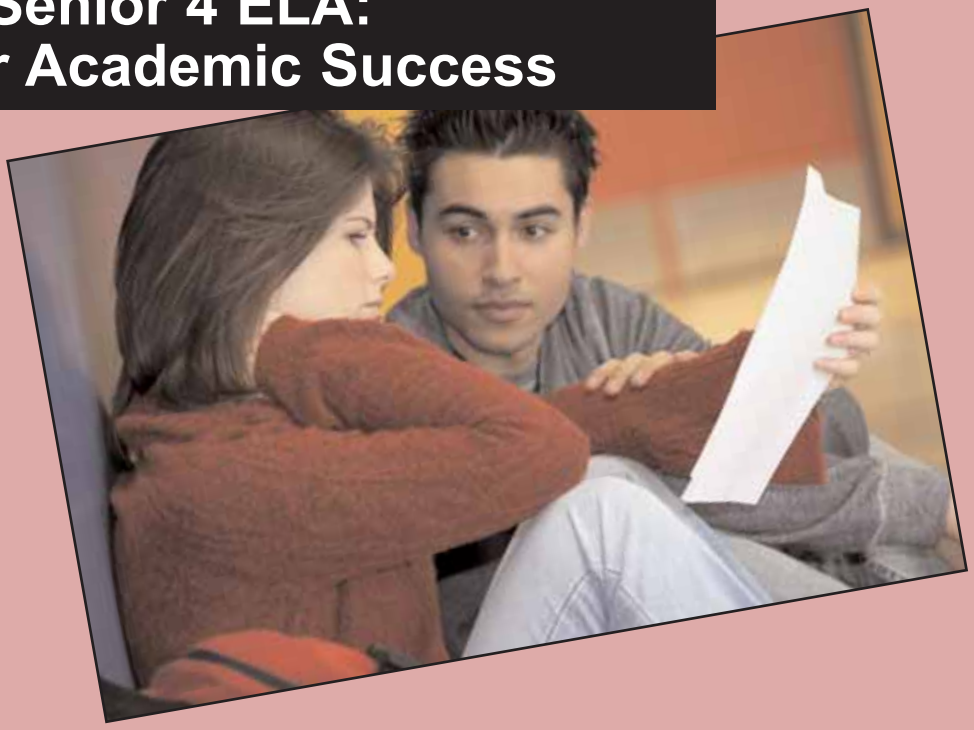
Senior 4 ELA:
ESL for Academic Success



Module Handouts

Senior 4 ELA:
ESL for Academic Success

Module Handouts

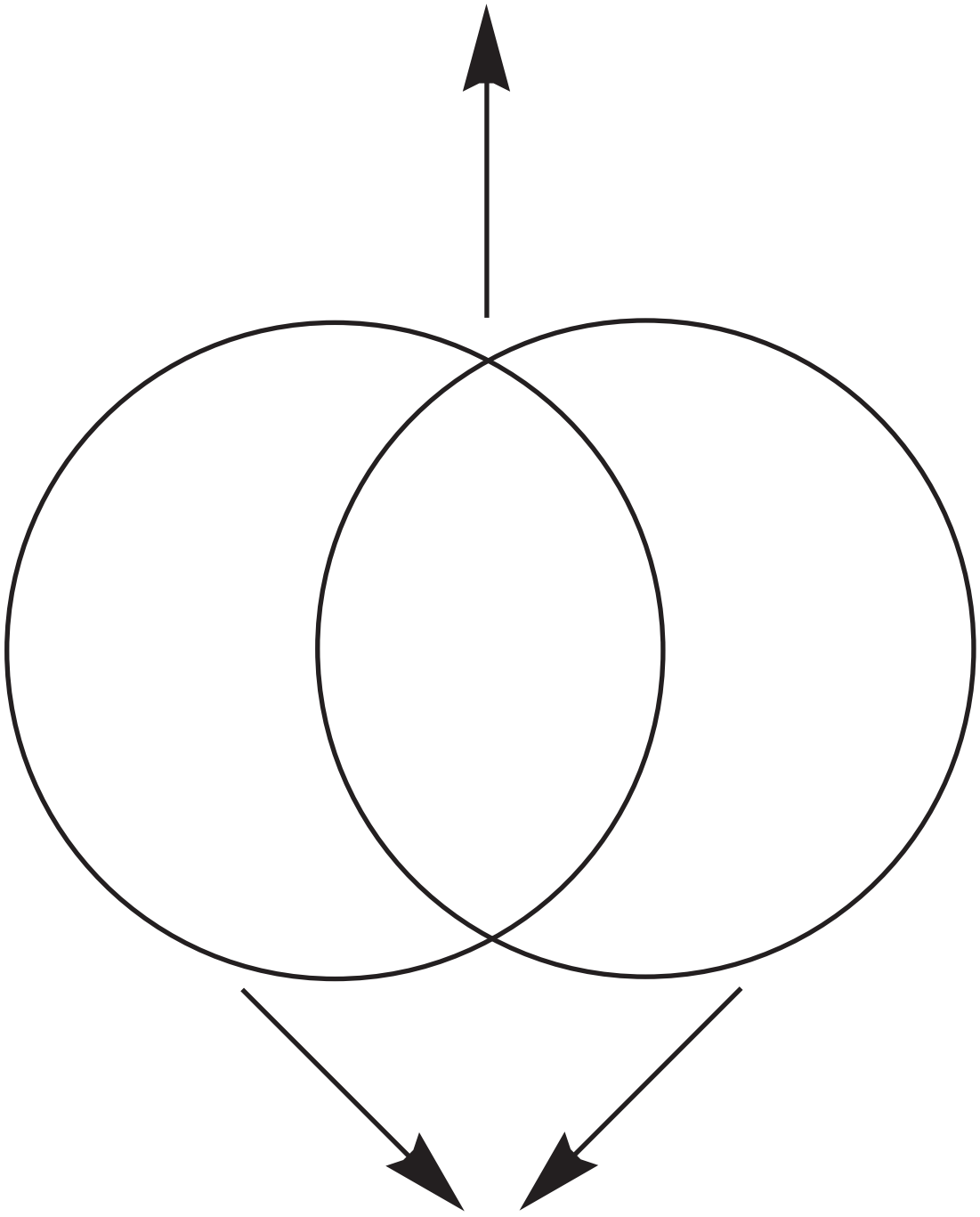
Module 1

Poster Presentation Evaluation Rubric

	3 Excellent	2 Adequate	1 Needs improvement
Information is accurate and thorough.	Relevant, accurate, and well-developed	Mostly relevant and accurate	Not relevant or inaccurate
English grammar and spelling are accurate.	Minor isolated errors in grammar and/or spelling	Sporadic errors in grammar and/or spelling	Frequent errors in grammar and/or spelling
Vocabulary used is appropriate to the topic and sports in general.	Effective word/idiom choices and usage that enhance meaning	Occasional errors of word/idiom choices and usage that do not obscure meaning	Inappropriate or incorrect word/idiom choices and usage that obscure meaning
The poster is attractive in terms of neatness, layout, and design.	Well-organized, effective, and relatively sophisticated design	Somewhat appropriate design that aids meaning	Ineffective design or sloppy or incomplete work
The presenter is able to speak about the material fluently and with accurate pronunciation.	Presentation was effective and clear	Presentation was comprehensible with some errors in pronunciation	Presentation was hard to follow, was difficult to comprehend, and included frequent mispronunciations

Language Associated with Venn Diagrams

similarly	likewise	in the same way that	just as
is like	is similar to	have in common	compared to
both	also	as well	too



in contrast	unlike	although	conversely
but	whereas	on the contrary	yet
still	however	differs from	
on the other hand	while	even though	

Check Out What You're Doing Now!

Take a moment to write down all the physical activities you did yesterday and will do today. Record them on the form. How much time did you spend in each activity? Jot that down, too.

Activity	Time Expended

Physical Fitness Requires Determination and Effort

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Learning Strategies for Better Second Language Acquisition

This is a list of proven strategies used by successful second language learners. Do you use any of these strategies? Will you try some of them?

Meta-cognitive Strategies (higher order skills; cold, organizational strategies):

1. Advance organization: Do I look carefully at a text before I read? Do I look at the way it is organized? Do I examine maps, graphs, titles, subtitles, bolded terms, etc.? Do I skim to get an overall idea?
2. Organizational planning: Do I plan what I say and do beforehand?
3. Directed attention: Do I decide before I start a task to ignore all the distracters around me?
4. Selective attention: Do I pay special attention to special aspects of a learning task? Do I listen for key words in lectures? Do I notice important words in questions and on tests?
5. Functional planning: Do I plan and rehearse before I perform a language task?
6. Problem identification: Do I explicitly look at the central problems that need to be resolved so I can complete a task correctly?
7. Self-monitoring: Do I check what I am doing as I am doing it? Do I make sure I am on track? Do I edit as I go? Do I think about what I should be listening for and remembering in a lecture?
8. Self-evaluation: Do I check my understanding after a lecture or discussion? Do I check my work after it is completed? Do I always edit carefully?

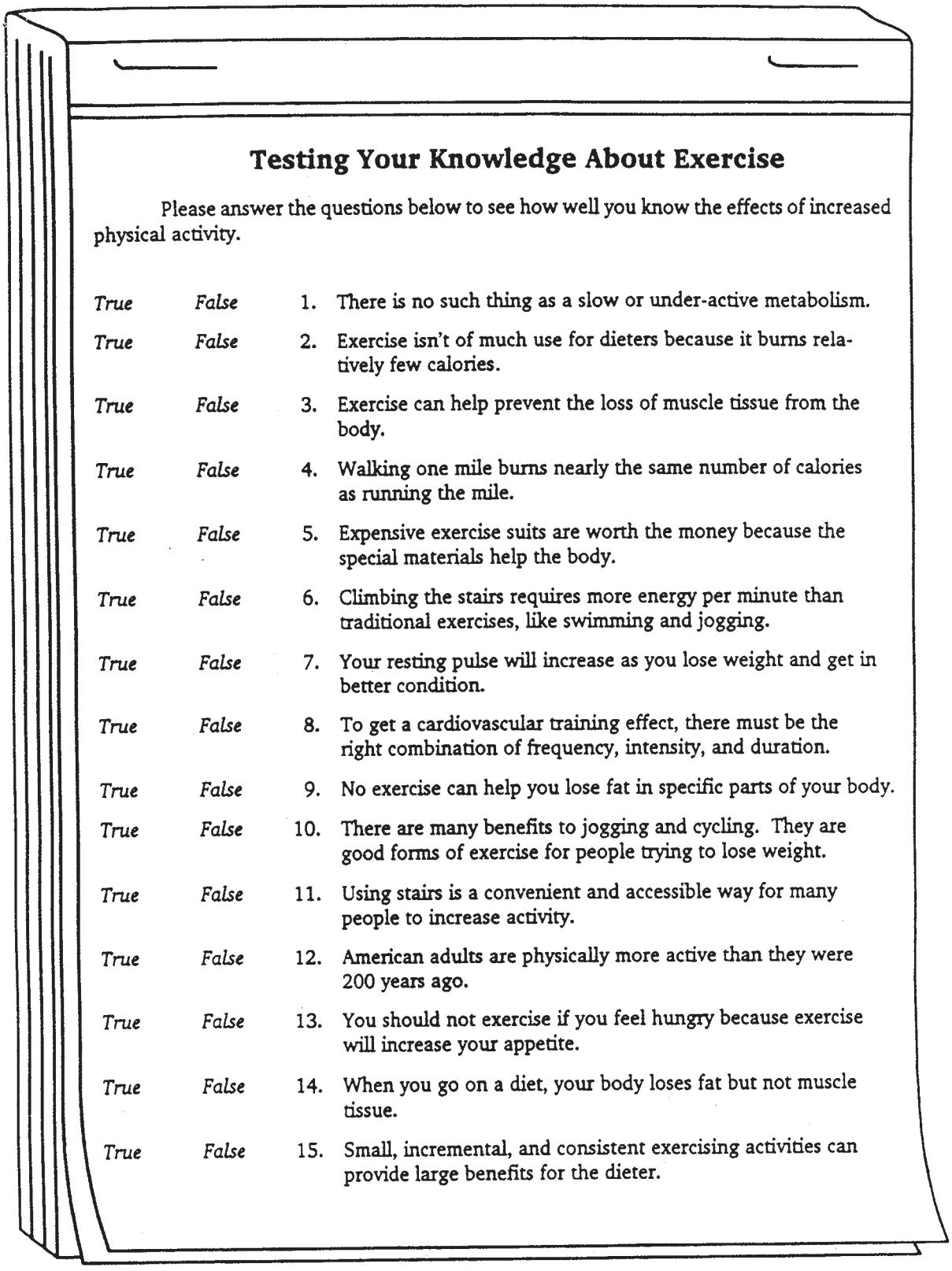
Cognitive Strategies (used while manipulating the material; strategies that help one grow and develop as a learner):

1. Prediction: Do I try to guess or predict what a lesson, text, assignment, or story will be about before I start the activity?
2. Elaboration: Do I activate what I know about this topic before I start the new work? Do I discuss with others to share information? Do I try to link the new information with information I already have?
3. Auditory memory: Do I rehearse and practise new vocabulary? Do I try to use new words so I become more familiar with them and remember them?
4. Note taking: Do I take notes of all important information in all classes? Do I know when to take notes in a lecture? Do I feel comfortable making point-form notes? Can I take notes in my own words?
5. Grouping or classifying: Do I group similar ideas and concepts together to remember them? Do I look for similarities and connections?
6. Imagery: Do I use the titles, headings, bolded words, graphs, maps, visuals, etc. to understand, learn, and remember a difficult text?
7. Inferencing: Do I use information in oral and written texts to predict meanings, complete missing parts, and guess meanings of new terms, et cetera?
8. Summarizing: Do I try to summarize an activity, lecture, lesson, or text after it is finished to help myself understand and remember what I have heard or read?
9. Transfer: Do I try to use what I know and apply it to something new?
10. Deduction/induction: Do I apply rules I know or figure out new rules to help me produce or understand my second language better?
11. Translation: Do I use translation to help me when I need help in understanding?
12. Substitution: Do I try different ways of solving language problems when one way isn't effective?
13. Recombination: In order to improve my writing skills, do I try to make my sentences longer or more complex by using meaningful sentence combining?

Social/Affective Strategies ("warm fuzzy" strategies that require one to interact with others):

1. Co-operation: Do I work with others to solve a problem, check notes, pool information, or check understanding?
2. Questioning for clarification: Do I ask my teacher or peers for more information, additional examples, or rephrasing for better understanding? Do I tell someone when I don't understand and ask for help?
3. Positive self-talk: Do I talk myself through a difficult task to lessen worry and to convince myself I can be successful?

Testing Your Knowledge about Exercise



Testing Your Knowledge About Exercise

Please answer the questions below to see how well you know the effects of increased physical activity.

True	*False*	1.	There is no such thing as a slow or under-active metabolism.
True	*False*	2.	Exercise isn't of much use for dieters because it burns relatively few calories.
True	*False*	3.	Exercise can help prevent the loss of muscle tissue from the body.
True	*False*	4.	Walking one mile burns nearly the same number of calories as running the mile.
True	*False*	5.	Expensive exercise suits are worth the money because the special materials help the body.
True	*False*	6.	Climbing the stairs requires more energy per minute than traditional exercises, like swimming and jogging.
True	*False*	7.	Your resting pulse will increase as you lose weight and get in better condition.
True	*False*	8.	To get a cardiovascular training effect, there must be the right combination of frequency, intensity, and duration.
True	*False*	9.	No exercise can help you lose fat in specific parts of your body.
True	*False*	10.	There are many benefits to jogging and cycling. They are good forms of exercise for people trying to lose weight.
True	*False*	11.	Using stairs is a convenient and accessible way for many people to increase activity.
True	*False*	12.	American adults are physically more active than they were 200 years ago.
True	*False*	13.	You should not exercise if you feel hungry because exercise will increase your appetite.
True	*False*	14.	When you go on a diet, your body loses fat but not muscle tissue.
True	*False*	15.	Small, incremental, and consistent exercising activities can provide large benefits for the dieter.

"Testing Your Knowledge about Exercise" Answer Key

1. *False* Humans vary on all traits, including metabolic rate. The causes of these variations are not well understood. But, even if you do have a relatively slow metabolic rate, exercise will cause an increase in caloric expenditure and will contribute to weight loss.

2. *False* It may be easier to eat 100 calories than to burn 100 calories through exercise, but the accumulative effect of exercise can increase caloric expenditure by several hundred calories per day. Remember that exercise provides many positive benefits aside from energy expenditure.

3. *True* Exercise maximizes the loss of fat and can help prevent the loss of muscle. In fact, exercise can build muscle tissue.

4. *True* How far you go is more important than how fast you go. It is not the rate of caloric expenditure that is important in weight loss, but the total number of calories that are burned. If you prefer to burn calories at a slower rate by walking instead of running, the effect on weight loss will be the same. Of course, running will get the job done faster!

5. *False* The rubberized "sweat suits" and other fancy gimmicks do not provide any benefit. In fact, they may cause you to overheat, especially in warmer weather. Wear clothing that is comfortable for you.

6. *True* Climbing stairs is an excellent way to burn a lot of calories. It is so strenuous that you will not be able to climb continuously at a fast rate unless you are very fit. You can accumulate significant caloric expenditure over the course of a day if you regularly take the stairs rather than the elevator.

7. *False* Your resting pulse rate will decline as you become more physically fit. This is a sign that your heart is getting stronger and can pump more blood with each heart beat.

8. *True* Improvement in fitness is related to the frequency, intensity, and duration of exercise. In the past, many people have overstated specific combinations of these variables that must be achieved to obtain certain health benefits. You should not worry about achieving a specific dose of exercise, but focus on increasing your activity level. Even modest increases in activity will, over time, produce changes in fitness and provide other benefits as well.

9. *True* Unfortunately, "spot reduction" just does not work. Your body adds and removes fat according to genetic and hormonal factors. You must concentrate on increasing caloric expenditure and achieving a negative caloric balance. When you do this, you can reduce fat in general, but you cannot control the areas where the fat will be lost.

10. *True* Jogging and cycling are excellent aerobic exercises and are ideal for many dieters. They provide both psychological and physical benefits. They burn a lot of calories quickly, make improvements in overall physical fitness, and make you feel good. Lower intensity activities such as walking also make important contributions to fitness, health, and weight control; but it may take a little longer.

(continued)

"Testing Your Knowledge about Exercise" Answer Key (continued)

11. *True* Most people have access to stairs, so it is easy to add several flights to your daily routine. Look for opportunities to build stair climbing into your day.

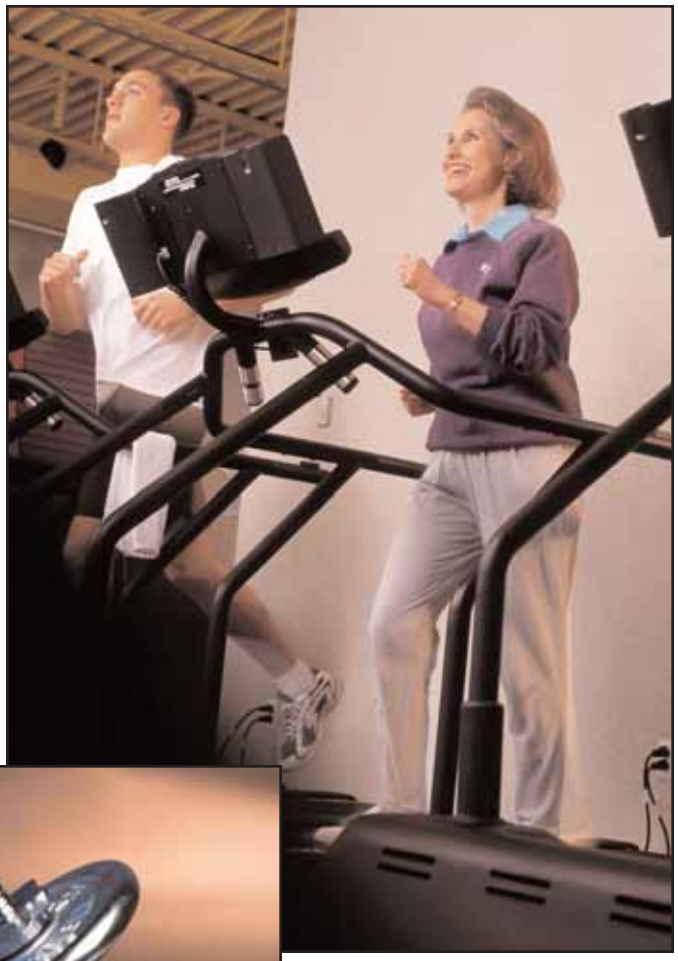
12. *False* Due to technological achievements, there is much less occupational physical activity today than there was 200 years ago. Motorized transportation and countless labor-saving devices have greatly reduced activity on the job and in leisure time.

13. *False* If anything, exercise will temporarily blunt your appetite, although in the long-run, more exercise will require more calories. However, exercise seems to help regulate caloric intake to appropriate levels. Regular exercisers weigh less than their sedentary peers.

14. *False* Caloric restriction causes significant loss of muscle tissue. Weight lost by exercise or by a combination of exercise and diet, tends to come predominately from fat stores.

15. *True* Building small incremental activities into your daily routine can have significant benefits in both weight loss and weight maintenance programs. The total accumulation of energy expenditure is what is important to weight loss efforts. Strive to accumulate several activities over each day.

The Importance of Physical Fitness



It is a fact: physical activity is vital in maintaining a healthy lifestyle. Physical activity strengthens the heart, helps people achieve and maintain a healthy weight, builds and maintains strong bones and muscles, and increases relaxation, to name just a few of its many benefits. To obtain the best results, a person must combine three types of physical activity: endurance activities (aerobic or cardiovascular exercise), which increase one's breathing and heart rate, causing perspiration or sweating; flexibility activities, such as bending, stretching or reaching, which help relax muscles and keep joints moving; and strengthening activities, which build muscles and bones.

What part does physical activity play in your life? Health professionals are recommending that all youths try to increase their physical activity by at least 30 minutes a day to begin and up to 90 minutes per day over a five-month period. To begin, increase the time currently spent on physical activity each day. Next, decrease the non-active time spent on TV, videos, computer games, and surfing the Internet. In addition, build up physical activity throughout the day in periods of at least five to ten minutes. While your physical activity may include moderate activities like brisk walking, also include at least ten minutes of vigorous activity, like playing soccer or running. Finally, set attainable goals and record your progress. With each increase, congratulate yourself and share your progress with your peers.

Introduction to the Energy Expenditure Chart

Many people find it useful to keep a progress chart to record their physical activity. The following chart is an energy expenditure chart. A person can estimate the number of calories expended daily by listing the number of hours spent at various MET levels. MET means metabolic equivalent, or the energy (calories) expended while a person is at rest. A general guideline is that a person spends one calorie per kilogram of body weight per hour while resting. There are five different MET levels: sleep, light, moderate, strenuous, and very strenuous. The following list shows the METs expended at each level and gives a general guide of the types of activity to include at each level:

- Sleep [1 MET]
- Light activities [1-3 METs]—Most daily activities, like standing or sitting in class, will fall into this category.
- Moderate Activities [3-5 METs]—This category includes any activity that requires 3 to 5 times resting energy expenditure. A good example is brisk walking at a pace that you would move at if you were in a hurry to get somewhere.
- Strenuous activities [5-7 METs]—These activities are more strenuous than walking and less strenuous than running. A good example is doubles tennis.
- Very strenuous activities [8+ METs]—These activities would be impossible for sedentary and unfit individuals because they cannot sustain very strenuous activities for more than a few minutes without becoming fatigued. Running qualifies for this category.

Follow the instructions to fill out the Energy Expenditure Chart. Think about ways you can change your caloric expenditure in positive ways. Over the next few months, record your progress. You can improve your physical fitness level!

Completing the Energy Expenditure Chart

Please review the next few pages including a sample of a completed energy expenditure chart. The energy expenditure chart allows individuals to calculate the approximate number of calories that they expended in a given period. The sample chart is for a 21.75-hour period from 4 pm the previous day until the time the chart was filled in at 1:15 pm the following day. Note that an average MET score has been provided for each category.

For this exercise, you may wish to have students complete the chart for a full 24-hour period.

(continued)

Introduction to the Energy Expenditure Chart (continued)

Instructions for completing the energy expenditure chart

1. Review Handout 1-6, the sample chart that has been provided as a guide. Notice that Jae Kim in completing the chart had to calculate the number of hours he spent on each category of activity and he needed to know his weight in kilos.
2. Take a blank page and divide it into five sections, one for each of the five categories of activities discussed in the article on METs (Sleep, Light, Moderate, Strenuous, and Very Strenuous)
3. List all of the activities in which you were involved in over the last 24 hours for each of the five categories (Sleep, Light, Moderate, Strenuous, and Very Strenuous) and the approximate number of hours spent on each activity. Refer to the chart CALCULATING YOUR ENERGY EXPENDITURE IN RECREATIONAL, WORK, and SCHOOL, AND HOME PHYSICAL ACTIVITIES USING METs (following page) to help you categorize each activity.

