But you know, in many City Beautiful cities—not all—people weren’t naturally drawn into the main monument area of the cities, so they did not become busy city centers.

So this is what happens, this is what happens with all three of these models. They all separate housing from business, and industry, and cultural activities. So, this leaves certain areas of the cities empty at certain times of the day—the residential areas in the daytime, the business areas at night. Think about it.

Alright, well now, it’s almost time, so for next class, this is what I’d like you to do: I’d like you to think about whether or not living in each of these ideals would be safe and why. Jane Jacobs’ book The Death and Life of Great American Cities shocked urban planners—the “experts” of the day—with its radical ideas about safety. We’re going to talk about that. And also, for next time I want you to read the following pages…

UNIT 2
Business: Leadership Behavior

Lecture: Behavioral Theories of Leadership

Professor: OK. To start, let’s review what we talked about last class. We talked about trait theories of leadership, and some of the weaknesses of trait research in relation to leadership. Now, you’ll recall that the identification of specific traits in successful leaders, like…intelligence, energy, dominance, emotional stability, and the like, while it was useful at describing leaders, did not solve the ‘chicken or the egg’ problem: that is, it didn’t explain which came first. Did the traits create the leaders, or did the leadership position create the traits? And this weakness meant we couldn’t apply the research findings to any real-life situations. We couldn’t select leaders based on the traits they demonstrated, because we didn’t know if the leaders had those traits first, or if they were likely to develop the traits later once they had the leadership position. That was a problem.

Consequently, researchers in the field of leadership began to think that maybe what made a great leader, or an effective and successful one, was not the leader’s traits. Maybe, what made a leader great was his or her behavior. Now, behavioral theories of leadership try to identify critical behaviors of leaders, in the hopes that we could train people to be leaders.

In the 1940s and 50s, researchers at Ohio State University developed a list of more than 1,800 or so specific behaviors that leaders might use. This list included behaviors such as telling employees what to do (being directive), um…another one, being friendly, setting goals for others, and so on. Then the employees were asked to rate their managers on these behaviors—you know—determine whether the manager demonstrated the behaviors, and to what extent. When the researchers put all their data together, they discovered that most leader behaviors were related to one of two main orientations. These two orientations were called consideration and initiation. Consideration and initiation behaviors are complementary. They can both be used at the same time.

Let me give you definitions of consideration and initiation orientations. Consideration behaviors on the part of the leader show that leaders trust, respect, and value good relationships with his or her followers. To complement consideration behaviors, initiation behaviors are what the leader does to get the work done. Assigning individual tasks, looking ahead, setting goals, deciding how the work should be done, and pushing the employees to do their work are all examples of initiation behaviors.

OK, I have a real life example of how consideration and initiation behaviors play out in real life. This is the case of David Pottruck, co-CEO of Charles Schwab and Company—that’s a brokerage company—he started out by using initiation behaviors. He was very directive, he used a competitive approach to leading. He didn’t show consideration behaviors.

As a result, one day, the boss, Charles Schwab, told Pottruck that he had discovered their employees didn’t like working with him. The employees felt that Pottruck was forcing his ideas on them, not asking them what they thought, and not asking for their agreement on projects.

As it turned out, Schwab helped Pottruck change his leadership style by hiring an “executive coach” who showed him how to incorporate consideration behaviors into his leadership style. These days, Pottruck shows consideration by explaining problems to his employees and getting their input first. For example, when he realized that the company should probably keep its branch offices open on Saturdays, he explained the need to his branch managers, and also recognized that this might be a big problem for them. Rather than resisting the Saturday openings, his branch managers understood the problem, and agreed to work with him to find the best solutions for their employees. Now Pottruck uses consideration behaviors often to encourage cooperation and teamwork, as well as initiation behaviors to get work done.

But just as behavior research has its strengths, it also has a weakness—just like trait theory did. Behavioral researchers in leadership began to see that the situation the leader was in had a large influence on the kind of behavior that was effective. Therefore, researchers began to look at the situations that
caused leaders to behave in certain ways. They discovered a few things.

- When employees experience a lot of stress due to deadlines, or unclear tasks, initiation behaviors will increase employee satisfaction and performance.
- Also, when the job is interesting and rewarding for employees, leaders can use fewer consideration behaviors; the employees are simply motivated by their work, and don’t need motivation from their boss.
- When the work is clearly defined, and the employees are experienced, leaders who use consideration behaviors will increase satisfaction. Those who use initiation behaviors will decrease satisfaction.
- When the work is NOT clearly defined—or undefined—or the workers are inexperienced, then they’ll appreciate a leader who uses initiation behaviors because the leader gives them guidance in what to do.

So in conclusion, clearly, the situation or the context of the job is very important, too. Leaders should consider the situation as a factor in determining how they should behave. So this information means that we need to look next at situational theories of leadership—that is, how the situation can affect how a leader should behave. Right, so we’ll leave it at that for now. Your homework is to read about situational theories of leadership for next class.

**Before You Speak**

**Exercise 2, Page 42**

**Student:** There are three major styles of leadership that can be used in any leader-subordinate, or employer-employee, situation.

Managers can be autocratic—which means they issue orders and expect the orders to be obeyed without question. Military commanders have to be autocratic leaders, especially on the battlefield. They make the decisions, and everyone else has to follow. This style is good for fast decision making because no one else is consulted. It is also useful in situations where an industry leader has to make a fast decision to beat out a competitor.

The second style of management is the democratic style. These managers generally ask for input from subordinates before making decisions but make the final decisions themselves. In this case, the manager may ask other group members to interview and offer opinions about someone applying for a job, but the manager will make the final hiring decision.

In contrast, the third management style is called the free-reign style (like letting the reins hang loose when you are riding a horse). This kind of manager acts like an adviser to subordinates, and it is the subordinates who are allowed to make decisions. If you were the chairperson of a volunteer committee that was raising funds for a new library or a piece of hospital equipment, you might use the free-reign style.

The relative effectiveness of any leadership style depends largely on the desire of subordinates to share input or be creative.

**UNIT 3**

**Environmental Science: Forest Fires**

**Lecture: The Benefits of Forest Fires**

**Professor:** Well, hello everyone. Some of the statistics on forest fires are quite sobering; they damage or destroy many square kilometers of land each year, and many lives have been lost fighting fires. It’s also true that the effects of forest fires can be quite complex—helping some plants and animals survive, while destroying others. However, today we’ll talk about the beneficial effects of forest fires.

In the early 1980s, the results of some careful research demonstrated that there were some benefits to forest fires. These results indicated that wildfires were a “natural” event in the lifecycle of a forest, and that wildfires actually helped maintain a healthy forest—so forest fires were, in fact, good for the ecosystem. For example, research proved that wildfires are important to maintaining the diversity of the woodlands and bushlands of eastern and southern Africa, and the eucalyptus forests in Australia.

Let’s discuss some of the ecological benefits of forest fires.

First, naturally occurring wildfires—usually started by lightning strikes—are often small—they don’t burn much forest, and they don’t get too hot. These “small” fires actually protect forests from large scale combined crown, surface and ground fires. This may seem strange, but most small forest fires don’t have enough heat to burn the big trees. Trees taller than 6 to 13 feet high have thick enough bark to protect them from burning at low temperatures. This means smaller fires burn away all the accumulated organic matter on the forest floor; you know—years of leaves, twigs and branches—foresters call this stuff “litter”—without damaging the taller trees. In fact, these kinds of low temperature fires can actually strengthen big trees as the fires can burn away all the smaller shrubs and bushes that might compete with the big trees for resources—water and soil nutrients.

So it’s a bit ironic. Small forest fires actually reduce the risk of large-scale destructive forest fires. Once the “litter” has been burned away on the forest floor, the forest is safer from high temperature fires—the combined crown, surface and ground fires that can do real damage to the tall trees.

Alright. Second, forest fires improve soil quality. The “litter” on the forest floor would normally decompose very slowly. The fire releases the nutrients in the litter right away—creating an increase in the amount of phosphorus and potassium available to the forest plants, which are key elements to promote tree growth. This makes the soil rich for further seed growth, too. The heat from a fire stimulates soil microorganisms, which again promote growth.

To have a balanced view of the effects of forest fires, yes, we must also consider the damage wildfires have on some plants and animals. The effects of fires on forests are really quite
complex, but that’s a matter for another lecture. We will be discussing the more complex effects next week.

Let’s see, which point are we on now? Oh, oh yes, third, forest fires reduce tree disease and pests. Trees that do burn in low-temperature fires are likely to be trees that have diseases or are infested with pests. These trees are weakened by their conditions, and the fires can eliminate—or at least reduce—the spread of diseases and pests to other trees.