Introduction to the Energy Expenditure Chart (continued)

Calculating Your Energy Expenditure in Recreational, Work, School, and Home Physical Activities Using METs (Metabolic Equivalent Task)

Light Activity	METs per Hour of Activity
1–3 METs	
Standing	**1.3**
Reading, talking on telephone	**1.5**
Sitting in class, studying, note taking	**1.8**
Walking at a slow pace, at 3 kph (in school, office or shopping), easy casual	**2.0**
Light gardening	**2.0**
Light office work, light use of hand tools (watch repair or micro-assembly, light assembly/repair), standing, light work (bartending, store clerk, assembling, filing)	**2.0**
Playing musical instrument	**2.0**
Walking downstairs	**2.5**
Walking at an average pace (3.5-4 kph)	**2.5**
Somewhat heavier gardening or yard work	**2.5**
Cooking, light housekeeping, shopping	**2.5**
Pushing stroller with child, walking dog	**2.5**
Dancing (slow)	**2.5**
Standing, light/moderate work (assemble/repair heavy parts, welding, auto repair, pack boxes for moving, etc.), patient care (as in nursing), driving heavy tractor, bus, truck	**3.0**
Washing car or windows, mopping, moderately vigorous playing with children, sweeping outside house, vacuuming, picking fruit or vegetables, scrubbing floors	**3.0**
Golf, using power cart, bowling, fishing	**3.0**

- MET values for each activity are approximations; there may be considerable individual variation.
- One MET is the energy expended at rest. Two METs indicates the energy expended is twice that at rest. Three METs is triple the resting energy expenditure, etc. Thus, the METs-per-hour score is a measure of the intensity of a physical activity.

Moderate Activity	METs per Hour of Activity
3–5 METs	
Walking on job, 5 kph (one kilometre every 12 minutes), in office, moderate speed, not carrying anything, or carrying only light articles	**3.5**
Weight lifting, water aerobics	**3.5**
Golf, not carrying clubs	**3.5**
Leisurely canoeing or kayaking	**3.5**
Raking lawn, planting shrubs, weeding garden, heavy yard work or gardening activities	**4.0**
Masonry, painting, paper hanging, moderately heavy lifting, moderately heavy farm work	**4.0**
Walking at a very brisk pace (1 k every 10 to 11 minutes)	**4.0**
Climbing stairs	**4.0**
Dancing (moderately fast)	**4.0**
Bicycling 16 kph, leisurely	**4.0**
Slow swimming	**4.5**
Golf, carrying clubs	**4.5**
Walking at a very brisk pace (one k every 10 min)	**5.0**
Walking downstairs or standing, carrying objects about 11-22 kg	**5.0**
Digging, spading, vigorous gardening, using heavy power tools, general gardening, mowing lawn (hand mower)	**5.0**
Painting, carpentry, cleaning gutters, laying carpet, other vigorous activities	**5.0**

(continued)

Introduction to the Energy Expenditure Chart (continued)

Calculating Your Energy Expenditure in Recreational, Work, School, and Home Physical Activities Using METs (Metabolic Equivalent Task)

Strenuous Activity	METs per Hour of Activity
5–7 METs	
Chopping wood	**5.0**
Most doubles tennis; Dancing (more rapid)	**5.0**
Slow jogging (one km every 9 to 10 min.); Some exercise apparatuses	**5.0**
Ice-Roller Skating; Doubles Tennis (if you run a lot)	**6.0**
Loading and unloading truck (standing); moving heavy objects; heavy farming work	**6.5**
Walking downstairs or standing carrying objects about 22-34 kg	**7.5**
Hiking	**6–7**

Very Strenuous Activity	METs per Hour of Activity
8+ METs	
Rowing, canoeing, kayaking vigorously	**6–8**
Dancing (vigorous)	**6–8**
Some exercise apparatuses	**6–8**
Bicycling 16 to 22 kph	**6–10**
Swimming laps moderately fast to fast	**6–10**
Aerobic calisthenics	**6–10**
Singles tennis, squash, racquetball	**7–12**
Jogging (1 km every 9 min.)	**8**
Skiing downhill or cross country	**8**
Running 10 kph (6-minute km)	**10**
Running 12 kph (5-minute km)	**13.5**
Running 16 kph (3.75-minute km)	**16**

Reference

<http://healthfullife.umdnj.edu/archives/METsTbl.htm>

<http://healthfullife.umdnj.edu/archives/METsWork.htm>

(Accessed on October 3, 2005.)

Energy Expenditure Chart (sample)

Name: Jae Kim Today's Date: 12/04/03

Energy Expenditure Chart

(1) Activity Type	(2) METS	x	(3) Hours of Activity	=	(4) Caloric Expenditure per kg of weight
1. Sleep	1	x	8	=	8
2. Moderate	4	x	1	=	4
3. Strenuous	6	x	.5	=	3
4. Very Strenuous	10	x	0	=	0
5. Total Hours (sum of hours #1-4)			9.5		
6. Light	1.5	x	*14.5	=	21.75
7. Total calories expended per kg today					36.75
8. Weight in kilograms					58
9. Total calories expended: the product of lines 7 and 8					2,131.5

* This number is derived by subtracting the total on line 5 from the number 24.

(continued)

Energy Expenditure Chart (continued)

Name: _____ Today's Date: _____

Energy Expenditure Chart

(1) Activity Type	(2) METS		(3) Hours of Activity		(4) Caloric Expenditure per kg of weight
1. Sleep	1	x	___	=	___
2. Moderate	4	x	___	=	___
3. Strenuous	6	x	___	=	___
4. Very Strenuous	10	x	___	=	___
5. Total Hours (sum of hours #1-4)			___		
6. Light	1.5	x	* ___	=	___
7. Total calories expended per kg today					___
8. Weight in kilograms					___
9. Total calories expended: the product of lines 7 and 8					___

* This number is derived by subtracting the total on line 5 from the number 24.

"It's Not So Bad"

The morn was dawning, dull and grey.
I thought I'd take a jog today.
But looking out the window, gee,
My warm, old bed looked good to me!
I thought, then, of my fitness oath.
Fit mind and body—one needs both!
"My body needs this run," I thought.
"I'll even use new shoes I bought!"
Out to the street I finally went.
My feet were pounding the cement.
To my delight, out came the sun.
I thought, "This running might be fun!"
And later on, I felt SO good—
I'm proud of my new attitude!

Twenty-five Ways to Get Moving

1. Put your exercise clothes on when you get up, and don't take them off until you get some exercise.
2. Make a date to do something active with a friend.
3. Ask a friend or family member to give you a call to remind you to exercise.
4. Set your alarm to remind you to take a two-minute walk. Walk for a longer time as you get in better physical condition.
5. Refuse to eat lunch until after you take at least a two-minute walk.
6. Plan some errands for your lunch hour. Bike, inline skate, walk, or run to do them.
7. Take your dog for a walk; he or she also needs exercise. If you train your dog, your dog will remind you to walk.
8. If you don't have a dog, borrow the neighbour's. (Both your neighbour and the dog will be delighted!)
9. Play a pick up game of basketball, soccer, or Ultimate.
10. Take up an active hobby.
11. Enrol in a hip-hop class.
12. Put some music on and dance to hip-hop, swing, or rock and roll.
13. Tune in to an exercise show on TV and learn the moves.
14. Walk around campus during your spares.
15. Walk and talk with your boyfriend or girlfriend every day. There is nothing to interrupt your conversation.
16. Plan short bicycle rides.
17. Learn to inline skate.
18. Walk more briskly on two of your everyday walks.
19. Take a little friend to the zoo.
20. Limit your TV and computer time by 10% and substitute this couch potato activity with some physical activity instead.
21. Take a 10-minute walk before going to bed.
22. Take the stairs instead of taking the elevator.
23. Run instead of walking up the stairs.
24. Get off the bus or subway a few blocks before your stop and walk briskly the rest of the way.
25. Join a gym.

My Very Own Twenty-five Ways to Get Moving—Starting Today!

Make a list of the twenty-five easiest ways for you to add more exercise to your day. You may borrow some of the ideas from the model list. Try to include some activities that are fun for you. It shouldn't be ALL hard work! ☺

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
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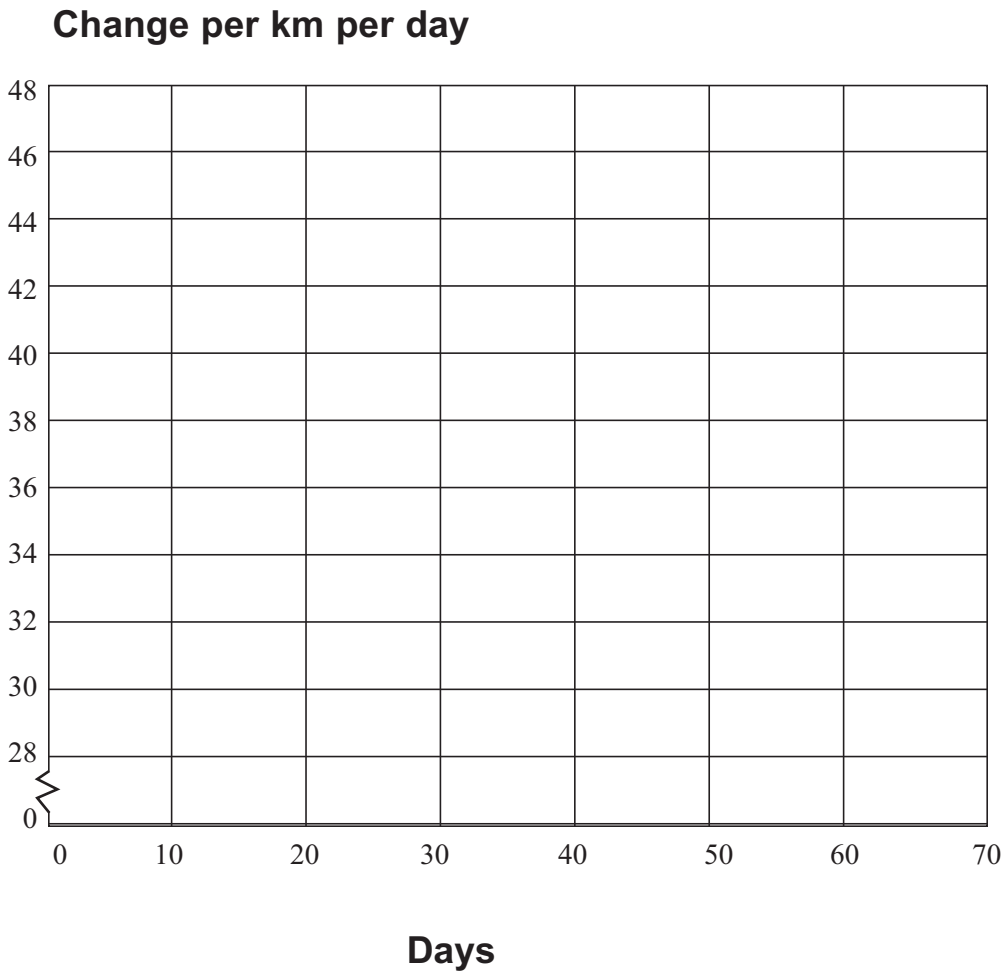
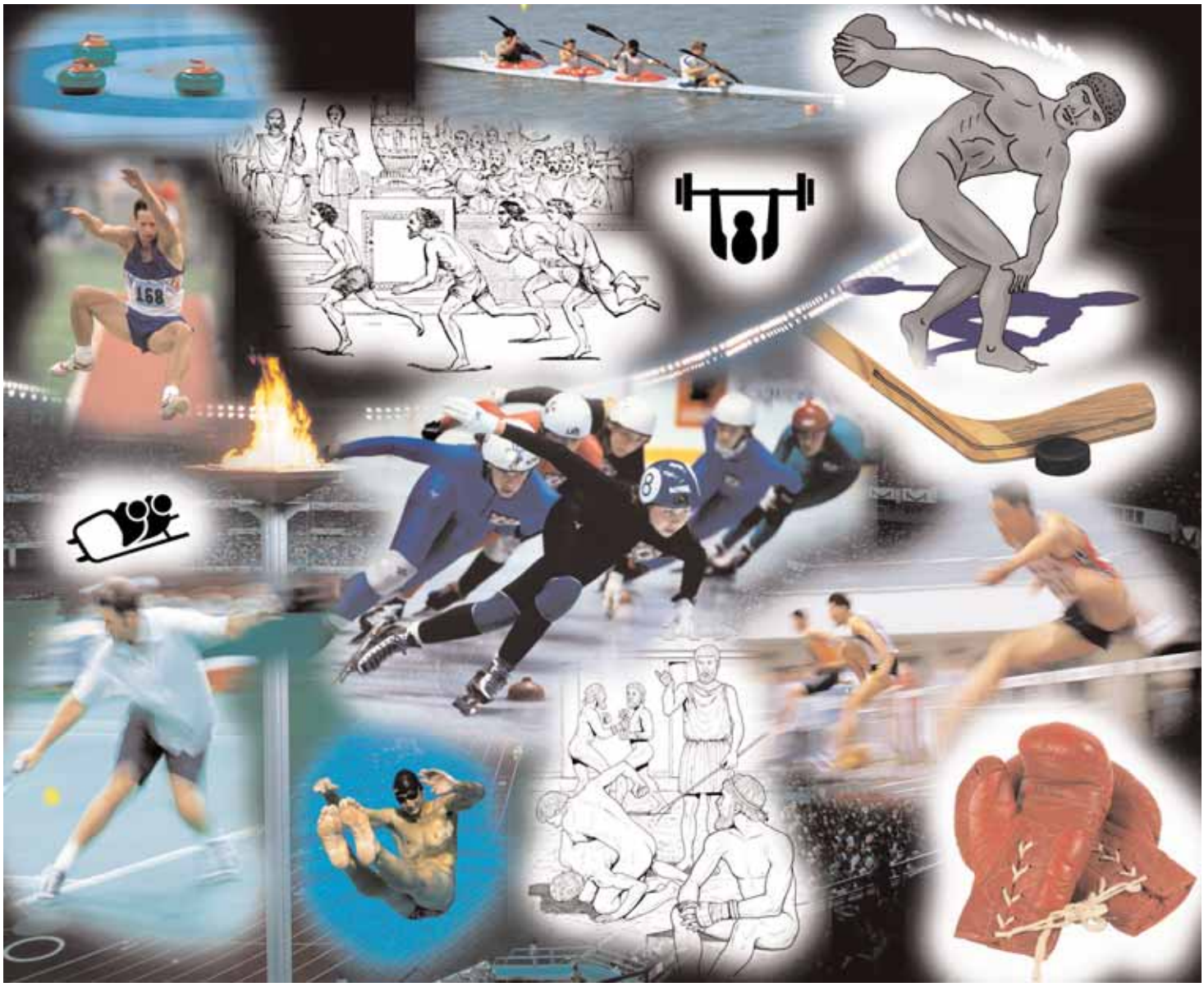
24. _____
25. _____

Chart: Change in Caloric Expenditure



The Olympic Games: A Picture Study



The Spirit of the Olympic Games

The Ancient Olympics

Although records cannot verify Olympic Games earlier than 776 BCE, Homer's *Iliad* tells of such contests at the Funeral of Patroclus, held during the Trojan War, about three to four hundred years earlier. The ancient Greek games were held at Olympia every fourth summer in Ancient Greece. They reached their height in the fifth to fourth century, BCE. They became more and more professionalized until, in the Roman period, they provoked much censure. They were eventually discontinued by Emperor Theodosius I of Rome at the end of the fourth century CE.

Among Greeks, the Games exemplified their attitude towards excellence in all things. Competition was an important part of Greek life and was a major motivational factor for the institution of the Games. Another basic Greek ideal, the striving for symmetrical and harmonious development of physical beauty, moral character, nobility of spirit and conduct, and intelligence, supported the Games. The Games, too, were nationalist in spirit; states were said to have been prouder of Olympic victories than of battles won. Women, foreigners, slaves, and dishonoured people were forbidden to complete. Contestants were required to train for ten months before the Games, had to remain thirty days under the eyes of officials in Elis who had charge of the Games, and had to take an oath that they had fulfilled the training requirements before participating. They also had to vow to conduct themselves with honour and integrity. At first, the Olympic Games were confined to running, but over time new events were added: the long run (720 BCE), when the loincloth was abandoned and athletes began competing naked; the pentathlon (708 BCE); boxing (688 BCE); chariot racing (680 BCE); the pancratium (648 BCE), involving boxing and wrestling for boys (632 BCE); and the foot race with armour (580 BCE).

Greek women, who were not even allowed to watch the Games, held their own Games, called the Heraea, starting as early as the sixth century BCE. They were also conducted every four years but with fewer events. These Games were discontinued about the time the Romans conquered Greece.

The Beginning of the Modern Olympics

On April 6, 1896, in Athens, Greece at the Panathenean Stadium, the International Games were opened. This was the dream of Baron Pierre de Coubertin of France. The program included track and field, fencing, weightlifting, rifle and pistol shooting, tennis, cycling, swimming, gymnastics, wrestling, and the first modern-day marathon. Although 14 nations participated; most of the athletes were Greek. Pleased with the success of the event, de Coubertin stressed to organizers the importance of moving the Games all around the world: thus, the modern Summer Olympic Games became a reality.

The Winter Olympics

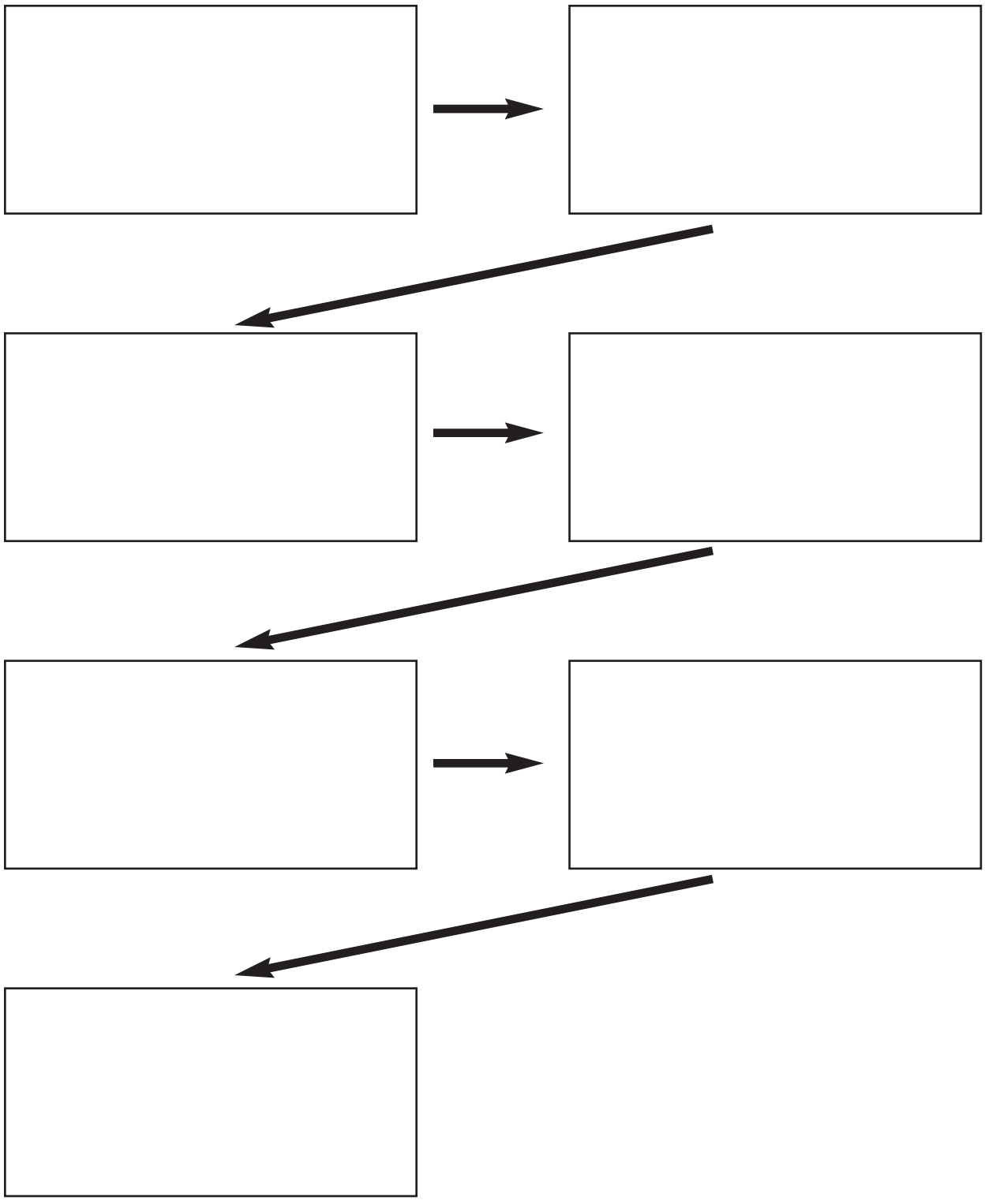
It was not until 1924 that the International Committee sanctioned an "International Winter Sports Week" at Chamonix, France. The eleven-day event included Nordic skiing, speed skating, figure skating, ice hockey, and bobsledding; it was a huge success. The Winter Olympics were born.

Today

Today, the Winter and Summer Games alternate every two years. Over time, these Games have been riddled with controversy that has thwarted their ideals of world co-operation and athletic excellence. Between 1952 and 1988, the rivalry between the United States and the former Soviet Union resulted in each country's boycotting the Games hosted by the other country.

Political ideals have interfered with the Games in other ways, from the propaganda of the Nazis in Berlin (1936) to the exclusion of white-ruled Rhodesia from the Munich Games (1972). At Munich, nine Israeli athletes were kidnapped and murdered by Palestinian terrorists. Furthermore, the International Olympic Committee has struggled with the licensing and commercialism of the Games, the need to schedule the Games to accommodate American television networks, and the monitoring of athletes who seek illegal competitive advantage, often through the use of performance-enhancing drugs. In 1998, a scandal erupted with the revelations that bribery and favouritism had played a role in the awarding of the 2002 Games to Salt Lake City, Utah. Scandals in judging of various sporting events, especially figure skating, continue to mar the Games. Where will it all end?

Summary Organizer



Motto, Creed, Oath

1. **Swifter, Higher, Stronger**
2. "In the names of all competitors, I promise that we will take part in these Olympic Games, respecting and abiding by the rules which govern them, in the true spirit of sportsmanship, for the glory of sport and the honour of our teams."
3. **"The most important thing in the Olympic Games is not to win but to take part, just as the most important thing in life is not the triumph, but the struggle. The essential thing is not to have conquered but to have fought well."**

Creed

Oath

Motto

Olympic Roots: The Olympics Draw on Traditions of War, Religion, and Ceremony

Introduction

Physical competitions and contests, like the Olympics, are as old as the hills, but what about the scandals associated with them? Olympic skullduggery is nothing new. The ancient Olympics were plagued by numerous scandals. Records show the Games were connected with commercialism and greed, nationalistic pride, and political strife and competition that sometimes led to war.

The Ancient Games Were Commercial

Today, winning an Olympic medal is a financial windfall of endorsements. Records suggest this was also common practice at the ancient Olympics. Although the accepted prize was an olive wreath, athletes competed for other perks, as well. Winners might pocket as much as 500 drachmas, which would make them millionaires today. Athletes were often offered free theatre seats or free meals at city hall for life—no small rewards, indeed!

The Games Instilled Nationalistic Pride

Competition between city-states to produce Olympic winners was fierce and often led to bribery and cheating. Astylos, a sprinter from the city-state of Kroton, competed and won in 488, 484, and 480 BCE. However, in his last race, he was bribed by a powerful tyrant from the city-state of Syracuse to change allegiance so his win would be attributed to that city.

City-states took immense pride in their winners. Sculptors were commissioned to create statues of the victors in their home city-states. The images were idealistic. Only if an athlete was victorious three times could a realistic image of him be erected in the Sanctuary of Zeus.

Cheating brought great shame to the athletes and their city-states. Although statutes warning athletes against cheating lined the road to the stadium, cheating, and bribery were common. In lieu of statues of winners, sometimes statues of Zeus, with written apologies in stone, were erected along the road from the altis to the stadion, the path the athletes took before they competed, to make an example of cheaters and to discourage others from cheating. Cheaters were sometimes punished by being castrated.

The Ancient Olympics Were Political and Often Caused War

Not only were the ancient Olympics athletic competitions, they were also political events. The city-state hosting the Games gained prestige, as well as economic and political advantages. The Games were immensely popular, and cities vied for the honour of hosting them. Sometimes citizens actually went to war over them. In 668 BCE, according to Pausanias, a Greek traveller, Pheidon, a powerful tyrant from Argos, was hired by the town of Pisa to capture the Sanctuary of Zeus from the city-state of Elis in order to gain control of the Games. This victory was short-lived, and Elis regained control of the Games the next year. Later, in 364 BCE, another military incident occurred. Elis had again lost control of the Games to Pisa. While Pisa was hosting the Games, Elis attacked the Sanctuary of Zeus. According to Xenophon, a fourth-century historian, the Eleans chose to attack just as the wrestling event was taking place between the dromos and the altar. A day-long battle commenced in which thousands of soldiers were involved.

Conclusion

(Students will add this.)