Next, forest fires encourage seed growth. Yes. Low-temperature fires encourage seed growth—or the germination of plants because some trees—usually varieties of pine trees—produce pine cones (with their seeds inside) that need to be exposed to heat before the cone opens and releases the seeds. The heat from the fire opens the pine cones which release their seeds. And the seeds benefit from the improved quality of the soil.

Finally, forest fires have a beneficial effect in that they open up the canopy. In a mature forest, the canopy captures the heat of the sun, and prevents the warmth from reaching the forest floor. A forest burn will open up the canopy and allow the energy from the sun to reach the forest floor. This creates room for some of the bigger animals, like deer and moose, to live in the forest. So it contributes to animal diversity within the forest. The heat of the sun on the forest floor also encourages smaller plants to grow, and this makes the biology of the forest more diverse—you know—it contributes to biodiversity—which makes the forest more resistant to disease and insect pests.

To conclude, these are quite significant benefits. These benefits, combined with the realization that forest fires are a natural part of forest ecosystems, changed forest management practices. As long as fires are far away from homes, communities, and stands of valuable trees, foresters often choose to let the wildfires burn.

Please read the article in your courseware package about the severe forest fires in Canada’s British Columbia. This will give you an idea of what happens when fires do approach human habitations.

**UNIT 4**

**Art History: Defining Cubism**

**Lecture: Cubism as Fashion Art**

**Professor:** Hello everyone. Let me remind you—we’ve been talking about how influential cubism was, as an art movement. Today we want to think about whether we can consider cubism as skillful—especially the later forms of cubism, like synthetic cubism—when Picasso began gluing objects onto the canvas, and cubist construction—when he began building objects.

By the way, I should mention that there will be a new exhibit of cubist art work on display at the art museum downtown this spring. It will feature some of Picasso’s more recent sketches that have never been displayed before. I recommend that you all try to attend when it opens. OK, back to our lecture.

I want you to think about this. All art movements begin with a new idea. An art movement begins as a way of representing new ideas in the clearest possible way. So novelty, or newness, is a key element in art. However, great art must also be skillful. Somehow, the artist must demonstrate some technical skill, right? The work must be skillfully impressive—otherwise it is nothing but invention—like a piece of machinery. Traditionally, art has always been a mixture of novelty and skill. It’s a balance—really good art has equal measures of skill and novelty.

Now, let me introduce you to the term “fashion art.” Now, fashion art is a whole new ball game. Artists who create fashion art change their art simply because they desire novelty, and they hope that novelty will generate sales. Art becomes fashion art when novelty becomes more important than skill. The balance is lost. Fashion art is new, and will attract buyers because it is different, but there is rarely much skill involved.

Oh, another point about fashion art is that it stimulates even more fashion art, since the novelty of the art wears off quickly. That’s when the public sees the lack of skill in the art work. Then there is demand for new novelties, and a new stage of art is produced to satisfy the demand.

My hypothesis is that the various forms of cubism—especially when cubism evolved into synthetic cubism and construction—are fashion art. Let’s look at some examples, and you can be the judge.

From 1907 to 1911 Picasso was in his analytical cubism stage. We begin by looking at a slide that you should be familiar with, as you read about it in your textbook.

This painting is called Portrait of Daniel-Henry Kahnweiler, and it is an excellent example of analytical cubism. You can see here Picasso painting objects and spaces into geometric shapes and cubes that interlock—merging the figure with the background. The perspective is flat. The colors are minimal, but the canvas “shimmers.” The true form of the subject is suggested, so the painting is not completely abstract, but “reality” is less important than the concept of the subject. This painting demonstrates both Picasso’s novel idea and skill.

Picasso took the cubist idea of breaking up shapes and space into angled planes and applied it to sculpture. Now, here is Picasso’s Woman’s Head, completed in 1909. You can see how he has transferred the idea of cubism from a flat canvas to a three-dimensional object. I would argue that this sculpture still demonstrates some skill, so I wouldn’t call this piece fashion art.

But Picasso also wanted to experiment with other forms of representation, and this lead to synthetic cubism. Now we move into what I call the fashion art period of cubism. Picasso was experimenting with his art for the sake of novelty, to generate sales, not to make art more expressive, or to move art forward.
From 1912 to 1914 he worked at synthetic cubism. In his Still life with Chair Caning, Picasso took a piece of cloth and painted it to look like the seat of a chair. The word jouer, which may be a reference to the French word jouer (to play) or jouet (toy) suggests that Picasso was playing with reality. What do you think? Is it skillful?