Facts from:

<http://museum.upenn.edu/new/ Olympics_rev.olympicpolitics.shtml>

<www.museum.upenn.edu/new/Olympics_rev/ olympiccommercialism.shtml>

<http://corinth.sas.upenn.edu/dgr/otherclips.ancgames.html>

<www.upennmuseum.com/pressreleases/forum.pl?msg=35>

T-List for "Olympic Roots: The Olympics Draw on Traditions of War, Religion, and Ceremony"

Main Ideas	Supporting Details
I. Introduction	- physical competitions & _____ old as _____ - Olympic _____ nothing _____ - Ancient Olympics _____ by _____ - Ancient Olympics connected w/: a) _____ & greed b) _____ pride c) political _____ & competition - → _____
II. Games - _____	- accepted prize- _____ _____ - competed for other _____ - might _____ _____ drachmas - make _____ today - offered free _____ _____ & _____ @ _____ hall - _____
III. Games Instilled _____ _____	- competition btw. _____ fierce - → _____ and cheating - _____- sprinter - _____ won _____, _____, _____ B.C. - last race - _____ by _____ - _____ to change _____ - win _____ - that city - city-state - _____ pride - winners _____ commissioned - statues of _____ in home _____ -Images - _____ - only _____ if athlete _____ X _____ - then statue in _____ - Zeus

(continued)

Note: A full-colour version of this handout is available at the Manitoba Education, Citizenship and Youth website at: <www.edu.gov.mb.ca/ks4/cur/diversity/eal.>

Handout 1-20

T-List for "Olympic Roots:
The Olympics Draw on Traditions of War, Religion, and Ceremony" (continued)

	- _____ - great _____ -_____ warned athletes - _____& cheating common - statues – Zeus w/ written _____ on _____ from altis → _____ - make _____ - cheaters' punishment - _____
IV. A.O.- _____ & Caused _____	- were _____ events - host - _____ + _____ & political advantages - Games - _____ - _____ for honour of _____ -Wars: a) according to _____: In _____, B.C., Pheidon - tyrant from _____ - hired by _____ - capture sanctuary _____ - control Games - _____short-lived - _____ - control next year b) according to _____: In _____ B.C., _____ lost control to _____ - _____Games –Elis _____ Sanctuary – Zeus – when _____ event taking place btwn. _____ & altar – day long battle _____ soldiers
V. Conclusion	

Filled-in T-List for "Olympic Roots: The Olympics Draw on Traditions of War, Religion, and Ceremony" (Teacher Reference)

Main Ideas	Supporting Details
I. Introduction	- physical competitions & contests old as hills - Olympic skullduggery nothing new - Ancient Olympics plagued by scandals - Ancient Olympics connected w/: a) commercialism & greed b) nationalistic pride c) political strife & competition - → war
II. Games - Commercial	- accepted prize- olive wreath - competed for other perks - might pocket 500 drachmas - make millionaires today - offered free theatre seats & meals @ city hall - life
III. Games Instilled Nationalistic Pride	- competition btw. city-states fierce - → bribery and cheating - Astylos - sprinter - Kroton won 488, 484, 480 B.C. - last race - bribed by tyrant - Syracuse to change allegiance - win attributed - that city - city-state - immense pride - winners Sculptors commissioned - statues of victors in home city-state -Images - idealistic - only realistic if athlete victorious X 3 - then statue in Sanctuary - Zeus

(continued)

Note: A full-colour version of this handout is available at the Manitoba Education, Citizenship and Youth website at: <www.edu.gov.mb.ca/ks4/cur/diversity/eal.>

Filled-in T-List for "Olympic Roots: The Olympics Draw on Traditions of War, Religion, and Ceremony" (Teacher Reference) (continued)

- Cheating - great Shame
- Statutes warned athletes - bribery & cheating common
- statues - Zeus w/ written apologies on them from altis → stadion
- make example
- cheaters' punishment - Castration

IV. A.O.- Political & Caused War

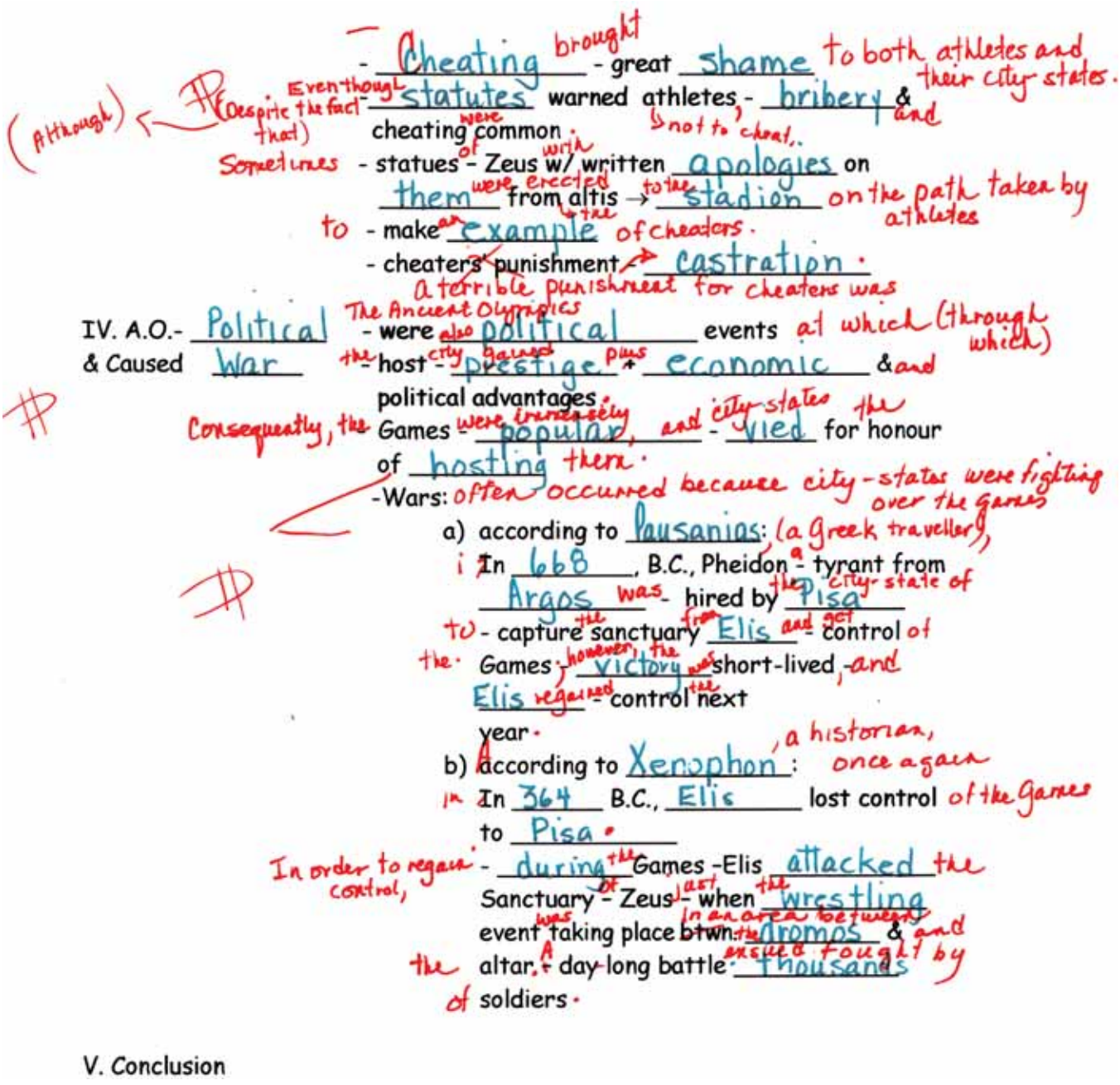
- were political events
- host - prestige + economic & political advantages
- Games - popular - vied for honour of hosting
- Wars:
  a) according to Pausanias:
  In 668, B.C., Pheidon - tyrant from Argos - hired by Pisa - capture sanctuary- Elis - control Games - victory short-lived - Elis - control next year
  b) according to Xenophon:
  In 364 B.C., Elis lost control to Pisa during Games -Elis attacked Sanctuary - Zeus - when wrestling event taking place btwn. dromos & altar - day long battle- thousands soldiers

V. Conclusion

Final T-List for "Olympic Roots: The Olympics Draw on Traditions of War, Religion, and Ceremony" (Teacher Reference)

Note: A full-colour version of this handout is available at the Manitoba Education, Citizenship and Youth website at: <www.edu.gov.mb.ca/ks4/cur/diversity/eal.>

Final T-List for "Olympic Roots: The Olympics Draw on Traditions of War, Religion, and Ceremony" (Teacher Reference) (continued)



Olympic Games–Some Track and Field Records

MEN's Track and Field Events					
Event	Athlete	Nationality	Time/Dist.	Year	Place
100 metres	Donovan Bailey	Canada	9.84s	1996	Atlanta
200 metres	Michael Johnson	USA	19.32s	1996	Atlanta
400 metres	Michael Johnson	USA	43.49s	1996	Atlanta
800 metres	Vebjoern Rodal	Norway	1m 42.58s	1996	Atlanta
1,500 metres	Noah Ngeny	Kenya	3m 32.07s	2000	Sydney
5,000 metres	Said Aouita	Morocco	13m 5.59s	1984	Los Angeles
10,000 metres	Haile Gebrselassie	Ethiopia	27m 7.34s	1996	Atlanta
Marathon	Carlos Lopes	Portugal	2h 9m 21s	1984	Los Angeles
Steeplechase	Julius Kariuki	Kenya	8m 5.51s	1988	Seoul
High Jump	Charles Austin	USA	2.39 m	1996	Atlanta
Long Jump	Bob Beamon	USA	8.90 m	1968	Mexico City
Pole Vault	Jean Galfione	France	5.92m	1996	Atlanta
Shot	Ulf Timmermann	German Dem. Rep.	22.47 m	1988	Seoul
Discus	Lars Riedel	Germany	69.40 m	1996	Atlanta
Javelin**	Jan Zelezny	Czechoslovakia	90.17 m	2000	Sydney
WOMEN's Track and Field Events					
Event	Athlete	Nationality	Time/Dist.	Year	Place
100 metres	Florence Griffith Joyner	USA	10.62s*	1988	Seoul
200 metres	Florence Griffith Joyner	USA	21.34s	1988	Seoul
400 metres	Marie-Jose Perec	France	48.25s	1996	Atlanta
800 metres	Nadiya Olizarenko	USSR	1m 53.43s	1980	Moscow
1500 metres	Paula Ivan	Romania	3m 53.96s	1988	Seoul
5000 metres	Gabriela Szabo	Romania	14m 40.79s	2000	Sydney
10000 metres	Derartu Tulu	Ethiopa	30m 17.49s	2000	Sydney
Marathon	Naoko Takahashi	Japan	2h 23m 14s	2000	Sydney
High Jump	Stefka Kostadinova	Bulgaria	2.05 m	1996	Atlanta
Long Jump	Jackie Joyner Kersee	USA	7.40 m	1988	Seoul
Shot	Ilona Slupianek	German Dem. Rep.	22.41 m	1980	Moscow
Discus	Martina Hellmann	German Dem. Rep.	72.30 m	1988	Seoul
Javelin**	Trine Hattestad	Norway	68.91 m	2000	Sydney

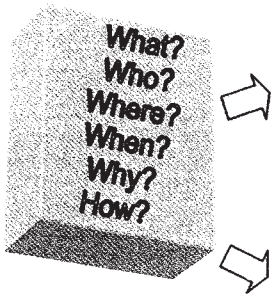
* indicates the record was set during one of the preliminary heats. In some cases a better result (time or distance) can be found for an event, but this usually means the better result was made with a wind speed greater than that allowed by the rules.

** The javelin record (over time) appears to go "backwards" at one point. This was because the javelin was being thrown so far (over 100 metres for men) it was becoming increasingly difficult to fit a safe throwing-range into a stadium, so the javelin was re-designed so as not to be thrown so far! This meant that records had to be "re-started."

Reading a Science News Article Frame

Read the article and write the facts in the boxes.

Title:
Author (if available):
Source of the article:
Date of publication:



Announcement

Problem

Solution

Characteristics

Process/Research

Result

Where Is the Science in Modern Sport?

By Craig Sharpe

Science and technology pervade so many aspects of our lives, both in work and leisure, that it would be remarkable if they did not have an equally great impact on sport. To maximize the sporting potential of an Olympic or national squad of competitors, expertise has to be drawn from a number of different branches of science, including physics, biomechanics, electronics, maths, chemistry, biochemistry, materials science, engineering, nutrition, medicine, psychology and physiology.

Skills

The competitor must be as skilled in the sport as possible, and in some "high skill" sports such as gymnastics, diving or trampolining, coaches will be highly expert at teaching the skills. A variety of analytical equipment may be used to aid in such skill coaching. For example: three-dimensional filming with digitizing into a computer for subsequent analysis of a high jump; slow-motion video analysis of a golf swing; "force platforms" built into gymnastics vaulting horses or discus circles to assess different forces exerted by the competitor at various phases of the movement. These involve a knowledge of biomechanics, electronics, physics and maths.

Equipment

The equipment has to be the best available, and this may range from a full-blown racing yacht to a vaulting pole to a pair of running shoes. In the pole-vault for example, the world record improved by only 23.5 cm from 1940-62, but in the following 20 years it rose by nearly 100 cm, largely due to improvements in the pole. New synthetic materials allow a much greater conversion of the kinetic energy of the run-up into the potential energy stored in the bending pole, which propels the vaulter ever higher. Also, such materials, by allowing greater bending, let the vaulters grip the poles much higher up, so their final "push-off" is from a greater initial height. Materials scientists and physicists are particularly helpful here.

In the case of distance running, elite marathoners running at a speed of 322 metres/minute were found to use 62.1 ml of oxygen per kg body weight wearing "old style" shoes; but this fell to 60.8 ml/kg at the same speed when wearing the new "air-soled" shoes, even though these were heavier by 68 g per shoe. Thus the runner could go at the same speed with less energy or at a faster speed with the same energy—with the new shoes. Again the materials scientists (and the shoe designers) and the physiologists are vital in this type of research.

In wind-tunnel tests on cyclists it has been shown that at 40 kph, wind resistance may account for 90% of a cyclist's energy output. Doubling the speed produces a four-fold increase in wind-resistance. Wind-suits and helmets, together with streamlining the bicycle and the rider adopting a low profile riding posture, can reduce drag by up to 7%. This gives a performance increase of about 5 seconds at 50 kph over 4,000 metres, the distance of an Olympic pursuit race. At this speed, the conventional track bicycle, with 68 cm wheels, may have a drag of 1 kg, but a modern aerodynamic bicycle, with 60 cm wheels, may have a reduced drag of only 0.62 kg.

The newer bikes—such as Olympic gold medallist Boardman's Lotus bicycle, and world champion Graham Obree's Caimey bicycle, weigh under 6 kg compared to a conventional track bicycle weight of over 8 kg. This work on the bicycles and cyclists involves materials and fabrics science, engineering, biomechanics, physiology, electronics, computer expertise, and physics.

Tactics

Tactics are vital in team games such as curling, football, camogie, hockey, soccer and rugby, and racquet sports such as squash, badminton and tennis. Detailed video recording and analysis with the help of computerized notational systems may greatly help the coach to assess the strengths and weaknesses of his or her team or players. This involves high levels of tactical knowledge from the coaches, together with good computer programmer skills to devise the software.

(continued)

Where Is the Science in Modern Sport? (continued)

Psychology

Many countries now put teams of fairly equal young men and women into the sports arenas of the world—and the difference between winning and losing may ultimately lie in psychological factors, such as ability to withstand the mental pressure of an entire country's expectations resting on the shoulders of, say, Sonia O'Sullivan, or on the Irish soccer or rugby team. Sports psychologists can also help to ensure that skills—e.g., racquet skills—do not break down under pressure, by using techniques such as "visualization" and "mental rehearsal," where the competitor goes over and over moves or situations or techniques in their minds.

Sports Medicine

The best competitor in the world is not going to win if they are too injured to compete—or if their training has been too severely curtailed. So the competitors may need the services of physiotherapists, doctors, osteopaths, and podiatrists (podiatry deals with foot abnormalities, which most of us have to a greater or lesser extent, and their causes and correction). Doctors and physiotherapists may now do special post-graduate courses in sports medicine, and then they often run special "sports injury" clinics.

Sports Nutrition

In recent years correct feeding of athletes together with fluid replacement has almost become a science in itself. A runner or games player can exhaust half the stored (glycogen) energy in muscle in a single hour of play or training—but there are ways of optimizing its replacement to allow high-quality play or training the next day. Similarly a squash player may lose fluid in the form of sweat at a rate of 1 to 1.5 litres per hour. This water loss must be replaced. Finally, in the sweat are the electrolytes Na, K, Mg and Cl which also have to be replaced later. All this involves biochemists, physiologists and dietitians, as well as some very sophisticated analysis techniques such as Nuclear Magnetic Resonance Spectroscopy, which can analyze levels of various chemical compounds and elements—such as lactic acid, or ATP or phosphorus—in living, exercising, human muscle.

Sports Physiology

Sports physiology is the analysis of physical fitness into its separate components, in order to see if a competitor is deficient in any of the fitness items and also if he/she is improving them with training. There are five main components of physical fitness:

1. Aerobic function—referring to the whole of oxygen intake, delivery and utilization, involving lungs, blood, heart, muscle capillaries, myoglobin and mitochondria.
2. Anaerobic function—referring to the ability of muscle to work extremely hard without any oxygen at all—as in fast bursts of speed or activity.
3. Muscle power, which involves the force a muscle can generate, together with the speed with which that force can be delivered—in other words, power is a combination of muscle strength and speed—and this can be measured in the laboratory with "isokinetic dynamometers." The technique of "muscle biopsy" can now help the physiologist to analyze the glycogen (muscle sugar), and other chemical content of individual muscle fibres.
4. Joint mobility refers to the range of movement at a joint. Very high levels are needed for gymnastics and dance, as well as hurdling and diving, and some martial arts such as tae kwon do and karate. The movement range of the limb is measured by "goniometers."
5. Body composition refers to the percentage of fat in the body. Untrained young men and women, 17 to 18 years old, tend to have between 25-30% of fat if they are female, and 12-15% if they are male—a natural sex difference. However, distance runners of both sexes have much less fat than this, whereas sea swimmers of both sexes have much more (which helps them both to float better and to resist the cold). Body fat is measured by skinfold calipers—or by simple (and painless!) electrical methods.

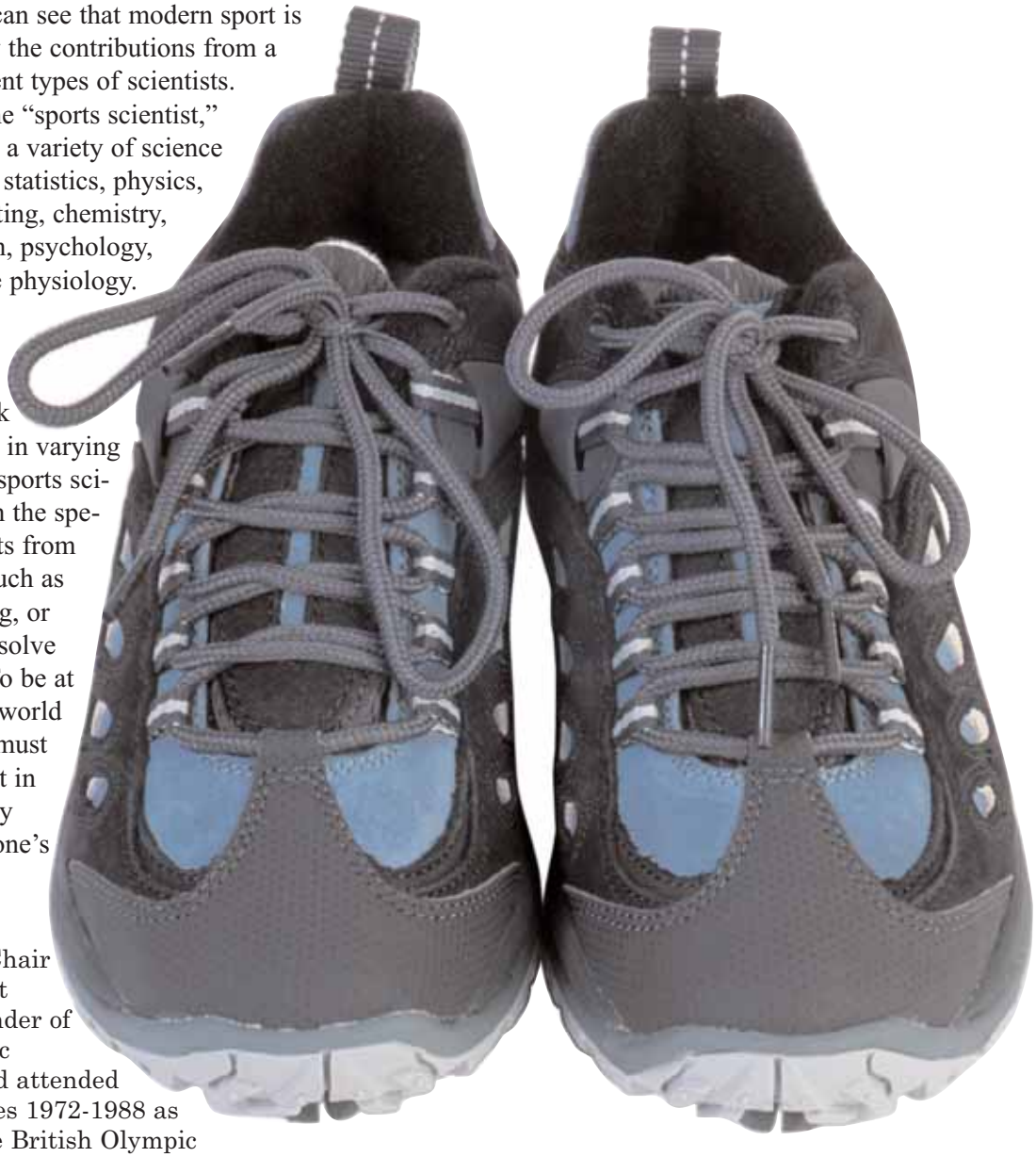
The scientists who carry out all these measurements will be sports physiologists working in a "human performance laboratory," as in the National Coaching and Training Centre in the University of Limerick, or Professor O'Brien and Dr Bamaville's laboratory in Trinity College Dublin.

Conclusion

(continued)

Where Is the Science in Modern Sport? (continued)

From the above, one can see that modern sport is enormously helped by the contributions from a whole range of different types of scientists. Central to all this is the "sports scientist," who will have studied a variety of science topics, such as maths, statistics, physics, biomechanics, computing, chemistry, biochemistry, nutrition, psychology, and sport and exercise physiology. For example, the new degree in Sports Science in the University of Limerick covers all these topics in varying depth. The practising sports scientist will often call in the specialist help of scientists from other specific areas, such as physics, or engineering, or biomechanics to help solve particular problems. To be at all competitive in the world of modern sport, one must have access to the best in science and technology that is appropriate to one's sport.



Professor Craig Sharpe holds the Chair of Sports Science at UL. He is a co-founder of the British Olympic Medical Centre and attended four Olympic Games 1972-1988 as official/coach to the British Olympic Association.

When Judges Need to Be Judged: Skategate

Pairs Skating Salt Lake City Olympics, 2002: "Robbed!" was the first word that popped into my head as I watched the scores posted for the Olympic Pairs event at the Salt Lake Olympics. Before the final performance, Canadians Jamie Sale and David Pelletier and Russian pair Elena Berezhnaya and Anton Sikharulidze sat at the number one and two spots with only a hair of a point differential separating the two. After skating a flawless final performance, Sale and Pelletier were cheated out of the gold medal which was instead awarded to Berezhnaya and Sikharulidze despite a major error in their performance. "Here we go again!" I thought to myself.

The judges' decision should have been a no-brainer. The Canadians skated the program of their lives while Sikharulidze was unable to land one of the necessary jumps. Add to that the fact that Sale and Sidharulize had a near disaster of a collision in the warm up, and the writing should have been on the wall. However, although Sale and Pelletier kept pace in technical merit, they received second-place votes for presentation, and the Russian pair walked away with the gold. And all because of a "fragile" French judge who said she was pressured to vote for the Russian pair. Where have all the ethics gone?

Judging fiascos like this are ongoing at the Olympics, especially in figure skating. The Olympics are supposed to stand for absolute integrity and sportsmanship, fairness, dignity, respect, and ethical values. What hypocrisy! At every Olympic gathering, there seems to be some outrageous decision that was influenced by factors outside the skills of the competitors. It seems to me there is little difference between an athlete who tests positive for a banned substance and a judge who is personally biased or who bows to pressure. How can we ban an Olympic athlete from the Games, yet accept a judge who cheats? The dark side of figure skating has once again reared its ugly head. The sport has to be cleaned up; otherwise, it does not belong in the Olympics.

Ottavia Cinquanta, president of the International Skating Union, has suggested a major overhaul of the figure skating scoring system in response to this latest scandal and the outcry it has caused. The plan outlined suggests replacing the present system with a simpler way of scoring jumps, footwork, spins, and other elements based on their difficulty. It also calls for fourteen judges, rather than the present nine, but only the scores from seven would count. A computer would randomly choose the judges whose scores would be used.

I'm glad to see a serious response to this cloud over Olympic skating, but I'll be happier when a positive change is actually in place. If the games are to regain public confidence, the problem of judges needs to be addressed. Of course, actions speak louder than words. So Cinquanta, we'll all be waiting for you to put your money where your mouth is.

Pros and Cons

Pros	Cons

Graphic Organizer for a Persuasive Essay

Graphic Organizer for a Persuasive Essay

Title:

Introduction:
Hook:

Connecting sentences/
supporting ideas:

Thesis statement:

Body paragraph #1
Topic sentence: (Idea 1)

Supporting example/
detail 1:

Supporting example/
detail 2:

Supporting example/
detail 3:

Concluding sentence:

(continued)

Graphic Organizer for a Persuasive Essay (continued)

Body paragraph 2:
Topic sentence: (Idea 2)

Supporting example/
detail 1:

Supporting example/
detail 2:

Supporting example/
detail 3:

Concluding sentence:

Body Paragraph 3:
Topic sentence: (Idea 3)

Supporting example/
detail 1:

Supporting example/
detail 2:

Supporting example/
detail 3:

Concluding sentence:

(continued)

Graphic Organizer for a Persuasive Essay (continued)

Conclusion:
Restatement of thesis:

Summary of supporting examples/details:

Reflection/recommendations/ prediction:

A starving daughter, a helpless mother

FOUR years ago, I had heard of anorexia, but I did not know anyone who had it, and thought it was actually quite rare.

Four years later, I am painfully and intimately aware of every facet of this disease; the triggers, the symptoms, the treatment, as well as the guilt, fear and utter sadness it causes, not only for the sufferer, but for their families and friends, as well.

I am also aware of the epidemic proportions this illness is reaching, how it steals our children younger than ever before and keeps them longer.

The VIEW FROM HERE

Patrice Skovgaard

And I have grown tired. I am tired of hearing well-meaning friends and total strangers tell my anorexic daughter that she is "so cute" and "adorable."

Don't they see that she is sick?

I am tired of the haunted look in my child's eyes. I am tired of the smell of her dying by inches, from the inside out, as her body consumes itself.

I am tired of doctors telling me there is nothing anyone can do, that I just have to keep loving her. As if my love for her does not already fill my heart. As though my every waking moment is not concerned with finding a way to save the life of my child... my child, who tells me she doesn't care if she lives or dies.

I am tired of trying to plan my future while my daughter's withers in front of me.

What makes me the weariest is pretending that everything is fine, that this way of living day to day, terrified of losing her, is acceptable to me. I do not find this acceptable at all, not for my family, not for my daughter, and not for me.

Wound throughout my weariness is my anger, deep and thundering whenever it breaks the surface. My anger is directed to those few Fashion Gods who have decided that all clothing looks best on six-foot-tall androgynous women with hollow eyes and cheeks and no discernible breasts or hips.

And it is unfathomable to me that our society has accepted this as right and normal, and that all women in some way aspire to look this way.

We accept that to be a woman and appear in movies or on television, you must be stick-thin. We accept that certain groups of female athletes must be thin far beyond their healthy norm.

We ignore the models and stars and athletes who have gone public with their eating disorders and the pressures forced upon them to be perfect. We continue to admire their thinness instead of concentrating on their talents, criticizing any little weight gain as though it is some type of personality flaw.

And so I call upon the Gods of Fashion, and the Gods of Sport, to come down from their clouds of irresponsibility and finally allow girls and women to have the bodies they are meant to have, womanly bodies with shape and curve, strength and size.

It would be so simple for the Gods to make things right. It could happen as early as the next runway show in Paris, the next movie made in Hollywood, the next Olympics.

Let the Gods learn to celebrate each person's body and soul for what it truly is and thereby allow all of us the same right.

We live in a strange society, we let our female children try to force themselves into moulds impossible to fit. We tell them they are imperfect every time we allow them to watch television or look at a magazine, criticize the bodies of famous women or even our own.

We tell them by our actions that they must not look quite right, either, and that this makes them ugly, unworthy of love.

I find it heinous that we have allowed this to happen, and I do not know why we continue to allow it to go on. Why do we allow the Gods to dictate our children's lives? What are we willing to do to make the Gods stop?

My own daughter may yet recover; 78 per cent of anorexics do not die.

And I am well aware that societal pressures are only one of the myriad causes of eating disorders — others are personality-driven or remain unknown.

But I also passionately believe that eating disorders can be greatly reduced by early education about positive body image and acceptance of one's self.

Let us teach our children not to worry so much about their perceived visible flaws as decreed by the Gods, and concentrate instead on their abilities to do and make and see wonderful things in their lives.

I want to see my self-starved child turn her back on the Gods, and get on with the business of doing the great things her spirit was made for.

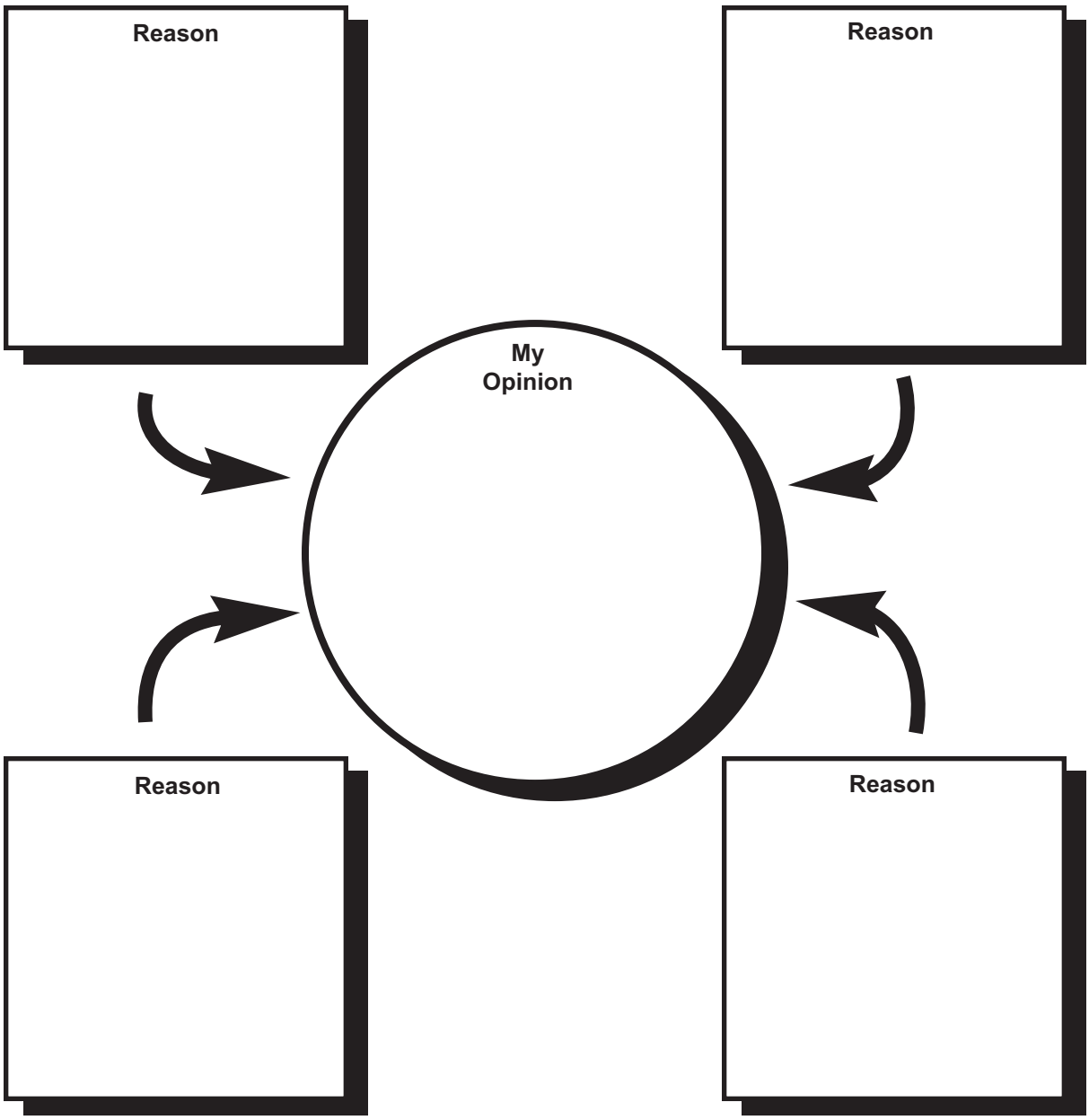
I only pray that she will survive long enough to learn how to take her life back and live it her own way, allowing her precious light to shine from a body that has somehow become, not perfect, but perfectly acceptable to her.

Patrice Skovgaard is a Winnipeg mother of two grown daughters.

The View From Here is open to anyone who wants to tell us a story. E-mail your first-person submissions — no longer than 800 words, please — to **theview@freepress.mb.ca.** *Due to the volume of submissions, we will only respond to those chosen for publication.*

Many fashion designers have decided that clothing looks best on six-foot-tall women with hollow eyes and cheeks.

Graphic Organizer: My Opinion

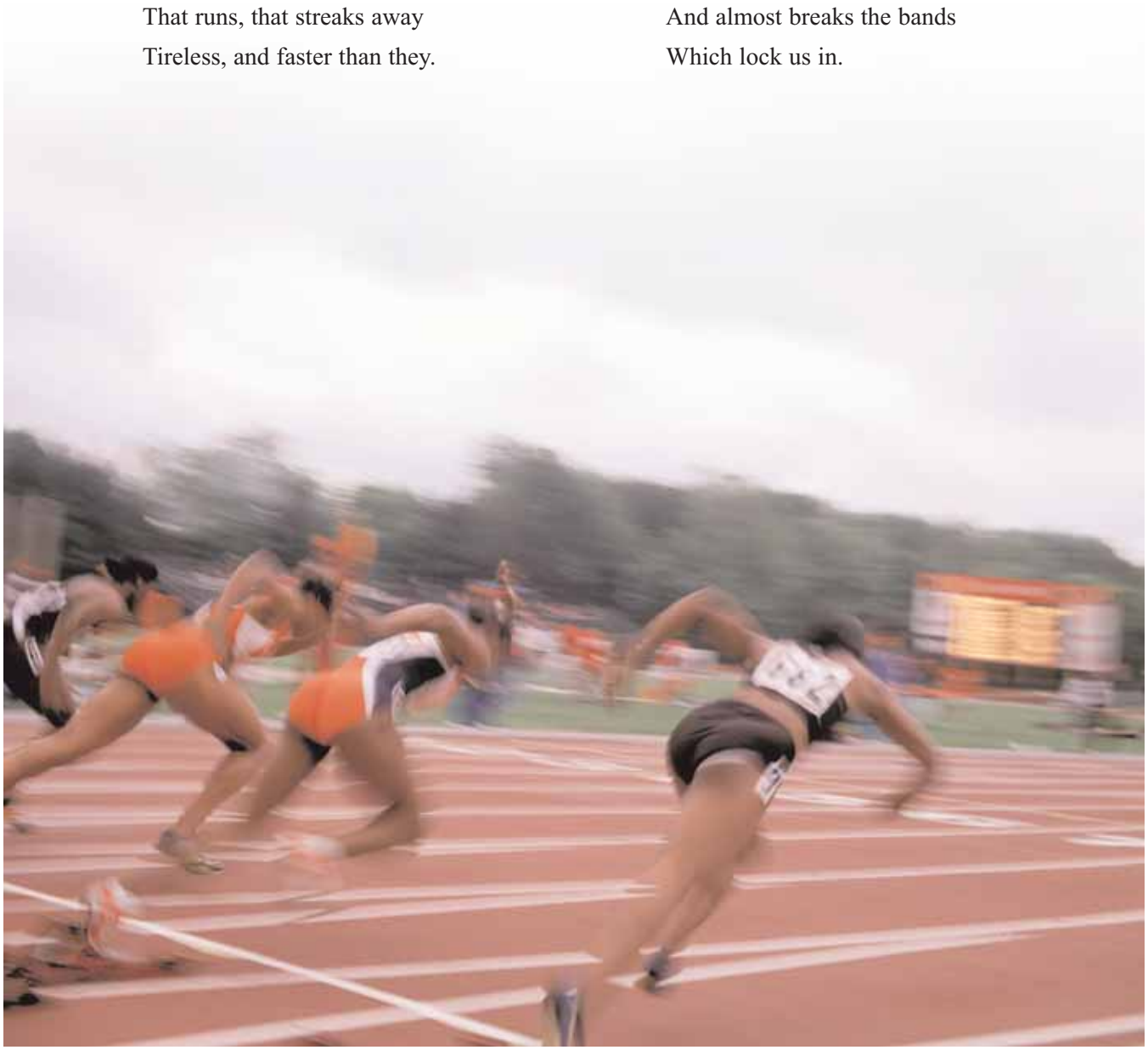


The Sprinters

By Lillian Morrison

The gun explodes them
Pummeling, pistoning, they fly
In time's face.
A go at the limit,
A terrible try
To smash the ticking glass,
Outpace the beat
That runs, that streaks away
Tireless, and faster than they.

Beside ourselves,
(It is for us they run!)
We shout and pound the stands
For one to win
Loving him, whose hard
Grace-driven stride
Most mocks the clock
And almost breaks the bands
Which lock us in.



Source: <www.experienceorigins.com/docs/sports4.pdf>.

Anticipation Guide: Ethics in Sport

Rate each statement according to the Strongly Agree/Strongly Disagree continuum and explain your choices. You may be asked to write your reasons on a separate sheet of paper. Then, in your group, discuss each statement; you must reach consensus in your ratings. (Optional: ask two people who are over 19 and not in your high school to rate these statements.)

1. People will do whatever is necessary to win.

❑ strongly disagree ❑ disagree ❑ depends ❑ agree ❑ strongly agree

2. Competition is healthy: it offers athletes a way to measure their success.

❑ strongly disagree ❑ disagree ❑ depends ❑ agree ❑ strongly agree

3. Ambition is good: it helps push athletes to work toward accomplishing their goals.

❑ strongly disagree ❑ disagree ❑ depends ❑ agree ❑ strongly agree

4. It is impossible to be ambitious and maintain one's integrity.

❑ strongly disagree ❑ disagree ❑ depends ❑ agree ❑ strongly agree

5. Pressure is often a factor when people cheat to win.

❑ strongly disagree ❑ disagree ❑ depends ❑ agree ❑ strongly agree

6. The desire to win is stronger than the desire to be honourable.

❑ strongly disagree ❑ disagree ❑ depends ❑ agree ❑ strongly agree

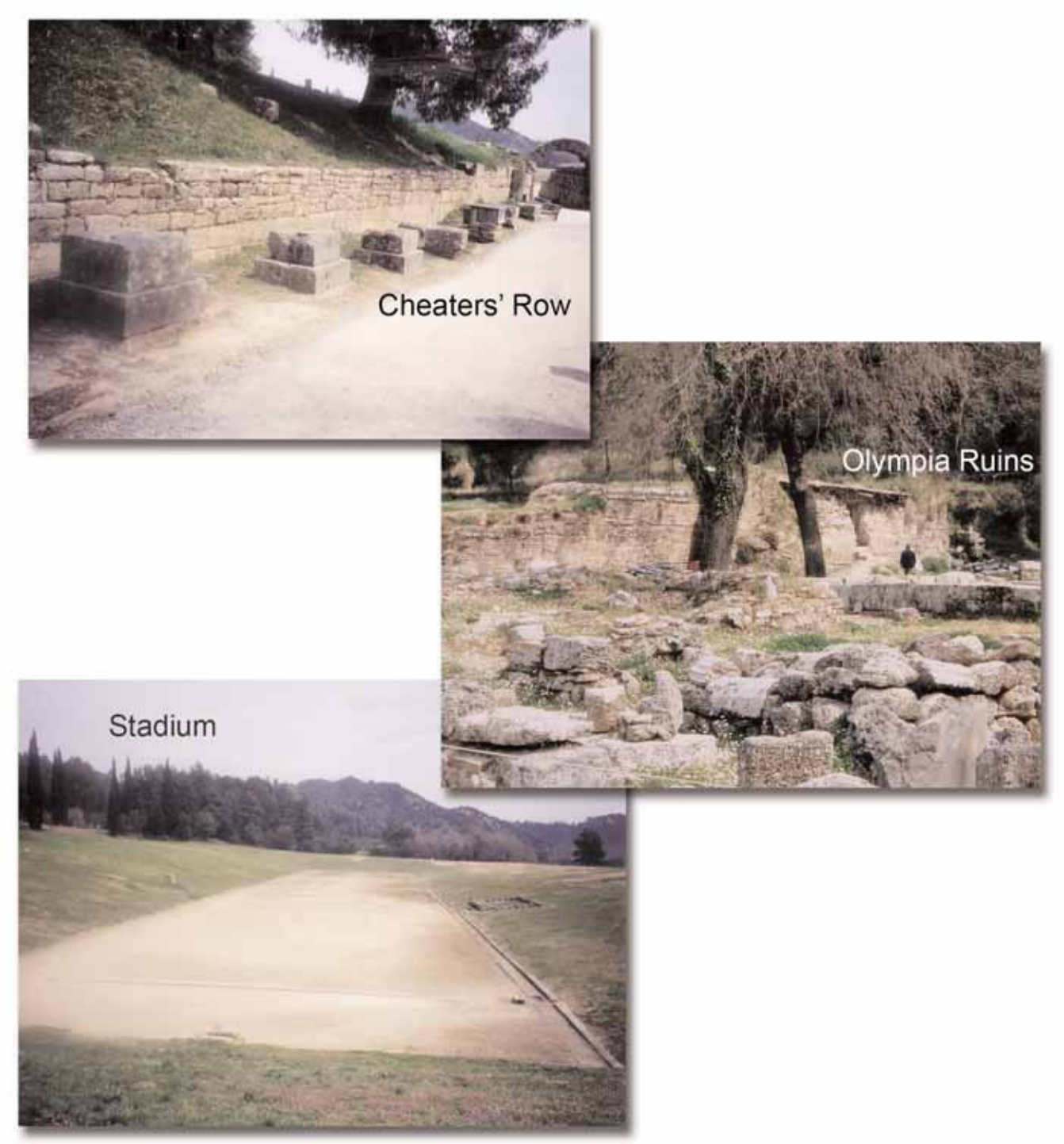
7. It is okay to cheat as long as one does not get caught.

❑ strongly disagree ❑ disagree ❑ depends ❑ agree ❑ strongly agree

8. Professional sport, integrity, and fair play all go together.

❑ strongly disagree ❑ disagree ❑ depends ❑ agree ❑ strongly agree

Pictures of the Ruins of Ancient Olympia



Listen and Label: Landmark Events in Drug Testing

Instructions:

Create a large timeline representative of the times mentioned in the article, marking off decades from 1885 to the present. Leave a section at the beginning of the timeline for landmark events in drug use long ago. Label this section "Ancient Times."

Cut out each piece of information below. Mix them up and give one piece of information to each student in the class. The teacher will read out the article, and the students will place the information at the appropriate spot on the timeline.

An Olympic medal was worth the modern-day equivalent of about U.S. $500,000. These large awards led to a professional class of athletes who were susceptible to corruption. Some tried to get competitive advantage, using concoctions of mushrooms and plant seeds. One reason for discontinuing the ancient Games was drug use.

Ancient Roman wrestlers used special mixtures of herbs to improve their performance.

A favourite mixture among ancient Egyptian athletes is said to have been the rear hooves of the Abyssinian ass, ground up, boiled in oil, and flavoured with rose petals and rosehip.

A cyclist named Linton dies of an overdose of trimethyl, becoming the first recorded drug death in sports.

Mass-produced amphetamines become the athlete's stimulant of choice, replacing strychnine.

The first steroid appears on the market, an injectable liquid called aqueous testosterone.

Soviet athletes allegedly use anabolic steroids.

Several competitive cyclists die suddenly, including Knut Jensen of Denmark, who died after taking amphetamines and nicotinyl tartrate. This results in the first cries for drug bans and testing.

British cyclist Tommy Simpson drops dead during a televised stage of the Tour de France. The International Olympic Committee establishes a commission to study doping.

Mexico City: Olympics drug testing begins. Only one athlete is caught—a modern pentathlete who tests positive for alcohol.

Munich Olympics: Urine testing on a large scale occurs for the first time. Seven athletes test positive for banned drugs.

Anabolic steroids are added to the IOC's banned list.

Caffeine and testosterone are added to the IOC's banned list.

Pan Am Games, Caracus, Venezuela: No drug testing had been announced. When a German doctor sets up a testing lab, many U.S. athletes leave without competing, and 19 athletes fail tests. The U.S. Olympic Committee immediately institutes testing for the next Games in Los Angeles.

Before the Olympics, a third of the 24-person U.S. cycling team receives transfusions to load their blood with muscle-fuelling red cells. The U.S. team wins a record nine gold medals. This "blood doping" is discovered months later (and is now banned). On the last day of the competition, five to nine positive tests are lost, and officials say the results were stolen or shredded.

Seoul Olympic gold medal sprinter, Ben Johnson of Canada, tests positive for a steroid, and loses his gold medal. The public perception that drug use occurs only in fringe "muscle" sports like weightlifting is destroyed.

Summer Games, Atlanta: A few positive tests are discarded by the IOC. When news of the discarded tests leaks, the IOC explains that it lacks confidence in the results from the high-resolution mass spectrometer they use to conduct testing.

The entire sport of cycling is sullied as prominent teams, riders, and trainers are thrown out of the Tour de France for drug violations. Others quit in protest.

World Swimming Championships: Chinese swimmers try to take growth hormone to Australia.

The IOC announces that blood testing may be introduced at the Sydney Games to supplement urine tests.

Teacher Resource: "Listen and Label": Landmark Events in Drug Testing

Most people assume that the abuse of drugs by professional athletes in events such as the Olympic Games is a modern occurrence, but this is not true. Competition, recognition, and victory, with its financial and personal rewards, have always been motivational factors. Ever since the ancient Olympic Games of Greece, there have been records of doping by elite athletes bent on reaping the accolades of winning in their fields.

A number of ancient civilizations used performance-enhancing drugs. An Olympic victory in ancient Greece was worth the modern-day equivalent of half a million dollars. The large rewards led to a professional class of athletes who were susceptible to corruption. Some tried to gain any competitive advantage, using concoctions of mushrooms and plant seeds. One of the reasons for discontinuing the ancient Games was drug use. Ancient Roman wrestlers used special mixtures of herbs to improve their performance. "A favourite mixture among ancient Egyptian athletes is said to have been the rear hooves of an Abyssinian ass, ground up, boiled in oil and flavoured with rose petals and rosehip" (Brukner, 1). Clearly, drug abuse is not just a problem associated with athletes of today.

The use of drugs has also contributed new words to our language. Norwegian warriors called "the Berserkers," used psychoactive mushrooms to give them strength and make them brave. The effects of the mushrooms made them act wildly or "go berserk" as we would say today. Indigenous South African tribes used a local type of alcohol called "dop" as stimulant. Today we use the word "doping" to refer to the use of chemicals to enhance athletic performance. Some words certainly have interesting origins!

During the centuries, there have been many examples of drug use and abuse. Reports of doping were common in the nineteenth century. In 1886, an English cyclist named Linton died of an overdose of trimethyl. His death was the first recorded drug death in sports. Until the 1930s, the performance-enhancing drug used by many athletes was strychnine. However, in the thirties, mass-produced amphetamines became the athlete's stimulant of choice. In the 1940s, the first steroid appeared on the market. It was an injectable liquid called aqueous testosterone. Muscle and strength-building steroids are still a cheater's best friend today because they are so affordable. Anabolic steroids were first alleged to have been used by Soviet athletes in the 1952 Olympics. Their use was confirmed two years later by one of the Russian team physicians. The use of anabolic steroids, especially by power athletes, became rampant in the late 1960s and 1970s.

Different kinds of doping were reported in the sixties. Several competitive cyclists died suddenly in the early 1960s. Included in this group was a famous cyclist from Denmark, Knut Jensen, who died suddenly after taking amphetamines and nicotinyl tartrate at the 1960 Olympics. These drug-related deaths caused the first outcry for drug bans and testing. Amid these cries for tests and bans, in 1967, a British cyclist named Tommy Simpson dropped dead during a televised stage of the Tour de France. As a result of these deaths and alleged drug use at the 1964 Tokyo Olympics, the International Olympic Committee established a medical commission to study doping and to ban the use of pharmaceutical agents to enhance performance.

In 1968 at the Olympics in Mexico City, drug testing began. Only one athlete was caught—a modern pentathlete who tested positive for alcohol. In the future, there would be many more tests and many more positive results.

In the 1970s and 80s, a number of new drugs were added to the banned substances list and many drug scandals occurred. In 1972 at the Munich Olympics, urine testing on a large scale occurred for the first time. Seven athletes tested positive for banned drugs. In 1975, anabolic steroids, such as androstenedione, were added to the IOC's banned list. Later, in 1982, caffeine and testosterone were also added. At the Pan American Games held in Caracus, Venezuela, in 1983, no drug testing had been announced. After a German doctor set up a testing lab, many U.S. athletes left without competing, and nineteen athletes failed tests. The U.S. Olympic Committee immediately instituted testing for the 1984 Olympic Games in Los Angeles. Just before the commencement of these Games, a third of the twenty-four person U.S. cycling

(continued)

Teacher Reference for "Listen and Label" (continued)

team received transfusions in a Carson, California, hotel room to load their blood with muscle-fueling red cells. This "blood doping" is now banned. At the Games, the U.S. cycling team won a record nine gold medals. The doping was only discovered months later. On the last day of competition, five to nine positive tests were mysteriously lost. Officials concluded that the results were stolen or shredded. Finnish distance runner Marti Vaino also tested positive for anabolic steroids as a result of reinfusing blood extracted some time earlier. In the 1998 Seoul Olympics, the pride of Canada, gold medal sprinter Ben Johnson, tested positive for an anabolic steroid and focused the whole world on the seriousness of the drug problem in professional sports. His disqualification and lost medal resulted in the disappointment of a whole nation and the destruction of the public perception that drug use only occurred in "fringe muscle sports" like weight-lifting. Just how widespread and pervasive was the use of banned substances?