His Guitar is an open construction. Volume is suggested by a series of flat and projecting planes. Picasso turned the guitar sound hole (in reality an empty space) into a cylinder. Incidentally, you may have seen this image of a guitar around town—even today it is used occasionally. It was used to promote a number of popular music bands in the 1920s, so it certainly caught the popular imagination.

Picasso later moved into collage—a combination of glued paper and drawing.

By gluing paper on canvas, Picasso created Guitar, Sheet Music and Wine Glass, and Man with a Hat. By the time he reached this stage of cubism, he was no longer creating art that represented the idea of cubism—he was generating pieces of fashion art that were “novel,” but lacked skill. This is what I call fashion art.

The textbooks don’t make this distinction between art and fashion art. The textbooks will tell you that Picasso’s works are all masterpieces. For our next class, be prepared to discuss whether you think Picasso’s synthetic cubism and construction cubism are examples of great art, or fashion art.

**UNIT 5**

**Sociology: Innovation**

**Global Listening**

**Exercise 1, Page 103**

**Professor:** Today we’re going to discuss how innovation diffuses—in other words—how change spreads. Specifically, we want to look at one of the most significant channels of diffusion—I think you know what that is? Right, the mass media. As you know, the mass media (Internet, newspapers, radio, television, and the like)—the mass media are very influential. That is undeniably true. However, you might be surprised to learn that the influence of the mass media has some limitations.

**Lecture: Mass Media and Diffusion of Innovation**

**Professor:** Today we’re going to discuss how innovation diffuses—in other words—how change spreads. Specifically, we want to look at one of the most significant channels of diffusion—I think you know what that is? Right, the mass media. As you know, the mass media (Internet, newspapers, radio, television, and the like)—the mass media are very influential. That is undeniably true. However, you might be surprised to learn that the influence of the mass media has some limitations.

OK. So, let’s begin. Every day we are inundated by mass media messages trying to get us to do something, to change something, or try some new product. But most research about the mass media suggests that they have limited direct effects for producing change.

Let’s look back first. Before the printing press was invented in the fifteenth century, there had to be direct contact between people, and cultures, for information to spread. Once the printing press was invented, there was a new possibility: the diffusion of innovation without physical contact between cultures. However, there was a problem. To receive information, people had to be able to read. Literacy was historically in the hands of just a few people—for example, the rich, the scribes, or monks. So the real impact of print media was dependent on the development of mass education and literacy. And this is the first limitation of mass media—it depends on literacy and education. In the twentieth century, of course, the number of literate people was much larger than it had ever been, but illiteracy is a phenomenon that limits the effectiveness of print media even today in some developing nations. And electronic media still suffers from this limitation. If people can’t read, they can’t get access to the innovation the media describes.

Radio and television have great potential for the mass diffusion of innovation because they don’t require literacy. But like the limitations of print media, the absence of education, and the lack of resources to purchase these items limit the diffusion of information technology. So lack of education, money, and access limit the direct effect of the mass media.

Alright, I can hear you saying it, but in the literate and developed countries, mass media is “king.” There can be no other limitations for this channel of diffusion. Right? But let’s think about this. Mass media offers one-way communication with limited capacity for feedback from audiences who listen, read, or watch. Recipients of mass communication such as newspapers, magazines, television, and radio can’t really ask questions, get clarification, or talk back in any meaningful way. The interesting thing about this is that effective persuasion to adopt change usually requires interactive communication between an individual promoting change and an individual who might adopt the innovation. Direct effects of mass-media communication are limited until they’re modified by interpersonal communication among people who tuned to the same media message. You’re very likely to discuss media messages with friends, family members, and classmates, and these conversations will critically reshape the impact of the messages. So lack of personal interaction is another limitation of the mass media.

Perhaps this explains the power of the Internet. People can learn about innovations, new technologies and ideas, and discuss them with others all through the same channel. That’s a very powerful thing, as you well know.

And there are other factors that limit the ability of the mass media to diffuse innovation. The selective exposure, perception,
and retention that people bring to their media exposure limit its ability to persuade people to change. People who initially feel positively about a particular innovation and change are the ones most likely to be receptive to mass communication about it. For example, television messages about voting for a certain political party (whatever the party) ... are most likely to have positive impacts on people favorably inclined toward that party in the first place. People are, in other words, most likely to pay attention to and remember information about those things that they feel positive about to begin with. What people bring to the media is at least as important as what media bring to people.

The actual effects of mass media are quite complex. Research suggests that mass media are successful at intensifying or reducing the intensity of existing attitudes and opinions. However, they are not successful, or not very successful, at creating new attitudes and opinions or converting people to new attitudes and opinions. And this limitation is mostly a result of the fact that diffusion of innovation occurs primarily when there is reinforcement through interpersonal communication in an informal group context.

But, for sure, the media can have important long-term effects on social change. They may not be able to get individuals to believe or try new things. They do, however, help socialize people and can shape the culture of knowledge, attitudes, and behavior that people bring to media exposure.

**Focused listening**

*Exercise 2, Page 104*

**Student 1:** I don’t really believe that the mass media has any limitations. The influence of television and the Internet is so pervasive, they can change anyone’s opinion you know, they reach almost everyone on the planet.

**Student 2:** I’ve never thought about it before, but if I’m not interested in what’s on TV one night, I don’t bother to watch it. For example, I don’t listen to political advertisements; I’m not very interested in politics.

**Student 3:** I’m going out tonight, and I won’t be thinking about innovation or channels of innovation diffusion! I’m going to see a movie.

**Before You Write**

*Exercise 2, Page 106*

**Lecture: Individuals as Channels of Innovation Diffusion**

**Professor:** I talked last class about the mass media—and its limitations—as channels of innovation diffusion, but I also want to touch upon the influence of individuals as channels of innovation diffusion. So this is what you need to know about individuals as channels of innovation diffusion. Individuals, specifically opinion leaders, can have significant direct effects on how the rest of the population perceives innovations.

Scholars have identified two kinds of opinion leaders: cosmopolitan leaders, and local opinion leaders.

Cosmopolitan leaders are people with an extraordinarily large network of friends and acquaintances...think of the people on Facebook who have the most friends—somewhere in the tens of thousands. They almost always belong to a wide variety of established groups, and have a wide range of interests. This allows them to diffuse information about innovations amongst groups. They have so many contacts that they can spread information quickly throughout a broad and diverse spectrum of society.

Local opinion leaders also have large numbers of contacts. However, in contrast with cosmopolitan leaders, the contacts of a local opinion leader are usually within one interest group. Now, local opinion leaders may belong to many groups, and are probably central figures in their groups, but the groups are mostly focused on the same interest or topic. In other words, they have a very deep reach into a single community of people. Cosmopolitan leaders have a wide reach into many communities, and local opinion leaders have a deep reach into a single community.

Together, these kinds of leaders have a significant impact on the rest of the population, and they are not limited by the kinds of limitations that the mass media experiences.

**UNIT 6**

**Physical Science: Nanotechnology**

**Global Listening**

*Exercise 1, Page 122*

**Professor:** We’ve all heard of the iPod Nano; your friends tell you they’ll be ready in a nanosecond. The prefix *nano-* is becoming commonplace in our vocabulary and our ideas. But what does *nano* actually mean? As science and math students you will know that *nano* means a *billionth*. So when your friend says, “I’ll be with you in a nanosecond,” he really means he’ll be there in one billionth of a second. A *nanometer* is—that’s right—a billionth of a meter, or about the length of six atoms. Not very big!

But what do you know about nanotechnology? Nanotechnology is the science of “how molecules do things.” It is the science of how molecules, and even atoms, are used to create new materials, new processes, and new machines. These tiny molecules can be put to work to substantially improve our quality of life.

Richard Feynman, the physicist and Nobel Laureate, started the nanotechnology revolution in 1959 when he gave an influential speech entitled “There’s Plenty of Room at the Bottom.” In his speech he argued that small machines can work more efficiently—using less power—and are cheaper to manufacture. Therefore, he suggested that research should focus on developing technology that is small. He suggested...
that scientists and medical researchers should look for ways to develop molecules that could perform surgery, devices that could store data on a pinhead, and minuscule generators that could generate power to run computers.

While Feynman’s vision was inspirational, researchers just didn’t have the tools to work on such a small scale. Until 1990 that is, when a new microscope—the atomic force microscope—was invented. This microscope has a minuscule needle that can move atoms and molecules around. The microscope can be used to manipulate and reorganize atoms. This opened the door to the nanoscale, allowing scientists to develop all kinds of tiny new ‘things.’