With the 1990s came concerns about mass coverups and lies about drug tests—a concern that still exists today. At the 1996 Summer Olympic Games in Atlanta, Georgia, a few positive tests on the last weekend of the competition were discarded by the IOC. When news of the discarded tests leaked, the IOC explained that it was concerned about "technical difficulties" in the drug-testing machinery used—a high-resolution mass spectrometer. In 1998 the entire sport of cycling was sullied, as prominent teams, riders, and trainers were thrown out of the Tour de France for drug violations connected with use of the drug erthropoitin. Others quit in protest. At the 1998 World Swimming Championships, Chinese swimmers were exposed for trying to bring human growth hormone through customs into Australia. In the summer of 1999, the IOC announced that blood testing might be introduced at the Sydney Games in 2002 to supplement the urine tests. However, mandatory tests for two powerful drugs, erythropoietin, or Epo, and hGH, or human growth hormone, believed to be widely used by athletes were not reliable enough by the commencement of the Games. Unfortunately, the crux of the problem seems to be that the commitment to find drugs does not seem to be there.

Sadly, there is some skepticism about the integrity of the athletes, trainers, doctors, judges, and committees involved with elite sporting events such as the Olympics. Not only are new drugs being discovered, new ways of "passing" tests are also on the rise. Some doctors and trainers are ready to help athletes find and use their drug of choice. According to Donald Catlin, the head of the UCLA lab that has handled drug testing at several Olympics, "We have to concede that, if [an athlete] knows what [he or she] is doing [he or she] can go right through and around these things. If you turn my hat around and ask me to figure out how to cheat, my gosh, you'd never catch me."

Drug tests are certain only in the detection of stimulants, such as amphetamines, and excessive caffeine taken on the day of the test. Athletes are relying on far more powerful drugs, as well as masking agents that cover up the appearance of drugs in their systems. It seems that cheaters are alive and well in this millennium.

For more information, visit <www.mapinc.org/drugnews/v99.n 1037.a08.htm> and "Drugs in Sport" at <www.sciencevictoria.org.au/ord1001.htm>.

Poster Presentation Evaluation Rubric

	3 Excellent	2 Adequate	1 Needs improvement
Information is accurate and thorough.	Relevant, accurate, and well-developed	Mostly relevant and accurate	Not relevant or inaccurate
English grammar and spelling are accurate.	Minor isolated errors in grammar and/or spelling	Few errors in grammar and/or spelling	Frequent errors in grammar and/or spelling
Vocabulary used is appropriate to the topic and sports in general.	Effective word/idiom choices and usage that enhance meaning	Occasional errors of word/idiom choices and usage that do not obscure meaning	Inappropriate or incorrect word/idiom choices and usage that obscure meaning
The poster is attractive in terms of neatness, layout, and design.	Well-organized, effective, and relatively sophisticated design	Appropriate design that aids meaning	Ineffective design or sloppy or incomplete work
The presenter is able to speak about the material fluently and with accurate pronunciation.	Presentation was effective and clear	Presentation was comprehensible with some errors in pronunciation	Presentation was hard to follow, was difficult to comprehend, and included frequent mispronunciations

Senior 4 ELA:
ESL for Academic Success

Module Handouts

Module 2

The Big Snow in the North Land as Told by the Dene People

Long ago, the animals and the birds and fishes along the shores of Great Slave Lake lived in peace and friendship. All spoke the same language at that time, when the world was new and people had not come out yet. No animal ate another animal. All lived on plants and leaves and berries.

One night in this long ago time, the darkness was very thick and snow began to fall. All night it fell. The night continued, so that it seemed never to have an end. The snow became deeper and deeper. Plants and bushes were covered and the animals had difficulty in finding food. Many of them died. At last their chief called a council of all the living.

"Let us send messengers to the Sky World," the council decided. "They will find out from the Sky People what is causing this long night and the deep snow."

So they sent a messenger—one member of every kind of animal, bird, and fish that lived on the shores of Great Slave Lake. Those who would not fly were carried on the backs of those who could fly. So all reached the Sky World and passed through the trap door.

Beside the trap door stood a great lodge made of deerskins. In the lodge were three little bears. This was the home of Black Bear, an animal not on the earth at the time. Their mother, the cubs said, was in her canoe on the lake nearby; she had gone out to spear caribou. The animal people did not like the idea of Black Bear's spearing caribou, one of their own group. But they said nothing about it. Instead, they looked around the lodge. Hanging from the crossbows overhead were some curious bags. "What are in those bags?" they asked the cubs.

At first the cubs would not answer. When asked again, they said slowly, "We can't tell you. Wait until our mother comes back. She asked us to stay here and watch them."

I wonder if those bags have something to do with us," the earth people wondered to themselves. So they asked the cubs again about the bags.

Pressed by their questions, the cubs finally told them.

"This bag contain the winds. That one contains the rain. This one, the cold. That one, the fog. This one—" But they would not say what was in the last bag.

"We dare not tell you about this one," said the youngest cub. "Our mother told us that it is a big secret. If we tell you what is in it, she will be angry when she returns and will spank us."

The visitors felt sure that the last bag contained the sunshine, and sunshine was what they wanted. So they left the lodge and held a council. They saw Black Bear landing her canoe on the far shore of the lake. Quickly they made a plan.

"Mouse, you go to Bear's Canoe and gnaw a deep cut in the handle of her paddle close to the blade. When you have finished your work, you signal to Caribou.

"Caribou, as soon as you get the signal, you jump into the lake and begin swimming. Before Black Bear gets close, swim ashore and run into the woods. The rest of us will hide until it is safe to take the bag of sunshine."

Before Fox hid himself, he put his head inside the lodge and said to the cubs, "Keep a lookout for the caribou. It may come near you here."

Mouse ran to the far shore of the lake and gnawed the paddle. As soon as she signaled, Caribou jumped into the water.

The cubs saw him and yelled to their mother. "Mother! Mother! Look at the caribou!"

(continued)

Source: <http://tigerlily_1.tripod.com/bigsnow.html>. Author unknown.

The Big Snow in the North Land (continued)

The earth people, watching from their hiding places, saw Black Bear jump into her canoe, seize the paddle, and begin to stroke as hard as she could. Caribou also watched as he swam. Soon the paddle broke, the canoe turned over, the Black Bear disappeared beneath the waters of the lake.

Caribou swam ashore, Mouse returned to her friends, and all the earth people ran into the lodge. They pulled down the bag they wanted, and in it they found the sun, moon, and stars. These they threw down through the trap door. When they opened the door, they saw that snow covered the tops of even the highest pine trees. While they watched, the snow began to melt from the heat of the sun.

Thinking the earth world soon would be safe, the animals started down. But some of them had accidents. Beaver split his tail, and the blood was spilled over lynx. Moose flattened his nose and Buffalo bruised his back. Ever since then, Beaver's tail has been flat, Lynx has been spotted, Moose has had a flat nose, and Buffalo has had a bump in his back. Since that time also, there have been bears in the earth world, for the three cubs came with the earth people.

But it was still hard to get food. The snow melted so quickly that the earth was covered with water. The fish, who had been living on the land, found that they could swim and so they carried their friends on their backs. The ducks set to work to pull the land up from beneath the water.

At last the people were so hungry that they sent Raven out to look for dry land. At that time Raven was the most beautiful of all birds. While looking for land, he found the body of a dead animal. Although he had never before eaten anything except berries and willow leaves, he began to feast on the body of his animal brother. As punishment, he was changed into the bird he is today. All the animals and birds hate him; and even man, who eats everything else, will not taste his flesh.

Then the people sent Ptarmigan out to look for dry land. When Ptarmigan came back, he carried on his back a branch of willow. It was a message of hope. As a reward, ptarmigans turn white when the snow begins to fall in the Barren Land. Thus they warn the animals and the people that winter is near.

But the peaceful and friendly life on Great Slave Lake was no more. When the floodwaters had gone, the fish found that they could no longer live on the land; if they did, they would be eaten by the birds and the animals. The birds found that they were safer high in the trees and up in the mountains than anywhere else. Every animal chose the place that suited it best. Soon the birds and fish and beasts could not understand the same language.

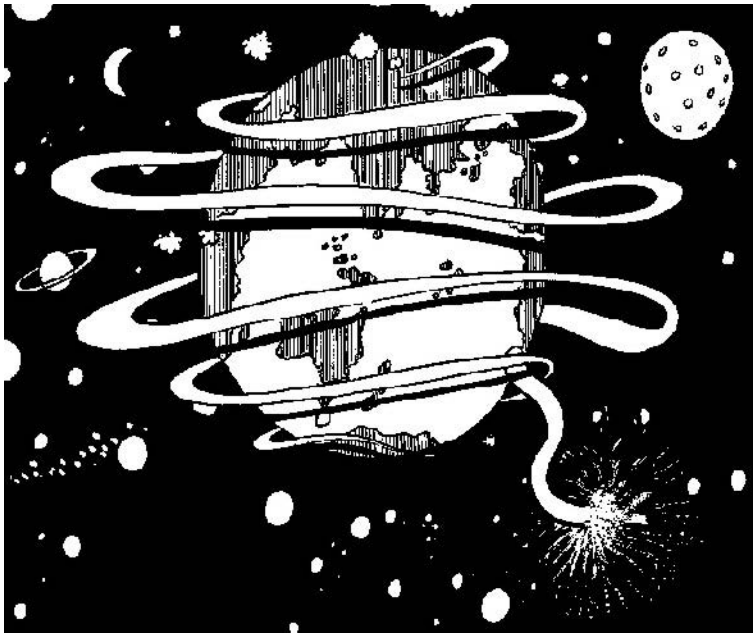
Not long afterward, the first human beings came to Great Slave Lake. Since then, there has been no peace.

The Big Snow
Worldview Comparison Chart

Instructions: Compare the beliefs and values communicated in the Dene story "The Big Snow in the North Land" with those you think modern North America holds. What is the possible effect on culture or on the physical world of these beliefs? The first heading is started for you, but you can add other ideas.

Belief or Value		
Relationship of animals to each other	**Dene (First Nation)**	**Possible Effect**
	Animals once lived in friendship.	People don't want to hurt the animals.
	Modern North America	**Possible Effect**
	Everything is part of a food chain—predator eats prey.	People take advantage of the animals—don't think about how they help each other.
Origin of natural forces, weather	**Dene (First Nation)**	**Possible Effect**
	Modern North America	**Possible Effect**
Relationship of the individual and the group	**Dene (First Nation)**	**Possible Effect**
	Modern North America	**Possible Effect**
Relationship of people and nature	**Dene (First Nation)**	**Possible Effect**
	Modern North America	**Possible Effect**

Blowing Up Your World



The Indian Ten Commandments

Treat the Earth and all that dwell thereon with respect.

Remain close to the Great Spirit.

Show great respect for all your fellow beings.

Work together for the benefit of all Mankind.

Give assistance and kindness wherever needed.

Do what you know to be right.

Look after the well-being of mind and body.

Dedicate a share of your efforts to the greater good.

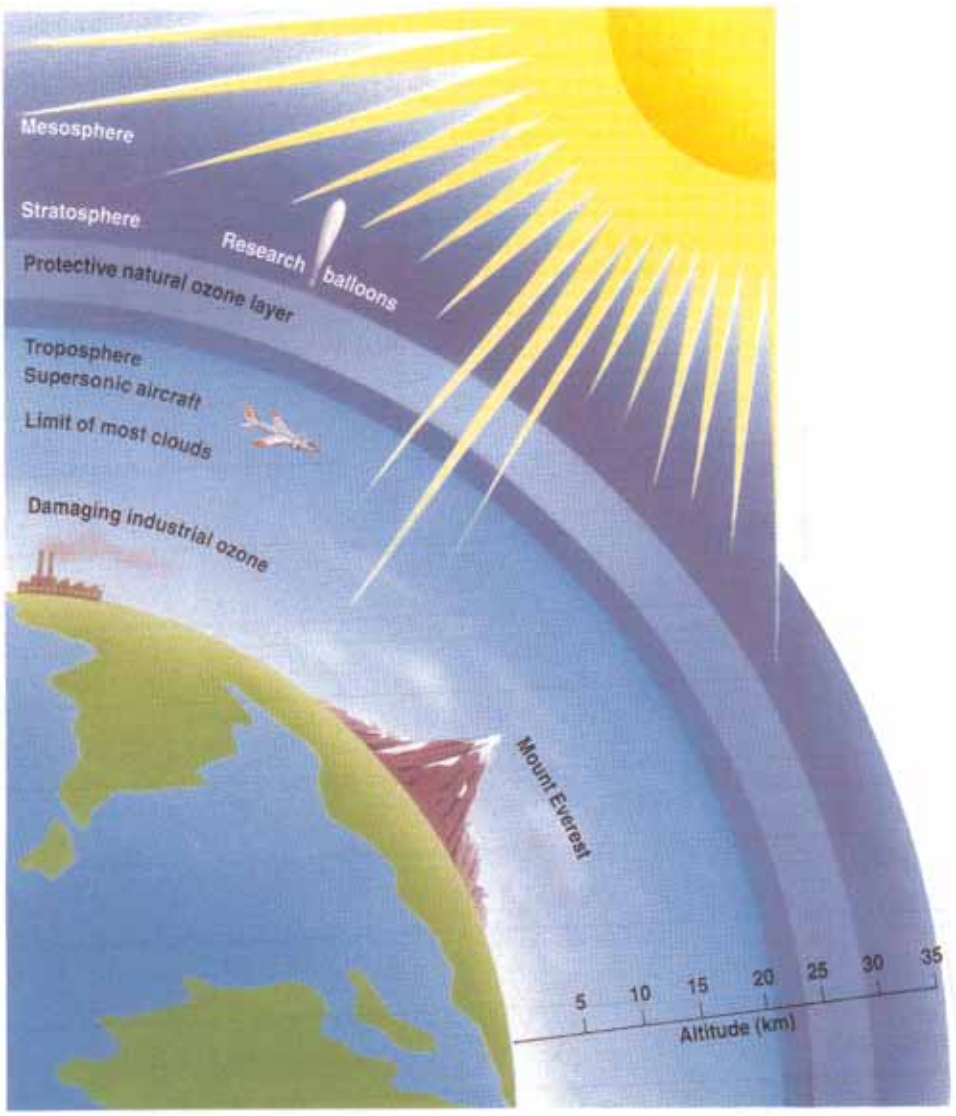
Be truthful and honest at all times.

Take full responsibility for your actions.

Author Unknown

Author unknown. Lone Wolf Band of Cherokee Indians <www.skynet.net/~meyersdk/religious.html>.

The Ozone Layer: What's Going On Up There?



Declaration of Interdependence

Marshall McLuhan's global village has arrived. Our world has shrunk, thanks to satellite, fibreoptics, and other electronic media. You can no longer ignore what is happening on the other side of the world, for it happens in your living room every evening. You need to get to know your neighbour: in Australia, in Africa, in Europe, in South America, in Asia. You are interdependent.

The David Suzuki Foundation's DECLARATION OF INTERDEPENDENCE

THIS WE KNOW: We are the earth, through the plants and animals that nourish us. We are the rains and the oceans that flow through our veins. We are the breath of the forests of the land, and the plants of the sea. We are human animals, related to all other life as descendants of the firstborn cell. We share with these kin a common history, written in our genes. We share a common present, filled with uncertainty. And we share a common future, as yet untold.

We humans are but one of thirty million species weaving the thin layer of life enveloping the world. The stability of communities of living things depends upon this diversity. Linked in this web, we are interconnected—using, cleansing, sharing and replenishing the fundamental elements of life. Our home, planet Earth, is finite; all life shares its resources and the energy from the sun, and therefore has limits to growth. For the first time, we have touched those limits. When we compromise the air, the water, the soil, and the variety of life, we steal from the endless future to serve the fleeting present.

We may deny these things, but we cannot change them.

THIS WE BELIEVE: Humans have become so numerous and our tools so powerful that we have driven fellow creatures to extinction, dammed the great rivers, torn down ancient forests, poisoned the earth, rain and wind, and ripped holes in the sky. Our science has brought pain as well as joy; our comfort is paid for by the suffering of millions. We are learning from our mistakes, we are mourning our vanished kin, and we now build a new politic of hope. We respect and uphold the absolute need for clean air, water and soil. We see that economic activities that benefit the few while shrinking the inheritance of many are wrong. And, since environmental degradation erodes biological capital forever, full ecological and social cost must enter all equations of development. We are one brief generation in the long march of time; the future is not ours to erase. So where knowledge is limited, we will remember all those who will walk after us, and err on the side of caution.

THIS WE RESOLVE: All this that we know and believe must now become the foundation of the way we live. At this turning point in our relationship with Earth, we work for an evolution; from dominance to partnership; from fragmentation to connection; from insecurity to interdependence.

Our Earth Will Not Die

NIYI OSUNDARE

(To a solemn, almost elegiac tune)

Lynched
the lakes
Slaughtered
the seas
Mauled
the mountains

But our earth will not die

Here
there
everywhere
a lake is killed by the arsenic urine
from the bladder of profit factories
a poisoned stream staggers down the hills coughing
chaos in the sickly sea
the wailing whale, belly up like a frying fish, crests
the chilling swansong of parting waters.

But our earth will not die

Who lynched the lakes. Who?
Who slaughtered the seas. Who?
Whoever mauled the mountains. Whoever?

Our earth will not die

And the rain
the rain falls, acid, on balding forests
their branches amputated by the septic daggers
of tainted clouds

Weeping willows drip mercury tears
in the eye of sobbing terrains
a nuclear sun rises like a funeral ball
reducing man and meadow to dust and dirt.

(continued)

Our Earth Will Not Die (continued)

But our earth will not die.

Fishes have died in the waters. Fishes.
Birds have died in the trees. Birds.
Rabbits have died in their burrows. Rabbits.

But our earth will not die

(Music turns festive, louder)

Our earth will see again
eyes washed by a new rain
the westering sun will rise again
resplendent like a new coin.
The wind, unwound, will play its tune
trees twittering, grasses dancing;
hillsides will rock with blooming harvests
the plains batting their eyes of grass and grace.
The sea will drink its heart's content
when a jubilant thunder flings open the skygate
and a new rain tumbles down
in drums of joy.
Our earth will see again

this earth, OUR EARTH.

Ozone

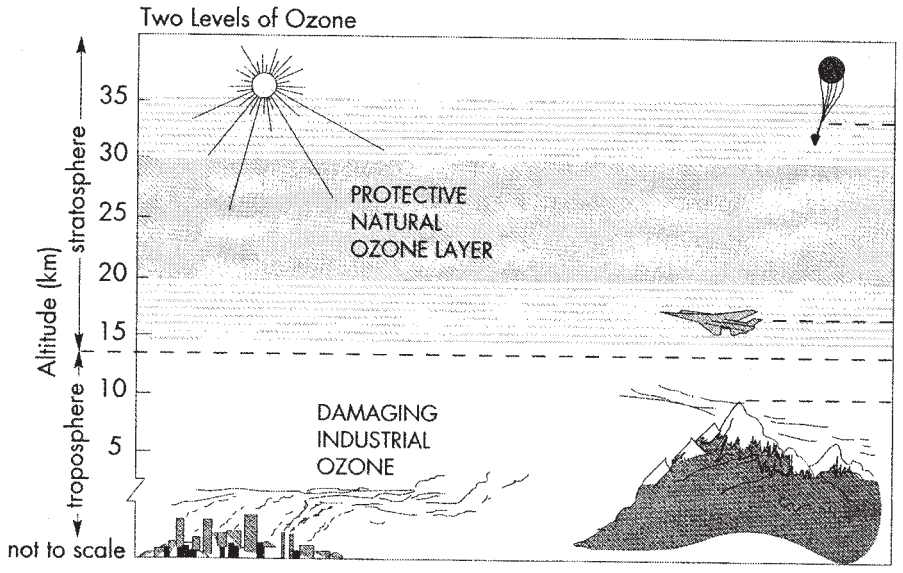


FIGURE 20.15 ◀
In the upper atmosphere, a layer of ozone shields us from the sun's damaging rays. Near ground level, ozone is a serious air pollutant.

THREATS TO THE OZONE LAYER

During the 1970s, scientists discovered that the amount of ozone in the upper atmosphere was declining. Beginning in the 1980s, large portions of the ozone layer over both the North Pole and the South Pole thinned out by about 50 per cent. The "holes" remained for two or three months of each year, but later filled in again (Figure 20.16). Scientists believe that the reason for this thinning involves the reaction of ozone with human-made pollutants that have been accumulating in the upper atmosphere.

Ozone Word Splash

Ozone Depletion
WORSENS

EEK—
Hole in the Ozone Layer Opens Again!

Aerosol Cans:
Deadly and Dangerous

CAN WE KEEP SUNSHINE SAFE?

Fate of the Arctic Remains Up in the Air

Radiation Hazard to Eyes

Loss of the Ozone Layer Protection: Malformed Amphibians

Deadly Chlorofluorocarbons: We've Got to Make Changes

Rapid Collapse of the Antarctic Ice Shelf Stuns Scientists

NEW THREATS TO SKY

What About Ozone Pollution?

The Green Leaders

In Canada and around the world, more and more industry leaders and communities are learning that there are opportunities that make both economic and environmental sense. They're finding out energy conservation and energy efficiency save money and create new industries and jobs.

Canadian Communities

Municipalities across Canada are reducing greenhouse gas emissions through a wide range of projects. Local governments say they can achieve one quarter of Canada's Kyoto target while creating jobs and strengthening the health of our communities.

Halifax: A city-wide composting program now prevents organic matter from reaching landfills. This has cut methane production by the equivalent of over half a million tons of carbon dioxide per year, compared to 1995.

Calgary: Calgary is achieving its target of six percent below 1990 levels ahead of schedule and at 50 percent projected costs, with substantial energy bill savings and employment created. Through the "Ride the Wind" initiative, the light rail system is powered by wind-generated electricity.

Edmonton: Target—to reduce emissions by six percent below 1990 levels by 2010, and 20 percent by 2020. Has already reduced emissions through one landfill waste-to-energy project by 174,949 tonnes.

Regina: Reduced emissions from internal operations nine per cent, or 10,000 tonnes annually, from 1988 levels. Energy retrofits will reduce emissions another four percent and save $400,000 annually.

Sudbury: Will reduce emissions by 21,000–51,000 tonnes per year with a co-generation and district energy system. Retrofit programs aim to reduce energy consumption 30 percent and save more than $800,000 annually.

St. John's: Retrofits to municipal buildings are expected to deliver annual energy savings of $600,000, improve workplace lighting and comfort levels, and reduce maintenance costs.

Toronto: Reduced emissions by 67 percent below 1990 levels, exceeding the city's goal threefold, generating thousands of jobs and reducing costs for many operations. Success was achieved through landfill waste-to-energy programs, energy efficiency building retrofits, streetlight changes, and more efficient vehicle fleets.

Companies

Many companies are dramatically reducing greenhouse gas emissions, often exceeding the Kyoto target. So far, this is generally achieved at minimal cost or with considerable savings.

Abitibi-Consolidated (Forest Products): Reduced emissions on average 10 percent below 1990 levels, and 27 percent below 1988.

Alcoa (Aluminum Manufacturing): Committed to reducing emissions by 25 percent from 1990 levels by 2010, and by 50 percent from 1990 levels over the same period if their inert anode technology succeeds.

Alcan (Aluminum Manufacturing): Reduced emissions by over two million tonnes worldwide over the last decade; plans to cut another 500,000 tonnes in the next four years.

BP (Petroleum & Renewables): Achieved its target, eight years early, of reducing emissions 10 percent worldwide below 1990 levels at no net cost. Energy investments in renewables to grow 40 percent in 2002.

Canadian Chemical Producers' Association: Members reduced emissions 39 percent below 1992 levels, primarily due to declines in emissions of nitrous oxide.

Canterra Towers (Buildings): Oxford Properties reduced energy consumption by 30 percent and emissions 28 percent below 1992 levels, saving tenants $1.5 million dollars in operating costs.

Dofasco (Steel Production): Reduced emissions 22 percent below 1990 levels by 1999, and 20 percent per unit of production. Target: to further improve specific energy intensity by 10 percent by 2010.

(continued)

The Green Leaders (continued)

DuPont (Chemical Manufacturing): Reduced emissions worldwide by 45 percent and improved energy efficiency by 15 percent over 1990 levels. Uses renewables for 10 percent of global energy use. Target: to reduce emissions by 65 per cent.

Dow (Chemical Manufacturing): Reduced emissions by 14 percent below 1990 levels, and reduced the level of CO2 per kg of product by 50 per cent. Target: to reduce emissions per unit of production another 10 per cent.

General Motors: Reduced emissions by 37 percent below 1990 levels, with a 30 percent reduction in emissions per vehicle produced. Target: to reduce emissions by 56 percent by 2005.

IBM (Information Technology): Reduced energy consumption worldwide by 25 percent through conservation, pocketing $527 million. Canada's operations reduced emissions by 33 percent since 1990.

Inco (Mining & Manufacturing): Reduced emissions by seven percent below 1990 levels by 1999. Target: to reduce emissions by a further one percent annually to 2005.

Mining Association of Canada: Metal mining in Canada reduced total emissions by 25 percent below 1990 levels and improved per-unit emissions of metal concentrate by 13.8 per cent. Nonferrous metal smelting and refining decreased emissions by 1.8 percent and improved intensity by 15.9 over the same period.