**Lecture: The New Small Is Big**

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The most significant ‘things’ developed by scientists working on a nanoscale are fullerenes and nanotubes. These are structured nanoparticles created out of carbon atoms. They have incredible properties. They are strong, light, flexible, heat tolerant, and can conduct electricity. These properties are useful in a wide range of fields and that is why nanotechnology is changing our lives in a wide variety of ways.

Let’s think about carbon nanotubes. A nanotube looks like a piece of paper—think of it as only one atom thin. The paper looks like chicken wire. Then roll that up into a tube—and we have a nanotube.

Nanotubes are already in products that we buy—for example in car parts, in the dashboard and tires, and in sporting equipment—tennis racquets, skis, bike frames. All of these things benefit from the strength and weightlessness that nanotubes can provide.

Similarly, nanotubes are in the lotions, makeup and hair products that we use. Some cosmetic companies use nanoparticles in makeup to make eye shadow and lipstick last longer. They use nanoparticles in face cream to help our skin absorb the creams more quickly and to penetrate more deeply into the pores of our skin.

It’s also likely that when we get dressed, the clothes we wear have nanoparticles in them. We’ve all seen the shirts that never need ironing, or the pants that simply will not stain. When fruit juice or red wine spills on those pants, the liquid just beads like mercury—and our pants remain clean! That’s the result of nanotechnology at work. Oh yes, and we’ve probably seen the socks that will never get smelly, right? That’s nanotechnology.

And one company—I think it’s Samsung—has developed a washing machine that uses silver ions. Silver ions can eliminate odor-causing bacteria and illness-causing bacteria; it eliminates viruses, algae and fungi—the washing machine disinfects our clothing. All thanks to silver nanoparticles.

Another application of nanotechnology is in the electronics industry. While you won’t see the nanotech electronic products just yet—don’t bother to look in the Future Shop this week—researchers at all the big electronics companies—such as Hewlett-Packard, Lucent, Intel, and IBM—all want to shrink computer chips to the size of a molecule. Why is that? Because at the moment, we can only make a silicon chip so small before heat from the operation of the chip circuits starts to melt the plastic from which it’s made. This heat problem is pushing researchers to look for ways to create tiny chips from materials that won’t melt—like those that nanotechnology make possible.

The field of medicine is also studying how nanotechnology can be used to help patients. It is hoped that a fullerene—that’s a nanoparticle in the shape of a ball—could be “filled” with medicine, or antibiotic. The fullerene would be attached to a molecule that would connect only with the bacteria, or defective gene, or cancer tumor inside the patient. In this way, medicine could be delivered exactly to the site of the problem. This delivery system would be efficient and might eliminate the nasty side effects of some medicines.

OK. We’re out of time for now. You will need to learn more about nanotechnology, its benefits and risks, and develop an opinion about it’s usefulness over the next week or so.
Focused Listening
Exercise 1, Page 123

Student 1: Nanotechnology is one of the most exciting technologies. I am certain that it will transform the fields of medicine, electronics, and product manufacture in the years to come.

Student 2: Whenever a new technology is introduced, there are risks. In my view, there’s a good possibility that there are risks associated with nanotechnology.

Student 3: I’ve read some articles about the application of nanotechnology to the field of medicine. I hear that nanotechnology may result in new treatments for cancer patients.

Student 4: OK. Well, even if nanotechnology has some drawbacks, there’s only a slight possibility that any drawback will prevent the further development of nanotechnology.

Student 5: There’s a good possibility that nanotechnology will have implications we haven’t thought of yet.

Exercise 2, Page 124

Student 1: We are already using nanotechnology in consumer products like cosmetics, sunscreens, stain-free clothing, and antibacterial washing machines.

Student 2: Minuscule machines—made out of molecules—would consume less power and be cheaper to make. It was Richard Feynman who thought of that first. He’s famous.

Student 3: Nanotechnology? How can something so small have such a large impact on our lives?

Student 4: Nanotubes and fullerenes will be used to cure cancer some day. I’m sure the benefits of nanotechnology will save the world.

UNIT 7

Microbiology: Fighting Infectious Diseases

Lecture: Conditions that Affect the Spread of Infectious Diseases

Professor: Hello everyone. This is our first lecture on infectious diseases.

Do you remember the outbreak of Severe Acute Respiratory Syndrome (or SARS) in 2003, or the more recent spread of the swine flu? Now, these are cases of infectious diseases that spread on a global scale. How can we keep these infectious diseases under control when they begin to spread? And this is the focus of today’s lecture: the conditions that encourage or discourage the spread of infectious diseases.

So, first of all, if we’re in good health, we are more able to resist disease, and the opposite is also true—if we’re nutritionally deficient, or ill with another disease (like cancer) we’re more likely to be susceptible.

A clean water supply and efficient water treatment are essential to preventing all kinds of illnesses. Our water systems can contain parasites that lead to schistosomiasis. Schi-sto-so-mia-sis, which is a disease that damages the bladder, the kidney, the liver, and the intestines. The World Health Organization estimates that 200 million people may be infected with the parasite and that 200,000 die every year.

Now, food preparation also affects our health. Gastroenteritis, ga-stro-en-te-ri-tis, which is a disease of the stomach and the intestines, is caused by improperly prepared foods, reheated meat and seafood dishes, dairy and bakery products. The WHO states that gastroenteritis kills 5 to 8 million people per year, and is the leading cause of death for children under the age of five. This, when gastroenteritis can be treated simply by rehydration.

Also, most of us live in large groups, in very large groups, and this makes us more vulnerable to infectious disease. So, let’s look at an example to make this more obvious. When a child is exposed to measles, his or her body requires about two weeks to make antibodies to fight the disease. This means that for the measles virus to survive, it must find a new body every two weeks. And this is easily done in a city where children go to school and meet at play groups.

And here’s another impact of living together in groups: we have more contact with waste products. We have to manage our waste so that we have as little contact with it as possible because there are many bacterial diseases and parasitic worms that result from contact with human waste. And of course, we have to minimize our contact with animal waste to prevent the spread of disease.

As if this weren’t enough, large groups of people attract what we call “agents of disease”—mosquitoes and rats. The kinds of things we do to support large numbers of humans contribute to the spread of disease. Now, to be specific, when we cut down trees for agricultural purposes or for urban development, we create pools of stagnant water, which are breeding grounds for mosquitoes that carry the protozoa that cause malaria. Similarly, large populations of humans tend to attract rats and other rodents that may also be agents of disease.

Our current levels of travel enhance the ability of a disease to spread as well. Like when SARS and the swine flu began to spread, one of the main problems was that unknowingly infected people traveling from one country to another, spread the disease across borders. These people unknowingly spread the disease to populations that had never been exposed to these diseases before. And if you have never been exposed to a disease before, then you have no antibodies, and you’re much more susceptible to contracting the disease.
This is nothing new, of course. One of the most horrific examples of this was the Black Death in Europe (in around 1348 to 1350). The Black Death was bubonic plague, caused by bacteria transmitted by the rat flea, which can spread to humans. An outbreak of bubonic plague was recorded in China in the 1330s, and by the late 1340s it had reached Europe. By the end of the epidemic, a third of Europeans, that’s 25 to 40 million, had been killed, and we don’t know how many Chinese had died. These deaths changed the economic and cultural life of Asia and Europe forever. Similarly, the native peoples of “The New World” also suffered when the European explorers and colonists arrived after 1492. Measles, smallpox, influenza, and whooping cough killed many of the natives throughout North and South America, the Pacific Islands, and Australia. Some populations were completely wiped out, and others had such severe disease rates that their cultures were destroyed.

So all of these conditions influence the spread of infectious diseases:

- how healthy we are
- whether we have access to clean water
- how we prepare our food
- how closely we live with others
- how much contact we have with waste products
- how closely we live to “agents of disease” like mosquitoes and rats
- how much we travel
- how likely we are to be exposed to a “new” disease

These are all conditions that we can take into account in our constant battle against the spread of contagious diseases. Now, the next challenge humans face in the war against infectious diseases is antibiotic resistance. We need to figure out what to do to combat antibiotic resistance. So, antibiotic resistance will be the focus of your reading for next class.

**Focused Listening**

*Exercise 2, Page 145*

**ONE AND TWO**

**Professor:** Do you remember the outbreak of Severe Acute Respiratory Syndrome (or SARS) in 2003, or the more recent spread of the swine flu? Now, these are cases of infectious diseases that spread on a global scale. How can we keep these infectious diseases under control when they begin to spread? And this is the focus of today’s lecture: the conditions that encourage or discourage the spread of infectious diseases.