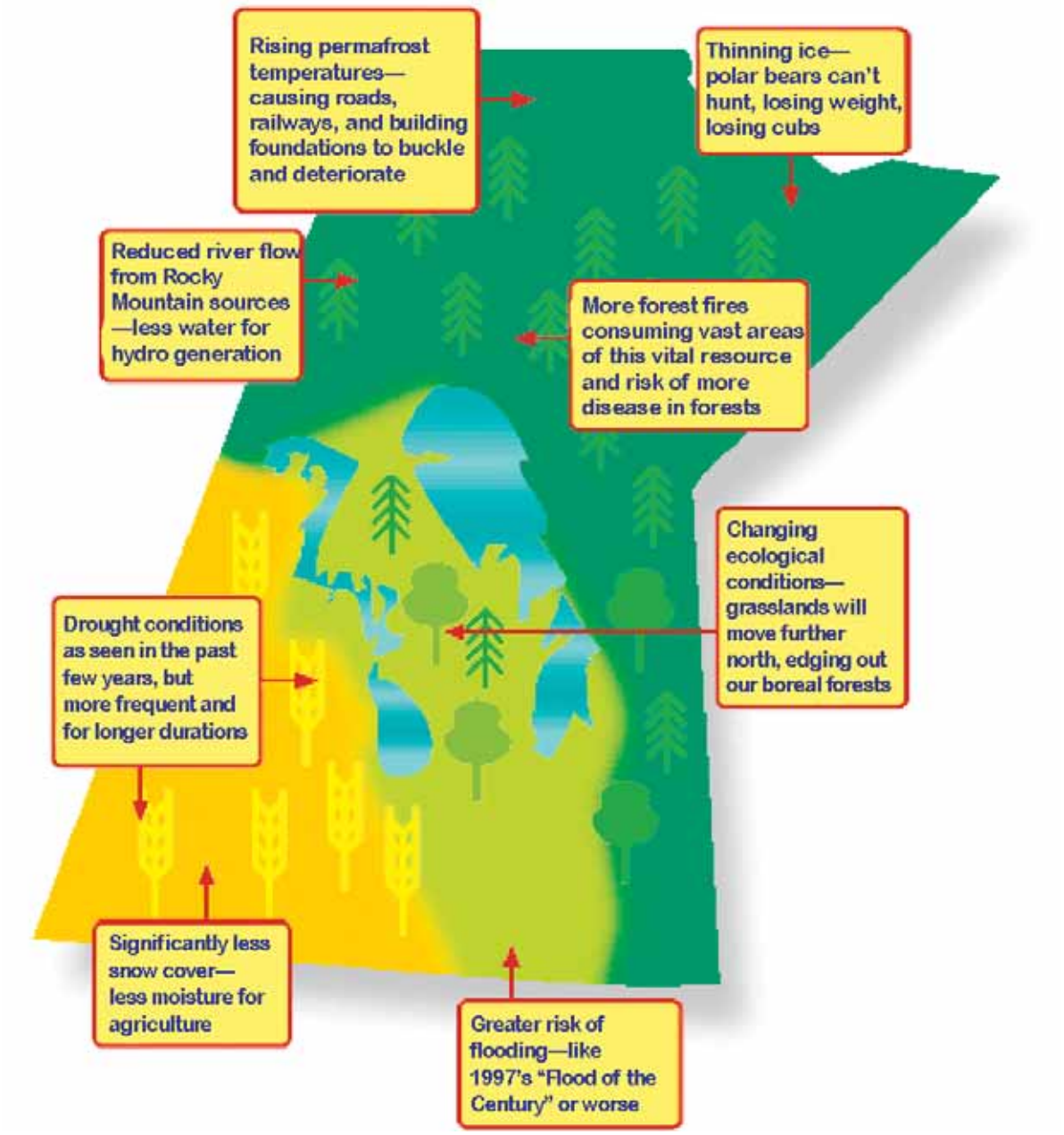
Nike (Garment Manufacturing, U.S.): Action Plan—To reduce CO2 emissions worldwide from business travel and from facilities and services to 13 percent below 1998 levels by 2006.

Toronto-Dominion Centre (Buildings): Cadillac Fairview reduced electricity consumption in Canada's largest office complex by about 21 million kWh annually—enough energy to power 6,000 homes—saving $2.5 million per year in energy costs.

Shell (Petroleum & Renewables): Reduced emissions 11 percent worldwide between 1990 and 2000, surpassing its target. Diversifying its investments in solar and wind technologies.

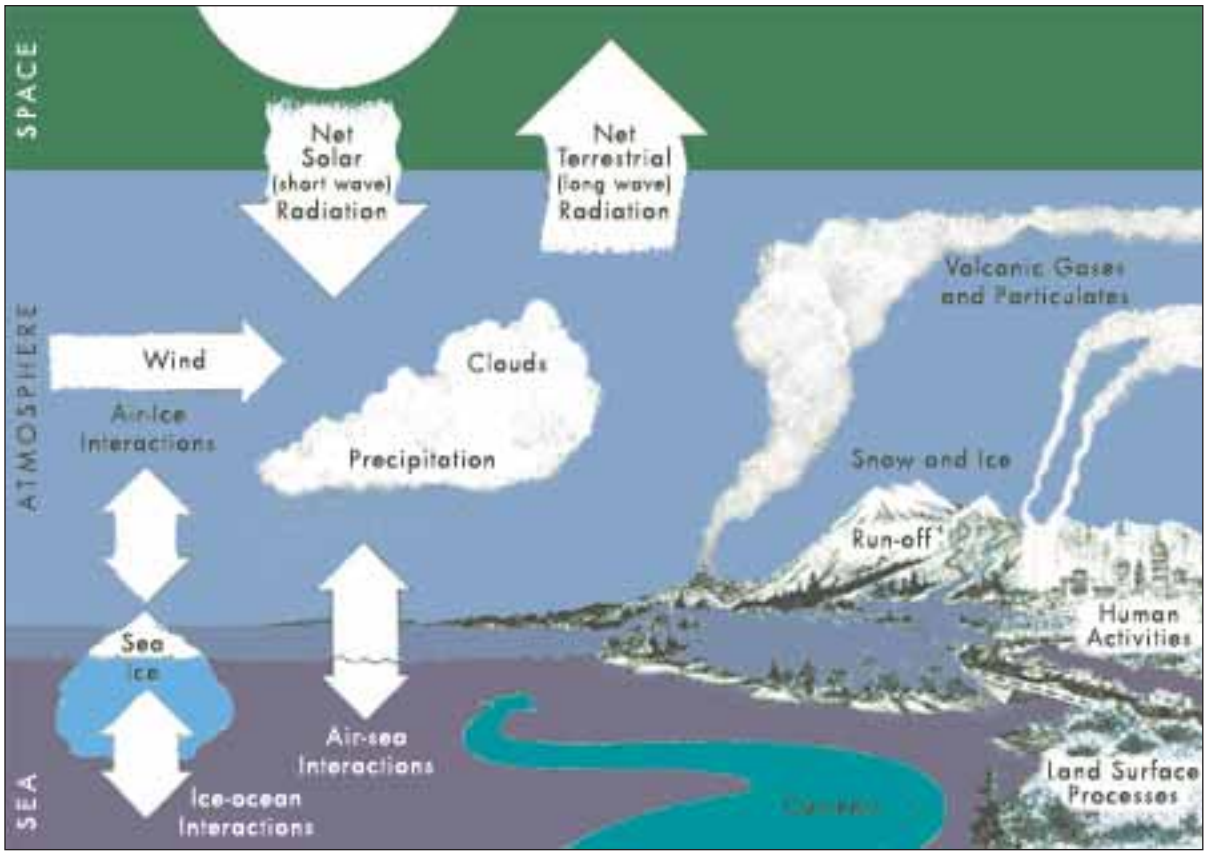
The information on this page is subject to change. For the most recent figures, please contact the municipality or business directly.

Our Climate Is Changing



Maps and Graphs

Major Elements of the Climate System



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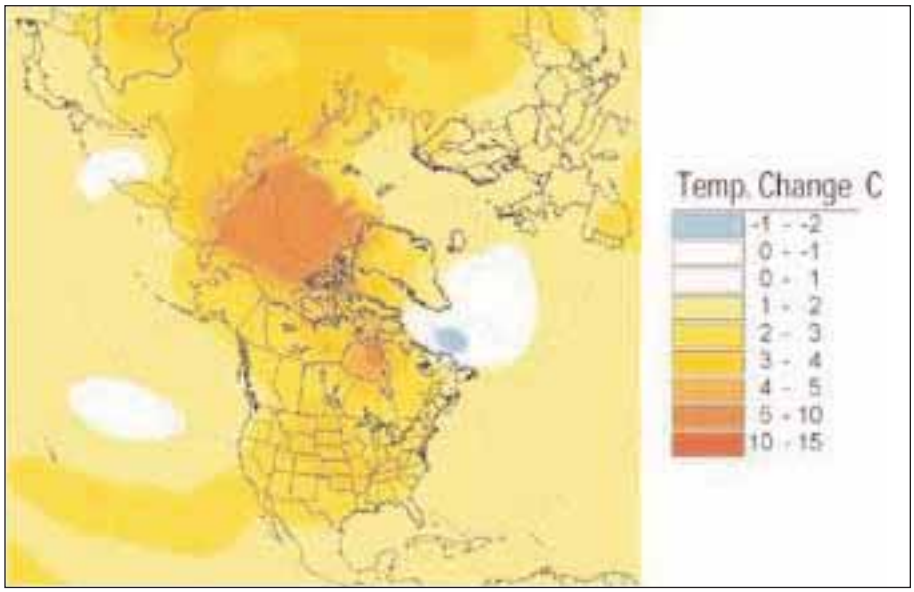
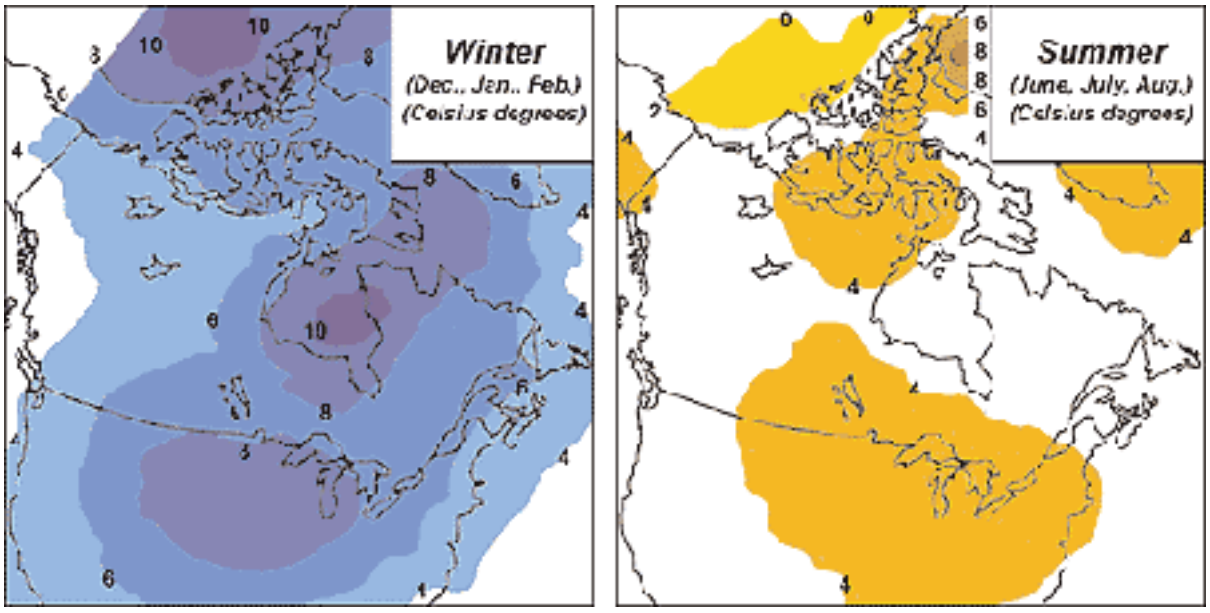
Maps and Graphs (continued)

Projected Temperature Change Between 1975-1995 and 2040-2060



Combined Effects of Projected Greenhouse Gases and Sulphate Aerosol Increases—Canadian Model

Temperature Projections for Canada for Winter and Summer Seasons Under Doubled Concentrations of CO_2



Climate changes will not be distributed uniformly. For a doubling of carbon dioxide concentrations, Canadian climate models project an increase of 3.5°C in the earth's average annual temperature but show more substantial warming over much of Canada, particularly in winter.

Different models have different projections for how much temperatures will change. For instance, the Geophysical Fluid Dynamics Laboratory GCM (GFDL 91) model projects increases of 2 to 6°C in the winter and 2 to 3°C in the summer, while the Goddard Institute for Space Studies GCM (GISS 85) model projects increases of 2 to 14°C in the winter and 1 to 2°C in summer.

Blowing Up Your World: Individual Responsibility in Environmental Issues

1. One student is given a balloon and asked to blow it up so it is full-blown. The balloon should not be tied but should be held closed.
2. Tell students that the balloon represents the world they have inherited from past generations. It is obviously tight with the environmental stress put on it.
3. Have the students determine how they are adding to or detracting from this stress by having them respond to a number of questions. In response to each question, students will raise their hands to indicate a positive response.
4. The student with the balloon will blow one big breath of air for every 3 to 5 students whose behaviour damages the environment.
5. For each question, students record their scores on a piece of paper.

Questions:

1. How many of you leave your bedroom light on when you are not in the room? (Hands down get 2 points.)
2. How many of you walked, biked, inline skated, or took the bus to school today instead of coming by car? (Hands up get 3 points.)
3. How many of you drink a soft drink, then throw the container in the garbage? (Hands down get 3 points.)
4. How many of you use aerosol hairspray or hair products? (Hands down get 3 points.)
5. How many of you use a hair dryer, curling iron, electric razor, or other energy-consuming convenience appliance, especially in the morning? (Hands down get 3 points.)
6. How many of you, when you go to the store, get a bag for your purchases, even if you have only one or two small items to carry? (Hands down get 2 points.)
7. How many of you carry lunch to school in a reusable container? (Hands up get 2 points.)
8. How many of you eat take-out or cafeteria food that is served in Styrofoam or plastic containers? (Hands down get 7 points.)
9. How many of you use handkerchiefs instead of disposable tissues or cloth towels instead of paper towels? (Hands up get 2 points.)
10. How many of you plan to buy a sports car when you can afford it? (Hands down get 4 points.)
11. How many of you throw your old cell phone away when you get a new one? (Hands down get 3 points.)
12. Is your sewage treated before it flows into a body of water? (Hands up get 6 points: zero points for those who don't know.)

Add up your score:

31-40 Very good! You're an environmentalist!

21-30 Good! You're starting to save the world!

11-20 Lots of room for improvement.

0-10 You're exiled to the town dump!

Did the balloon blow up? What must we do to save our environment?

Kyoto: The Barebones

The Deal: The Kyoto Protocol, a plan constructed in Kyoto, Japan, in 1997, is the only international agreement that sets targets to reduce greenhouse gas emissions that cause climate change. It represents a decade of negotiations and includes mechanisms to provide efficient implementation.

The Problem: According to scientists, greenhouse gases form a blanket in the upper atmosphere, trapping heat from the sun and contributing to the phenomenon commonly known as global warming. There are a number of gases targeted as culprits, the most important one being carbon dioxide, or CO_2, which is produced when fossil fuels, such as coal oil and natural gas, are burned. Some of the other contributing gases are methane (CH_4) and nitrous oxide (N_2O), as well as hydrofluorocarbons (HFCs), perofluorocarbons (PFCs), and sulphur hexafluorides (SF_6), which are used as refrigerants, heat conductors and insulators. Chlorofluorocarbons are also powerful greenhouse gases. Canadians currently produce 700 megatonnes of greenhouse gases per year. This translates to 2% of global emissions coming from a country with about ½ of 1% of the world's population. In other words, the average Canadian produces four times the global average level of emissions.

The Target: In order for the Kyoto Protocol to come into force, 55 countries that produce 55% of the developed world's 1990 carbon dioxide emissions must ratify it. The European Union ratified in May, 2002, and Japan followed suit a month later. In December, 2002, Canada ratified the agreement under Prime Minister Jean Chretien. More than 100 countries have now ratified the agreement. The reduction targets are different for each country, but Canada must reduce its emissions over the years of 2008 and 2012 to 6% below 1990 levels. A recent study, "Kyoto and Beyond," shows that we can cut Canada's total emissions in half by 2030 using existing technology, while maintaining our quality of life and economic growth at "business as usual" levels.

Who's Not In? Developing countries, including India and China, are exempt from reducing greenhouse gases in the first phase of Kyoto reductions because their per-capita emissions are much lower than those of developed countries. It is important to note that China has already made cuts even without legal requirements to do so. Unfortunately, the United States, the world's most profligate energy user, has not opted to ratify, along with Australia.

The Business Plan—Cap and Trade: It's actually a straightforward plan in which Ottawa, after consultations with the industrial sector, would set a mandatory limit, or cap, for greenhouse emissions. Industries especially affected would be the oil and gas industry, the industrial sector, and generating plants. The oil-rich province of Alberta has concerns about the impact of this plan, but the Canadian government predicts that Alberta's economy will actually grow by an estimated 12% by 2012 assuming a middle-of-the-road plan for implementing Kyoto. An emissions trading system between energy-efficient firms and inefficient ones would develop, allowing businesses to sell unused portions of their caps. New and expanding operations would have to purchase emission permits through this trading system.

The Wrinkles: There are other methods by which large firms having difficulty meeting their targets can gain Kyoto credits. One is to finance abatement programs in developing countries and even in industrialized nations that are in need of creative solutions to the problems of global warming. Such programs could take the form of:

- education programs
- development programs to implement the use of alternative and renewable fuel sources such as natural gas, wind, and solar power
- projects to develop cattle feed that reduces or stops cows from belching methane gas
- afforestation projects
- aggressive biofuels and energy-efficiency programs

(continued)

Kyoto: The Barebones (continued)

Bigger Wrinkle: Canada wants a 70-million-tonne credit for clean (natural gas and hydro) exports, especially to the U.S., that displace dirtier fuels, reducing gas emissions. However, the United States has not agreed to ratify Kyoto, so the UN has not agreed to this credit. That leaves a gap of 96 million tonnes a year which new policies will have to fill. The most controversial offset, as the credits are called, is Russia's so called "hot air" program, which would allow the country to export excess pollution rights to countries that might not otherwise be able to meet their quotas. This is possible for Russia because of the collapse of so many Russian industries after the fall of the Soviet Union, leaving emissions already far below their 1990 levels.

References:

"Kyoto: The Details" at: <www.cbc.ca/news/features/kyoto_cost2.html>

David Suzuki Foundation: "Climate Change: FAQs" at: <www.davidsuzuki.org/Climate_Change/Kyoto/FAQs.asp>

David Suzuki Foundation: "Climate Change: Kyoto Protocol" at: <www.davidsuzuki.org/climate_change/kyoto/kyoto_protocol.asp>

Kyoto: The Barebones
Note-Taking Organizer

The Deal	
The Problem	
The Target	
Who's Not In	
The Business Plan	
The Wrinkles	
The Bigger Wrinkle	

Economy vs. the Environment: Pros and Cons

Is it possible to protect the environment and see economic growth at the same time? This is a big question. And with us to discuss all this, from the environmental group Greenpeace, Kert Davies, and from the U.S. Chamber of Commerce, Bill Kovacs.

Mr. Kovacs: I would argue that the only way you can ever have environmental protection is by generating the wealth to protect the environment. If you go through the history of civilization, you find that we started off really as a subsistence economy, then we moved to agriculture, then we moved to industrial. And at each stage of the process you accumulate wealth. But the lower the stage of the process, the more you deplete the resources, the more you deplete the wood, the coal—whatever it is that's in the ground—the more you use the resources. And then, as you move from an industrial society to an information and service society, you then have created the wealth and you begin to reinvest that in environmental protection.

And if you look at what's happened over the last 30 years, the American business community has put $3 trillion into environmental protection. Every single environmental indicator is going the right way. So I would make the argument that the only way that you can ever have true environmental protection is to really generate the wealth that can pay for it.

Mr. Borgida: Mr. Davies, your rebuttal?

Mr. Davies: The question that is brought up by that is: Why can't this economy, the most robust economy in the world, take the lead and the rightful leadership role that the U.S. should have on this issue of global warming?

Now the Bush administration says it's a real problem, humans are causing it, the burning of fossil fuels is at the root. And yet the government's reaction is to do nothing. I don't get it.

Mr. Kovacs: Well, let's put it this way. You can sit there and say the government is doing nothing, but all of the studies are based on very small amounts of data. And they're asking you to make the assumption that we're going to put 2.4 million people out of work, that we are going to lose about $300 billion a year in the GDP. So I guess the question that I would ask you is: If you were going to implement the Kyoto Treaty, how could you do it without costing 2.4 million jobs and $300 billion a year to the economy?

Mr. Davies: I don't believe those numbers. I think we can grow the economy. I think we can build clean energy jobs. I know that wind power, for example, has grown 40 percent in the last year in this country. There is a path forward that includes clean jobs, clean cars. U.S. industry is the boldest in the world, the most innovative. We should be selling this technology to the developing world. We should be moving forward with our innovation and our prowess in these things, and leading the world forward to a clean energy economy that not only protects the environment but makes lives better everywhere.

Mr. Kovacs: I would agree with you that we certainly should be selling our energy efficient technologies to the world. That is the number one thing that we should be doing. Because the truth of the matter is, if the United States went out of business tomorrow, the rest of the world is still going to continue to emit more greenhouse gases. China, Mexico, India, they're going to continue to emit. So what we have to do is we do have to transfer this technology there.

Mr. Davies: We have an obligation. We are 25 percent of the pollution in the world, with 5 percent of the population. We have an obligation to act now, and act quickly.

(continued)

Economy vs. The Environment: Pros and Cons (continued)

Mr. Kovacs: Well, we are acting. If you look at the energy efficiency of the United States, for example, it took 20,000 BTUs in 1970 to create a dollar of GDP. Today it takes 8,000. We're about 60 percent more efficient than we were then. We're efficient on the amount of oil that we're using. We're efficient on every single aspect of—

Mr. Davies: And yet the Bush administration says we need more oil and doesn't say we need more renewable energy, more clean energy. It doesn't make sense.

Mr. Kovacs: No. If you look at the Bush energy plan, it talks about renewables. It talks about tax credits to spur investment. In the House bill, you have $22 billion worth of new investment into renewables. But the bottom line is, no matter how much you talk about it, renewables as you talk about them—wind and sun and solar and geothermal—is about 1 percent of all of the energy in the United States.

Mr. Davies: We just did a report with the European photovoltaic industry—or the European Wind Energy Association, and found that wind could provide 12 percent of the world's electricity in 20 years. That's a short time frame. It can be done. It's on that path already.

Mr. Kovacs: I think that's a great example. You have to ask the viewing public: How many people want a windmill in their yard? These things are about 120 feet high, 60-foot blades.

Mr. Davies: Who wants a coal-fired power plant in their yard?

Mr. Kovacs: They're not.

Mr. Davies: Who wants a nuclear power plant in their yard? This goes both ways.

Mr. Kovacs: They serve large communities. The wind and a wind farm is—

Mr. Davies: Wind is making money for farmers in Iowa and all around the world.

Mr. Borgida: Mr. Davies, let me interrupt for a minute. This is an engaging conversation; I want to ask you one quick question, though. You mentioned a windmill in your yard and those kinds of things. Not everybody in the world has a yard in which to place a windmill, and are concerned about this issue. There are Third World people out there who are concerned about surviving each day. How do you make your case, particularly on the environmental side, to a part of the world where making it through the next day is important?

Mr. Davies: There is nothing better for the developing world than renewable energy. It is low input. There are no wires required. You set up a distribution system that's just for a village, build solar power for that village. At the meeting in Bali right now, Greenpeace is demanding that governments of the world put a whole lot more money than they are right now into renewable energy for the poorest people in the world. It just makes perfect sense. It fits perfectly with those economies.

Mr. Borgida: Mr. Kovacs, a thought on that?