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**THREE**

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**FOUR**

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**UNIT 8**

**Children’s Literature: Characteristics of the Genre**

**Lecture: Characteristics of Children’s Literature**

**Professor:** Hello everyone. In today’s lecture I want to define the characteristics of the genre of children’s literature. You have read about the generic plot pattern, and its variations, in your textbook. Now I’d like to discuss with you other characteristics of the genre of children’s literature.

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**Audioscript 193**
Let’s think about style first, specifically the amount of descriptive detail that is provided about characters and settings. First, think about children’s limited tolerance for descriptive detail. In general, kids aren’t very interested in descriptive detail, are they? So the description of character in most children’s literature is minimal, at least compared to the description we find in adult literature. But this lack of descriptive detail doesn’t make the stories vague. The information that is provided tends to be concrete rather than abstract—to give details about shape, sound, and color that allow readers to imagine physically specific worlds. In *Joey Pigza Loses Control*, for instance, Joey provides not just the abstract information that his mother is “stressed-out” but also some easily visual details: “Her elbows were shaking and her jaw was so tight her front teeth were denting her lower lip.” The texts of picture books tend to leave out the visual details of this sort—but do so because the pictures in them offer equivalent concrete and visual information about the way things look.

What about the characters in children’s books? Who are the main characters? The main characters are children of course. Child readers are most interested in child, or at least, child-like protagonists. Also, the characters confirm adult assumptions about children—that is to say, the protagonists are limited. The generic story often informs children that they’re too limited to cope with the world on their own; however, the characters often have some redeeming quality that saves them. For example, Cinderella is limited by her servant-like status in her step-mother’s house, but is redeemed by her goodness and beauty, which attracts the prince. In the traditional folktale *Three Billy Goats Gruff*, the youngest goat avoids being eaten by the monster by telling the monster that his older brother, who would make a bigger and tastier meal, will be coming by later. The youngest goat is limited by his size and strength, but makes up for it with quick thinking.

Another common characteristic of protagonists in children’s literature is that they are frequently orphans. Think of Cinderella, Peter Rabbit, Stuart Little, Harry Potter, both Lyra and Will of *The Golden Compass*; also Anne in *Anne of Green Gables*, Dorothy in *The Wizard of Oz*, and Simba in *The Lion King* were all orphans. The prevalence of orphans in children’s fiction seems to relate to a central concern that adults have with children’s independence and security. Orphans are of necessity independent, free to have adventures without the constraints of protective adults. At the same time, they’re automatically faced with the danger and discomfort of lack of parental love. In using orphans as main characters, writers can focus on children’s desire for independence, or on their fear of loss of security.

This is a good point at which to consider another characteristic of children’s literature—it often clearly shows opposition between two themes. As the use of an orphan as a main character allows, the two opposing themes of independence versus a fear of loss of security is common. You can probably think of other themes that are often placed in opposition in children’s stories—the classic example is the contrast of good and evil (think of Harry Potter and Voldemort), but there are many others, for example obedience and disobedience, civilization and nature, restraint and wildness, boredom and adventure, safety and danger, companionship and solitude, old ideas, new ideas, acceptance and defiance, and so on.

Finally, let us think about the meaning of children’s stories. Children’s stories are action oriented, but they almost always have moral commentary. Remember that most children’s stories are written by adults whose primary goal is to instruct children about the adult world. While the stories are action oriented, children’s writers almost always want both their characters and their readers to focus on the moral implications of exciting actions. To do this, writers must find ways of expressing the deeper implications in their apparently straightforward stories. Sometimes, the implications are obvious: characters merely state what they have learned from their adventures. But in books such as *Peter Rabbit or Where the Wild Things Are*, the complex ideas beneath the surface simplicity aren’t explicitly stated. Instead they are implied. By choosing a series of actions that are superficially straightforward but actually complex, Potter and Sendak can both focus on action and imply complex moral situations.

So you can see that children’s literature, because of its distinctive characteristics, can certainly be considered a genre in itself. Even if individual stories don’t reflect these characteristics, each story can be seen as expressing variations on these common characteristics.

Let me recap the main characteristics we’ve discussed here. Children’s literature generally displays these features:
- minimal but concrete and visual detail;
- child or child-like protagonists, that are limited in some way, but have redeeming qualities;
- orphan protagonists that allow for the exploration of the conflicting desires of independence and security;
- contrasting themes in clear opposition to each other, like good versus evil, and
- stories that are instructive at a deeper level, that allow readers to make inferences about meaning.

Alright. That’s all for today. Does anyone have any questions?