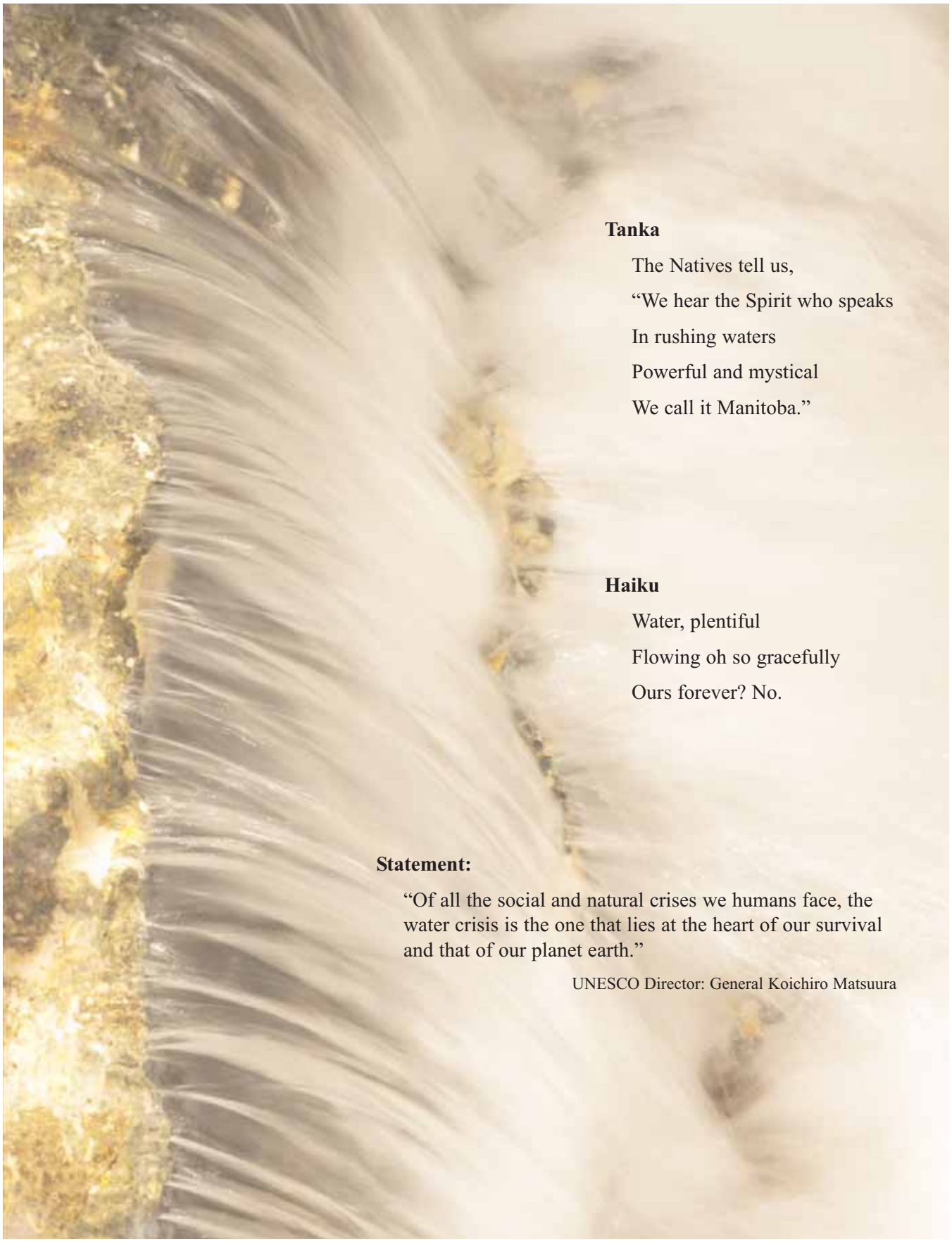
Mr. Kovacs: I think the economists are very clear that people don't worry about the environment until they have a set standard of living. For example, if you want to address deforestation, that occurs when there is about a $7,000 per household income. And you have to begin generating wealth in these nations. And generating wealth means moving them from subsistence living to industrial and then into the information age. And the best way to do that is technology transfer. I think that the United States is very well-equipped to do that, and we should do it. And that's probably the one point we agree on.

Mr. Davies: And we would agree on that.

Mr. Kovacs: The bottom line is we have to—

Mr. Davies: The point is we have to leapfrog the dirty technology and go to the clean—not let these countries and these people make the same mistakes that we made in going through these dirty pathways. It's simple.

Water Poetry



Tanka

The Natives tell us,
"We hear the Spirit who speaks
In rushing waters
Powerful and mystical
We call it Manitoba."

Haiku

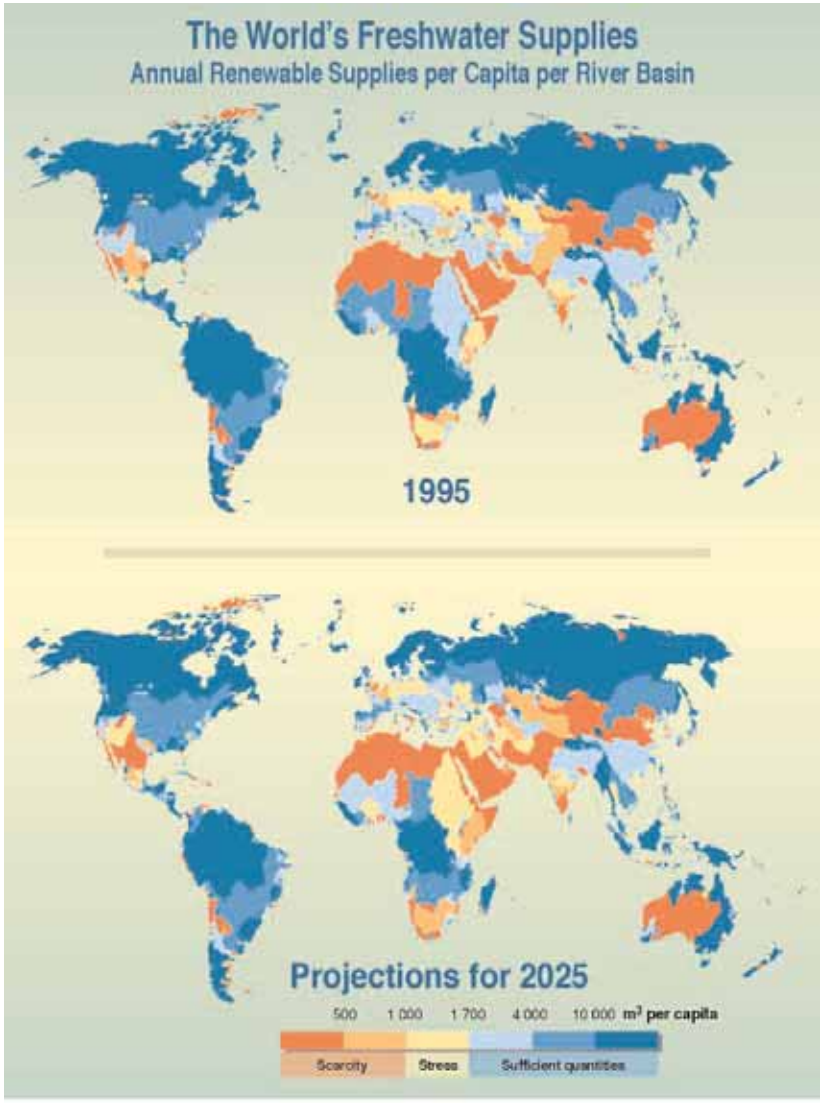
Water, plentiful
Flowing oh so gracefully
Ours forever? No.

Statement:

"Of all the social and natural crises we humans face, the water crisis is the one that lies at the heart of our survival and that of our planet earth."

UNESCO Director: General Koichiro Matsuura

The World's Freshwater Supplies

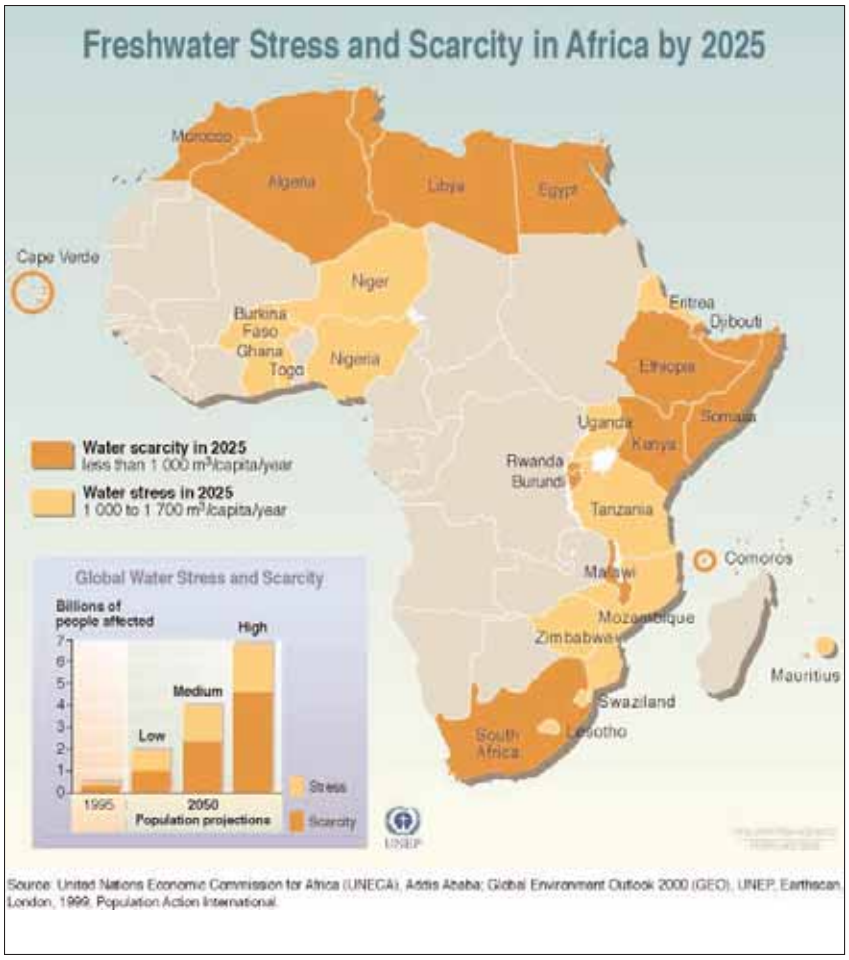


	m³ per capita per year		m³ per capita per year		m³ per capita per year
North America		**Europe**		**Asia and Australia**	
1 Yukon	1 249 832	25 Danube	2 519	13 Volga	4 260
2 Mackenzie	408 243			14 Ob	14 937
3 Nelson	15 157	**Africa and West Asia**		15 Yenisey	79 083
4 Mississippi	8 973	8 Niger	4 076	16 Lena	161 359
5 St. Lawrence	9 095	9 Lake Chad Basin	7 922	17 Kolyma	722 456
		10 Congo	22 752	18 Amur	4 917
South America		11 Nile	2 207	19 Ganges and Brahmaputra	-
6 Amazon	273 757	12 Zambezi	-	20 Yangtze	2 265
7 Paraná	8 025	26 Orange	1 050	21 Murray Darling	-
		24 Euphrates and Tigris	2 189	22 Huang He	361
				23 Indus	830

Source: Revenga et al. 2000, from Pilot Analysis of Global Ecosystems: Freshwater Systems

Although the absolute quantities of freshwater on Earth have remained approximately the same, the uneven distribution of water and human settlement continues to create growing problems of freshwater availability and accessibility.

Water Stress



According to Population Action International, based upon the UN Medium Population Projections of 1998, more than 2.8 billion people in 48 countries will face water stress or scarcity conditions by 2025. Of these countries, 40 are in West Asia, North Africa or Sub-Saharan Africa. Over the next two decades, population increases and growing demands are projected to push all the West Asian countries into water scarcity conditions. By 2050, the number of countries facing water stress or scarcity could rise to 54, with their combined population being 4 billion people— about 40% of the projected global population of 9.4 billion (Gardner-Outlaw and Engleman, 1997; UNFPA, 1997).

- Many African countries, with a population of nearly 200 million people, are facing serious water shortages. By the year 2025, it is estimated that nearly 230 million Africans will be facing water scarcity, and 460 million will live in water-stressed countries (Falkenmark, 1989).
- Today 31 countries, accounting for less than 8% of the world's population, face chronic freshwater shortages. Among the countries likely to run short of water in the next 25 years are Ethiopia, India, Kenya, Nigeria and Peru. Parts of other large countries (e.g., China) already face chronic water problems (Hinrichsen et al., 1998; Tibbetts, 2000).
- Bahrain, Kuwait, Saudi Arabia and the United Arab Emirates have resorted to the desalinization of seawater from the Gulf. Bahrain has virtually no freshwater (Riviere, 1989). Three-quarters of Saudi Arabia's freshwater comes from fossil groundwater, which is reportedly being depleted at an average of 5.2 km^3 per year (Postel, 1997).

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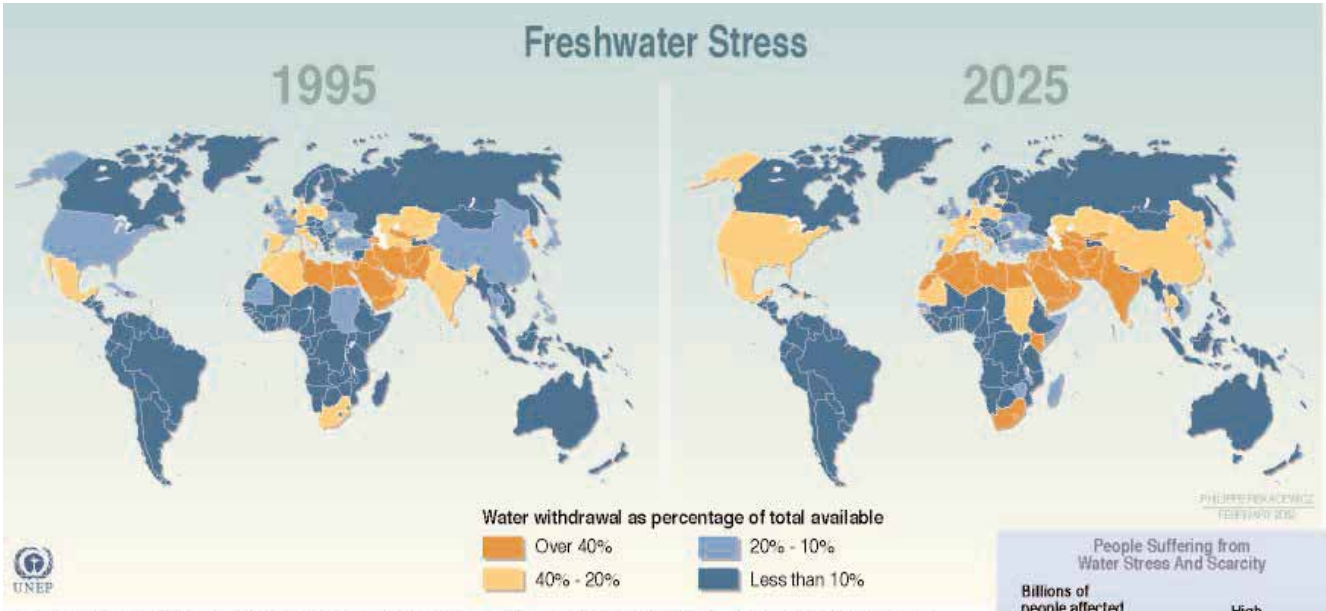
Water Stress (continued)



Source: World Meteorological Organisation (WMO), Geneva, 1996; Global Environment Outlook 2000 (GEO), UNEP, Earthscan, London, 1999.

Some 460 million people—more than 8% of the world's population—live in countries using so much of their freshwater resources that they can be considered highly water stressed (UNCSD, 1999; WMO 1997). A further 25% of the population lives in countries approaching a position of serious water stress (WMO, 1997). Water scarcity occurs when the amount of water withdrawn from lakes, rivers or groundwater is so great that water supplies are no longer adequate to satisfy all human or ecosystem requirements, resulting in increased competition between water users and demands.

Definitions of Water Stress and Scarcity

An area is experiencing water stress when annual water supplies drop below 1,700 m^3 per person. When annual water supplies drop below 1,000 m^3 per person, the population faces water scarcity.

Sources: UNPD, UNEP, World Bank, and WRI. 2000.

Approach #1: Seek New Sources
Sweating the Small Stuff

A water-covered planet facing a water crisis seems paradoxical. And yet that is exactly the reality on planet Earth, where 97 percent of the water is too salty to quench human thirst or to irrigate crops. Tackling water shortage issues with desalination—drawing fresh, drinkable water out of salty seawater—is common in the desert nations of the Middle East, the Caribbean and the Mediterranean. But as the cost of desalination drops and the price and demand for water climb, countries in temperate regions are turning more and more to the sea.

Large-scale desalination facilities are even turning up in the U.S., one of the world's most water-rich countries. As part of an ambitious plan to reduce pumping from depleted underground aquifers, water officials in the Tampa Bay, Fla., area are contracting the construction of a desalination plant capable of producing 25 million gallons of desalted water a day. They are relying on desalination to supplement the region's future water demands. Houston is also looking at desalinating water from the Gulf of Mexico to keep from going dry.

People have been pulling freshwater out of the oceans for centuries using technologies that involve evaporation, which leaves the salts and other unwanted constituents behind. Salty source water is heated to speed evaporation, and the evaporated water is then trapped and distilled.

This process works well but requires large quantities of heat energy, and costs have been prohibitive for nearly all but the wealthiest nations, such as Kuwait and Saudi Arabia. (One exception is the island of Curaçao in the Netherlands Antilles, which has provided continuous municipal supplies using desalination since 1928.) To make the process more affordable, modern distillation plans recycle heat from the evaporation step.

A potentially cheaper technology called membrane desalination may expand the role of desalination worldwide, which today accounts for less than 0.2 percent of the water withdrawn from natural sources. Membrane desalination relies on reverse osmosis—a process in which a thin, semipermeable membrane is placed between a volume of saltwater and a volume of freshwater. The water on the salty side is highly pressurized to drive water molecules, but not salt and other impurities, to the pure side. In essence, this process pushes freshwater out of saltwater.

Most desalination research over the past few years has focused on reverse osmosis, because the filters and other components are much smaller than the evaporation chambers used in distillation plants. Reverse osmosis plants are also more compact and energy-efficient.

Although reverse osmosis plants can offer energy savings, the earliest membranes, made from either polyimide fibers or cellulose acetate sheets, were fragile and had short life spans, often no longer than three years. These materials are highly susceptible to contaminants in the source water—particularly chlorine, which hardens the membranes, and microbes, which clog them. Pretreatment regimes, such as filtering out sediments and bacteria, must be extremely rigorous. A new generation of so-called thin composite membranes, made from polyimide films, promises to eliminate these problems. Though still susceptible to contamination, these new membranes are sturdier, provide better filtration and may last up to 70 years.

Technical performance is important, but it alone does not drive the adoption of desalination as a source of clean water. With or without technical improvements, the market for desalination equipment will very likely show healthy growth in the next 10 years as cities and other consumers realize the potential and favourable economics of existing equipment, according to James D. Birkett, who runs West Neck Strategies, a private desalination consulting company based in Nobleboro, Me.

Hundreds of suppliers are already selling many thousands of pieces of equipment annually. These desalination units range in capacity from a few gallons a day (small emergency units for life rafts) to several million gallons a day (municipal systems). "So confident are the suppliers that they enter into long-term contracts with their customers," Birkett says, "thus

(continued)

Approach #1: Seek New Sources
Sweating the Small Stuff (continued)

assuming themselves the risks of performance and economics." The desalination plant on Tampa Bay, scheduled to be operational by the end of 2002, will be funded and operated in such a manner.

Today the best estimate is that about 1 percent of the world's drinking water is supplied by 12,500 desalination plants. No doubt, this is only the beginning. In the future, the water in your glass may have originated in the seas.

Approach #2: Redistribute Supplies Bagged and Dragged

Pipelines make it possible to move freshwater cheaply over vast distances of land. If only the same were possible over the oceans. Dragging waterproof plastic or fabric containers behind tugboats may be the answer.

Beginning in 1997, the English company Aquarius Water Trading and Transportation Ltd. has towed water from mainland Greece to nearby resort islands in enormous polyurethane bags, helping the tourist destinations deal with increased demand for drinking water during the peak season. Another company, Nordic Water Supply in Oslo, Norway, has made similar deliveries from Turkey to northern Cyprus using their own fabric containers.

The seemingly far-fetched concept of water bags was born in the early 1980s out of the desire to move large amounts of water more cheaply than modified oil tankers can do. For many years, tankers and barges have been making deliveries to regions willing to pay premium prices for small amounts of freshwater, such as the Bahamas, Cyprus and other islands with inadequate sources. Tankers have also supplied water during short-term droughts and disasters such as the 1995 Kobe earthquake in Japan.

Aquarius has manufactured eight 790-ton bags and two 2,200-ton versions; the latter hold about half a million gallons of water each. Aquarius has also developed models that are 10 times larger than the ones in use today, and last year Nordic began manufacturing bags that can hold nearly eight million gallons.

Water bags could offer a less expensive alternative to tankers—bags in the Aquarius fleet cost anywhere from $125,000 to $275,000—but some technical problems remain. In particular, making such large bags that are capable of withstanding the strains of an ocean voyage is difficult. For freshwater deliveries to the Greek isles and to Cyprus, bags need be dragged no farther than 60 miles. The piping systems needed to connect the bags to water supplies on land can be built from existing technology, but bags have ripped during transport on several occasions.

A third water-bag inventor, Terry G. Spragg of Manhattan Beach, Calif., is solving the problems of both volume and towing in a different way. With the support of privately hired scientists and consultants, Spragg has patented specialized zippers, with teeth more than an inch long, that can link water bags like boxcars. He has demonstrated the technology but has yet to sell it for commercial use.

Thus far this technology has been used only for freshwater deliveries to emergency situations and to extremely water-scarce coastal regions with a reliable demand for expensive water. But for some communities with no other option, water bags may offer a new and clever solution.

Approach #3: Reduce Demand Leaking Away

New York City is a metropolis of flamboyant excess, except when it comes to water. No one would suspect it, but the Big Apple has clamped down on water wasters, and after 10 years of patching leaky pipes and replacing millions of water-guzzling toilets, the city is now saving billions of gallons of water every year.

Back in the early 1990s New York City faced an imminent water shortage, and it was getting worse with every flush, shower and tooth brushing. With an influx of new residents and an increase in the number of drought years, the city needed to find an extra 90 million gallons of water a day—about 7 percent of the city's total water use. Instead of spending nearly $1 billion for a new pumping station along the Hudson River, city officials opted for a cheaper alternative: reduce the demand on the current water supply, which was piped in from the Catskill Mountains.

Officials knew that persuading New Yorkers to go green and conserve water would require some enticement—free toilets. The city's Department of Environmental Protection (DEP) stepped in with a three-year toilet rebate program which began in 1994. With a budget of $295 million for up to 1.5 million rebates, the ambitious scheme set out to replace one third of the city's inefficient toilets—those using more than five gallons of water per flush—with water-saving models that do the same job with only 1.6 gallons per flush. With the rebate program, the DEP hoped to meet the largest part of its water-savings goal.

New Yorkers embraced the plan. Some 20,000 applications arrived within three days of its start. By the time the program ended in 1997, low-flow toilets had replaced 1.33 million inefficient ones in 11,000 buildings. The result: a 29 percent reduction in water use per building per year. The DEP estimates that low-flow toilets save 70 million to 90 million gallons a day citywide—enough to fill about 6,700 Olympic-size swimming pools.

But more efficient flushes weren't enough. The toilet rebate program happened concurrently with the city's water audit program, which continues today. For much of the city's history, the amount building owners paid for water was based on the size of their property. Following a law passed in 1985, however, the city began keeping tabs on water use and charging accordingly. The law dictated that water meters be installed during building renovations, and the same requirement was applied to construction of new homes and apartments beginning in 1988. As of 1998, all properties in the city must be metered.

Homeowners who want to keep their water bills down under the new laws can request a free water-efficiency survey from Volt VIEWtech, the company that oversees the city's audit program. Inspectors check for leaky plumbing, offer advice on retrofitting with water-efficient fixtures and distribute free faucet aerators and low-flow showerheads. Low-flow showerheads use about half as much water as the old ones, and faucet aerators, which replace the screen in the faucet head and add air to the spray, can lower the flow of water from four gallons a minute to less than one gallon a minute. Volt VIEWtech has made several hundred thousand of these inspections, saving an estimated 11 million gallons of water a day in eliminated leaks and increased efficiency.

In efforts to save even more water, New York City has gone outside the home and into the streets. Water officials have installed magnetic locking caps on fire hydrants to keep people from turning them on in the summer. The city is also keeping an eye underground by using computerized sonar equipment to scan for leaks along all 32.6 million feet (6,l74 miles) of its water mains.

Although the city's population continues to grow, per person water use in New York dropped from 195 to 169 gallons a day between 1991 and 1999. From all indications, this trend is following its upward path. Water conservation works. And New Yorkers are proving that every flush makes a difference.

Approach #4: Recycle
Waste Not, Want Not

Namibia is the driest African country south of the Sahara Desert. Blistering heat evaporates water faster than rains can rejuvenate the parched landscape, and there are no year-round rivers. Residents of the capital city, Windhoek, must do more than just conserve water to secure a permanent supply. They must reuse the precious little they have.

By the end of the 1960s, most underground aquifers and reservoirs on seasonal rivers near Windhoek had been tapped dry by the capital's burgeoning population, which has grown from 61,000 to more than 230,000 in the past 30 years. Transporting water from the closest permanent river, the Okavango—some 400 miles away—was too expensive. This crisis inspired city officials to implement a strict water conservation scheme that includes reclaiming domestic sewage and raising it once again to drinkable standards.

The city's first reclamation plant, initially capable of producing only 460 million gallons of clean water per year when it went on line in 1968, is now pumping out double that amount enough to provide about 23 percent of the city's yearly water demands. Officials hope to boost that supply number to 51 percent with an upcoming facility now under construction.

To make wastewater drinkable, it must undergo a rigorous cleaning regimen. First, large solids are allowed to settle out while biofilters remove smaller organic particles. Advanced treatments remove ammonia, and carbon and sand filters ensure that the last traces of dissolved organic material are eliminated. The final step is to purify the water by adding chlorine and lime. To guarantee a safe drinking supply, the reclaimed water is tested once a week for the presence of harmful bacteria, viruses and heavy metals. (Industrial effluent laden with toxic chemicals is diverted to separate treatment plants.) Compared with local freshwater sources, the reclaimed water is equal or better in quality.

Despite 32 years of access to high-quality recycled water, the residents of Windhoek still doggedly oppose its use for personal consumption. For this reason, most of this purified wastewater irrigates parks and gardens. But sometimes people don't have a choice about their water source. In times of peak summer demand or during emergencies such as drought, local freshwater reservoirs are strained, and Windhoek relies heavily on treated effluent to boost supply. During the drought of 1995, for instance, reclaimed water accounted for more than 30 percent of the clean water piped into homes.

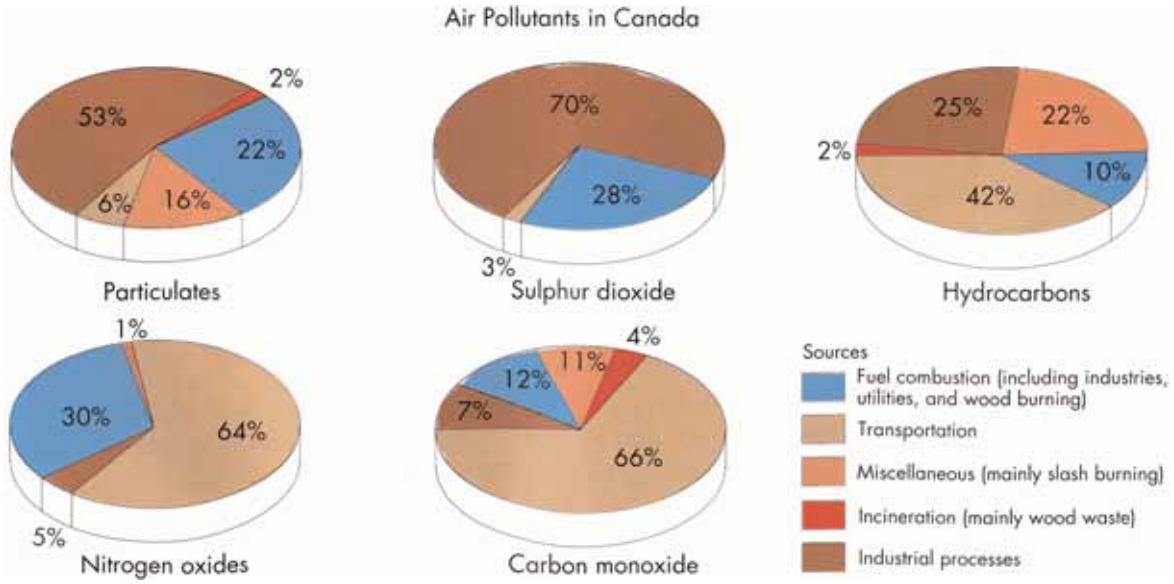
Officials hope to bolster support for the recycling program through enhanced public education—like letting the word slip that besides irrigating the city's greenery, treated wastewater is the secret ingredient in the prized local brew.

Examples of Focus Questions: Water: Some Solutions

1. Explain why there was an imminent water shortage in New York in the early 1990s.
2. How were New Yorkers convinced to "go green?" Discuss the plan in a few sentences.
3. What else did the city do concurrently to help conserve water? Explain the program.
4. What is Volt VIEWtech?
5. What statistical evidence is there that New York's water conservation plans were successful?
6. Although 97 percent of the earth is water, much of it cannot be used. Why not?
7. Define the term desalination. Describe the process.
8. What is reverse osmosis? What are the pros and cons of this process?
9. Eventually, what percentage of the world's drinking water will be supplied by desalination?
10. After skimming and scanning the article, what do you think "Sweating the Small Stuff" means?
11. What does the expression "bagged and dragged" refer to? Where has this process begun to occur? Why?
12. Explain the initial reason for the development of water bags.
13. Evaluate these water bags as a useful invention.
14. What do you think the expression "waste not, want not" means?
15. Describe the water problems facing Namibia, Africa.
16. Explain their solution to their problem.
17. What is the quality level of the reclaimed water? What has been the response of the people? Hypothesize why this is so.

Major Air Pollutants

Pollutant	Physical Characteristics	Effect on humans
Sulphur dioxide (SO_2)	colourless gas with a pungent odour	Irritation of the respiratory tract; may aggravate asthma
Carbon monoxide (CO)	colourless, odourless, tasteless gas	When inhaled, reduces the body's ability to use oxygen; in high quantities, may cause drowsiness or asphyxiation
Nitrogen dioxide (NO_2)	reddish-brown gas	Irritating; can impair lung function; at high concentrations, makes breathing difficult for people with respiratory problems
Ozone (0_3)	pungent smelling, colourless gas, formed when sunlight heats other air pollutants	Significantly reduces lung function, even in healthy people
Particulates	microscopic solids or liquids; vary widely in size and chemical composition	Can irritate the eyes and respiratory system; cause coughing and breathing difficulties; associated with cardiac problems; finer particles can cause deep lung damage



Urban Air Pollution

Urban air pollution, also known as smog, has five main components, each of which is harmful to the human respiratory system. Sulphur dioxide (SO_2) is a colourless gas with a pungent odour. It causes irritation of the upper respiratory tract and eyes and may lead to an increase in respiratory diseases. Carbon monoxide (CO) is also a colourless gas, but odourless and tasteless. Low concentrations of CO slow reflexes, while higher concentrations may cause drowsiness and asphyxiation. Nitrous dioxide (NO_2), a reddish-brown gas, also causes an increased risk of respiratory infection and produces constricted air passages in people suffering from asthma. Ozone (O_3), a pungent-smelling, colourless gas, causes coughing and irritation to the lungs and eyes. In addition to the gases, microscopic particles of solids and liquids suspended in the air contain a variety of irritating chemical compounds. These particulates reduce visibility and can damage the lungs and heart.

Projections and Analysis Chart

NAICC Consensus Forecast - Canada

	Nitrogen Oxide Emissions									
	1990		1995		2000		2005		2010	
	(Kt)	%	(Kt)	%	(Kt)	%	(Kt)	%	(Kt)	%
Transportation	1253	59	1161	58	1117	54	1088	51	1116	51
Industrial Sources	489	23	481	24	564	27	627	30	685	31
Power Generation	252	12	234	12	266	13	263	12	234	11
Fuel Combustion	65	3	66	3	69	3	71	3	72	3
Incineration/Misc/Ot	47	2	57	3	64	3	72	3	80	4
TOTAL	**2106**	**100%**	**1999**	**100%**	**2080**	**100%**	**2121**	**100%**	**2187**	**100%**

	Volatile Organic Compound Emissions									
	1990		1995		2000		2005		2010	
	(Kt)	%	(Kt)>	%	(Kt)	%	(Kt)	%	(Kt)	%
Incineration/Misc/Ot	926	33	933	35	971	36	1035	37	1110	38
Industrial Sources	843	30	857	32	878	33	921	33	959	33
Transportation	804	28	647	24	592	22	584	21	604	21
Fuel Combustion	254	9	239	9	238	9	239	9	239	8
Power Generation	2	0	3	0	3	0	3	0	3	0
TOTAL	**2829**	**100%**	**2679**	**100%**	**2682**	**100%**	**2782**	**100%**	**2915**	**100%**

	Sulphur Dioxide Emissions									
	1990		1995		2000		2005		2010	
	(Kt)	%	(Kt)	%	(Kt)	%	(Kt)	%	(Kt)	%
Industrial Sources	2425	73	2125	76	2046	73	2042	72	2152	75
Power Generation	690	21	500	18	581	21	628	22	523	18
Transportation	133	4	123	4	116	4	124	4	132	5
Fuel Combustion	50	2	49	2	51	2	51	2	50	2
Incineration/Misc/Ot	7	0	8	0	8	0	9	0	10	0
TOTAL	**3305**	**100%**	**2805**	**100%**	**2802**	**100%**	**2854**	**100%**	**2867**	**100%**

Environmental Implications of the Automobile (SOE Fact Sheet No. 93-1)

The automobile has probably done more to shape the character of 20th-century Canada than any other piece of technology. It has given us mobility and independence. It has given us the convenience of going where we want to, when we want to, and of doing so in comfort. It has liberated the average person from the limitations of time and place, opening up new opportunities and offering new experiences. More significantly, it is one of the pivotal elements of our economy. No wonder, then, that Canadians have made the car such a central fixture of their lives.

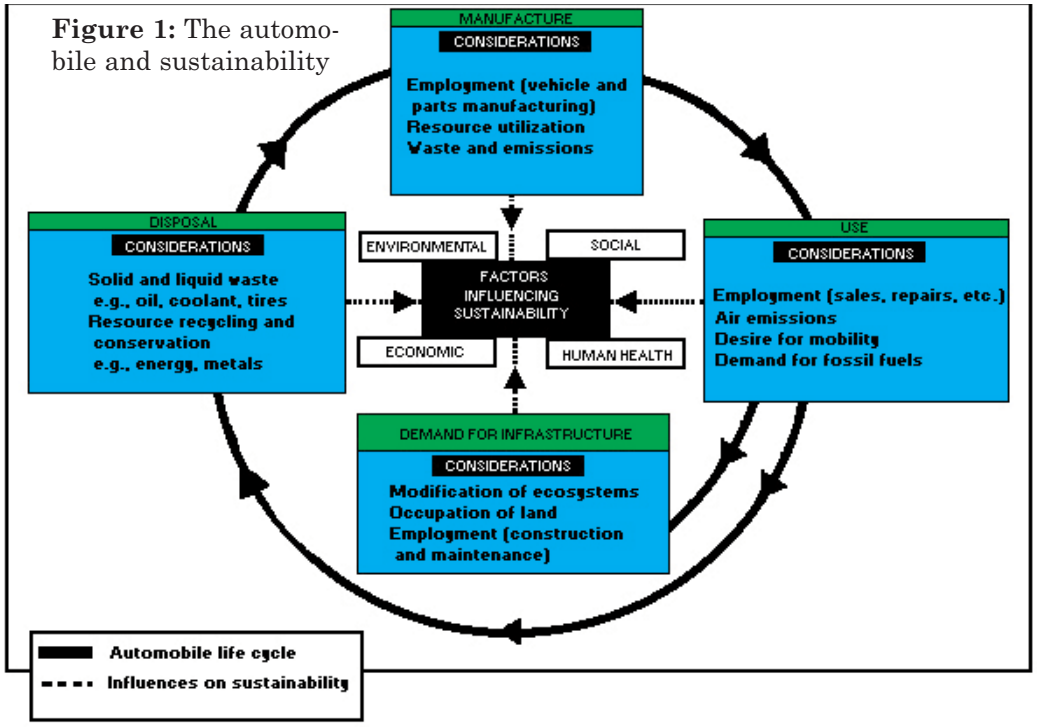
But the automobile also affects the environment in many ways. Cars and their associated infrastructure use resources, consume energy, and emit pollutants on a substantial scale. They are a source of noise and congestion and a leading cause of accidental deaths. They have also radically reshaped the landscape—directly through the building of expressways, roads, and other infrastructure, and indirectly through effects on settlement patterns.

The automobile's impact has been all the greater because of its success. More than 12 million cars now traverse Canada's roads—one for nearly every two Canadians, one of the highest ratios of car ownership in the world. Each of these cars travels, on average, more than 16,000 km per year, a total of some 200 billion kilometres, or more than 1,000 times the distance between the Earth and the sun.

Because it is so tightly woven into the fabric of Canadian life, the car presents a special kind of environmental dilemma. On the one hand, there is the need to eliminate or reduce the environmental stresses associated with it. On the other, there is the desire to preserve the advantages it has given us. Reconciling these objectives presents a considerable challenge.

As Figure 1 shows, the automobile is part of a complex web of interactions. To determine its place in a sustainable environment, we must examine its impacts and devise solutions that effectively respond to this entire range of interactions.

Figure 1: The automobile and sustainability



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Environmental Implications of the Automobile (continued)

The Car and the Economy

In Canada, the demand for automobiles and associated products and services has stimulated activity in virtually every sector of the economy, contributing to a standard of living that is one of the highest in the world.

Workers on an automobile parts assembly line

With the economic boom that followed the Second World War, car ownership rose dramatically. More people could afford to live and work in widely separated areas, and low-density suburbs began to spring up at the edges of large cities and nearby towns. For the suburbanites, car ownership was not only a convenience but often a necessity.

More cars and expansive development increased the demand for motor vehicle infrastructure, such as roads, bridges, and parking lots. More service outlets, dealerships, gas stations, auto parts stores, and other car-related services became necessary. Motels, restaurants, and retail businesses along well-travelled routes also began to benefit. Both directly and indirectly, the automobile had become an important influence on Canada's economic activity, employment opportunities, and development patterns.

In general, the fortunes of the motor vehicle industry have been a good indicator of those of the economy as a whole. In good economic times, car production increases; in bad times, it declines (Fig. 2). And as the automobile industry goes, so go the many other industries, such as mining, manufacturing, and retail sales, that depend on it. In 1988, for example, the motor vehicle manufacturing industry used more than $30 billion worth of materials, indirectly stimulating demand in sectors such as energy and mineral resources (Statistics Canada, 1988a).

Between 1986 and 1990, about 1.9 million motor vehicles and $35 billion worth of motor vehicles and parts were produced each year (ISTC, 1991). The value of these goods was equal to over 6% of Canada's Gross Domestic Product and accounted for more than a quarter of the nation's exports (Statistics Canada, 1990b,1990f). In 1990, 572,000 people—roughly one out of every 20 working Canadians—were employed in jobs directly linked to motor vehicles. They earned approximately $16 billion in gross wages (Statistics Canada, 1990e).

Retail sales of motor vehicles, parts, and associated services make up the largest proportion of Canadian retail activity—35% in 1988 (Statistics Canada, 1988b). Hotel, restaurant, and other retail businesses associated with domestic automobile travel amounted to $9.1 billion, or 64% of domestic travel spending, in 1990 (Statistics Canada, 1990c).

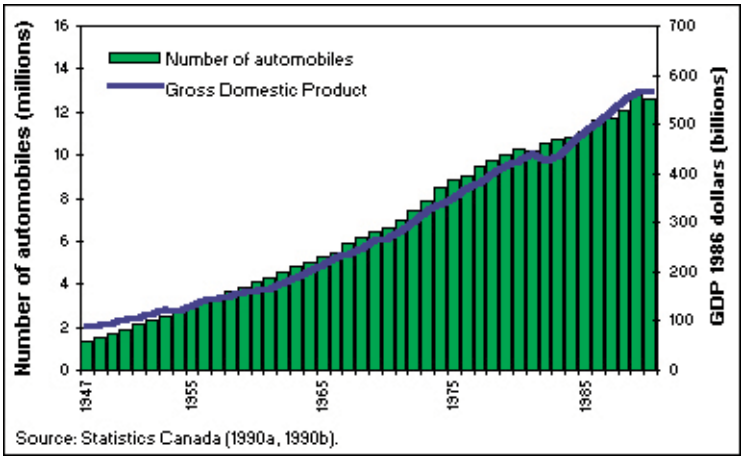

Figure 2: The relationship between number of automobiles and Gross Domestic Product

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Environmental Implications of the Automobile (continued)

The Car and the Environment

Most Canadians are aware of the high-profile environmental concerns associated with automobiles, such as the consumption of fossil fuels and the subsequent air pollution that accompanies their use. While these are legitimate concerns, a number of less obvious but equally significant environmental stresses occur during the car's life cycle. These impacts are related not only to its use but also to its manufacture, demand for infrastructure, and disposal. Understanding the full spectrum of these impacts is an important first step towards minimizing the negative environmental effects of the car.

Motor Vehicle Manufacture

The transformation of raw resources and energy into motor vehicles gives rise to a variety of environmental consequences. The most important of these are the depletion of nonrenewable resources (including metals and energy) and the environmental stresses associated with the production and use of these resources.

Use of nonrenewable materials. In 1989, the average motor vehicle weighed 1,428 kg, 77% of which was metal (Table 1). It can therefore be estimated that more than 2 billion kilograms of metal could be used in the manufacture of the 1.9 million motor vehicles produced each year in Canada. While much of this metal is recovered or recycled when the vehicle is taken out of service, it is neither cost-effective nor technologically possible to recover all of the metal used in motor vehicle manufacture. Furthermore, because the number of vehicles being produced is growing, more metal is needed for the manufacture of new vehicles than can be obtained from old ones. Consequently, some depletion of nonrenewable resources is inevitable.

In addition, the extraction, smelting, and refining of these metals can give rise to a number of other concerns, such as land disturbances, leaching of metals from mine tailings, acid mine and saline drainage, runoff of milling effluent containing toxic reagents used to extract minerals from the ore, and release of nitrogen oxides (NOx), volatile organic compounds (VOCs), sulphur dioxide (SO^2), carbon dioxide (CO^2), carbon monoxide (CO), particulates, and other pollutants (Government of Canada, 1991).

Material	Weight (kg)
Plain carbon steel	643.6
High-strength steel	106.4
Stainless steel	14.1
Other steel	21.4
Iron	208.6
Plastics/composites	102.0
Fluids/lubricants	81.6
Rubber	61.1
Aluminum	70.7
Glass	38.6
Copper	22.5
Zinc	9.1
Other materials	47.5
Total	1 427.7

Includes cars, vans, and station wagons.
Source: Government of Canada (1991).

Table 1: Weights and types of materials utilized in the construction of an average motor vehicle, 1989

Consumption of energy. As much as 20% of all the energy consumed throughout the life of a vehicle goes into its manufacture (Matsumoto, 1984). It has been estimated that between 66 and 105 gigajoules of energy are needed to produce a motor vehicle, depending on the proportion of recycled materials used. This is equivalent to the energy contained in between 2000 and 3100 L of gasoline, or the amount of fuel consumed by 16,000 to 26,000 km of driving. Production of the 1.9 million motor vehicles made in Canada in 1989 would thus have consumed between 1.8% and 2.9% of Canada's end-use energy demand, or the energy used by the final consumer (Tien et al., 1975; Government of Canada, 1991).

The environmental stresses that may result from using this energy depend on its source. Fossil fuels, for example, emit SO^2, CO^2, NOx, CO, and particulates, while nuclear power plants generate toxic radioactive wastes, which are often difficult to dispose of. Hydroelectric energy may cause ecological disruption through flooding. Regardless of origin, electric power requires the construction and maintenance of transmission lines and associated rights-of-way.

Infrastructure and Land Use

The infrastructure required by the increasing numbers of vehicles on Canada's roads today can be linked to a variety of environmental effects, including the occupation of productive land and the alteration of ecosystems.

(continued)

Environmental Implications of the Automobile (continued)

Overall, there are about 879,000 km of highways in Canada (Statistics Canada, 1991). In urban areas, up to 42% of the land in downtown cores and 18% of the land in greater metropolitan areas may be occupied by motor vehicle infrastructure, including roads, rights-of-way, bridges, garages, retail outlets, and parking lots (Simpson-Lewis et al., 1979). In Toronto, 2% of the city's area is devoted specifically to parking (Macpherson, 1988).

Much of this land was once prime agricultural land. Urban development patterns, while beginning to change, are still often characterized by the demand for low population density suburbs and are based on the assumption that cars will be the primary mode of transportation. As most of Canada's largest urban centres—the Windsor–Quebec City corridor, for example, or British Columbia's Lower Fraser Valley—have typically developed in productive agricultural areas, motor vehicle infrastructure usually consumes some of the country's best farmland. The most recent data available show that, between 1981 and 1986, 55,200 ha of rural land near 70 Canadian cities was urbanized. Of this, 59% was prime agricultural land (Government of Canada, 1991).

Roads and supporting services for vehicles affect the environment in numerous other ways as well. Road salt, leaked motor oil, and particulate emissions, for example, wash off road surfaces and concentrate in ditches and storm sewers. The extent of the contamination of water and land by these routes has not yet been determined. In addition, highway construction may alter traditional drainage patterns, and soil erosion and landslides may occur more frequently around roads and bridges. Roads may also divide otherwise undisturbed lands, interfering with the movements of wildlife and altering habitats.

The Demand for Fossil Fuels

In 1990, transportation accounted for 29% of Canada's end-use energy demand. Retail sales of gasoline for motor vehicles accounted for 54% of this, or 16% of end-use energy demand (Statistics Canada, 1990d). Although fuel consumption per vehicle has declined in recent years, a number of concerns remain. These include dependence on a nonrenewable energy source, the environmental damage that accompanies the exploration, extraction, refining, storage, delivery, and disposal of fossil fuels, and the pollution produced by combustion.

Consumption of energy resources. In 1988, the average personal-use passenger car was driven 6% farther but consumed 22% less fuel than its 1980 counterpart. The average fuel consumption of all in-use automobiles decreased from 16.5 to 12.0 L/100 km between 1980 and 1988 (Statistics Canada, 1991). For new cars, the average consumption decreased from 10.2 to 8.1 L/100 km over the same period (Transport Canada, 1991). Reduced engine size and vehicle weight have both contributed to improved fuel efficiency.

Energy production and delivery. About 35% of the crude oil that enters Canadian refineries is turned into motor gasoline. The processing and handling of these substances can result in such environmentally damaging events as oil and gas spills. Between 1985 and 1990, an average of 7.9 million litres of motor gasoline and 16.2 million litres of crude oil per year were reported to have been spilled in Canada during extraction, transportation, refining, storage, and delivery (NATES, 1992). It is suspected that unreported events, such as the dumping of contaminated ballast from tankers and runoff from roads and sewers, may release even greater amounts (OECD, 1991). Furthermore, leaking gasoline from underground storage tanks has recently begun to emerge as a significant contributor to the contamination of soil and water. A single litre of gasoline can make up to 1 million litres of water unfit for human consumption (Kruss et al., 1991).

In 1987, crude oil refineries collectively discharged, on a daily basis, 1,080 kg of oil and grease, 4,039 kg of suspended solids, 77 kg of phenols, 21 kg of sulphide, and 726 kg of ammonia nitrogen. However, a general downward trend in refinery discharges has been apparent. Between 1972 and 1987, discharges of oil and grease were reduced by 87%, suspended solids by 81%, phenols by 96%, sulphides by 99.5%, and ammonia nitrogen by 93%. In 1987, refineries were, on average, in compliance with monthly emission standards 94% of the time and with daily standards more than 99% of the time (Losier, 1990).

VOCs, which contribute to the formation of ground-level ozone, are commonly released into the air when gasoline is transferred between facilities and vehicles are refuelled. In 1985, these processes contributed an estimated 6% of the human-released VOCs in Canada (Government of Canada, 1991).

(continued)

Environmental Implications of the Automobile (continued)

Fossil fuel combustion. Emissions from fossil fuel combustion can lead to a number of environmental and human health problems (Table 2). In the past 20 years, factors such as improved fuel efficiency, the increased use of emission control devices, and stricter new car emission control standards have contributed to a decline in per-vehicle emissions of some common pollutants. A new car today emits only 24% of the NOx, 4% of the VOCs, and 4% of the CO of a new car in the early 1970s (Motor Vehicle Manufacturers' Association 1991). Between 1985 and 1990, total emissions of NOx from automobiles decreased from 352,000 to 248,283 t, VOC emissions decreased from 412,700 to 340,838 t, and CO emissions decreased from 4.0 to 2.7 million tonnes (Kosteltz and Deslauriers, 1990; Environment Canada, Pollution Data Analysis Division, unpublished data).

Reduced automobile emissions may be contributing to improved urban air quality in some Canadian cities. For example, in Vancouver, Calgary, Toronto, Ottawa, Montreal, and Quebec City, where cars are a major influence on air quality, indicators such as ambient NO^2 and CO decreased by an average of 8.6% and 33%, respectively, between 1980 and 1990 (T. Furmanczyk, personal communication).

Emission	Health impacts	Environmental impacts
Nitrogen oxides (NO_x) include nitric oxide (NO) and nitrogen dioxide (NO_z), which is formed from the oxidation of NO.	• NO_2 is a lung irritant at high concentrations. • NO_2 may lead to depression of the immune system, with children and the elderly being at risk.	• NO_2 reacts with water to form nitrate (NO_3^-) a source of acid rain. • $N0_2$ contributes to the formation of ground-level ozone. • NO_2 is associated with suppressed vegetation growth. • $N0_2$ contributes to the corrosion of metals and degradation of textiles, rubber, and polyurethane.
Carbon monoxide (CO) is a gas produced through the incomplete combustion of organic materials.	• CO reduces the ability of the blood to carry oxygen, with smokers, persons with heart disease, and those with anemia being especially sensitive.	• CO may contribute to the formation of ground-level ozone by depleting the atmosphere's supply of hydroxyl radical (OH^-).
Carbon dioxide (CO_2) is released by the combustion or decay of organic material.		• CO_2 is an important greenhouse gas, contributing to global warming.
Volatile organic compounds (VOCs) are a chemically diverse group of compounds that have at least one carbon atom and are highly volatile.	• Many individual VOCs (e.g., benzene) are known to have or are suspected of having human health effects ranging from carcinogenicity to neurotoxicity.	• VOCs contribute to the formation of ground-level ozone.
Ozone (O_3) is formed from the reaction of NOx, VOCs, and sunlight.	• Exposure to O_3 is associated with changes in lung function, decreased immune function, and possibly the development of chronic lung disease.	• O_3 reduces agricultural productivity and the growth rate of trees. • Ground-level ozone is a global warming agent.

Source: Modified from Healthy City Office (1991)

Table 2: Major impacts of common pollutants associated with automobile use on human health and the environment

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Environmental Implications of the Automobile (continued)

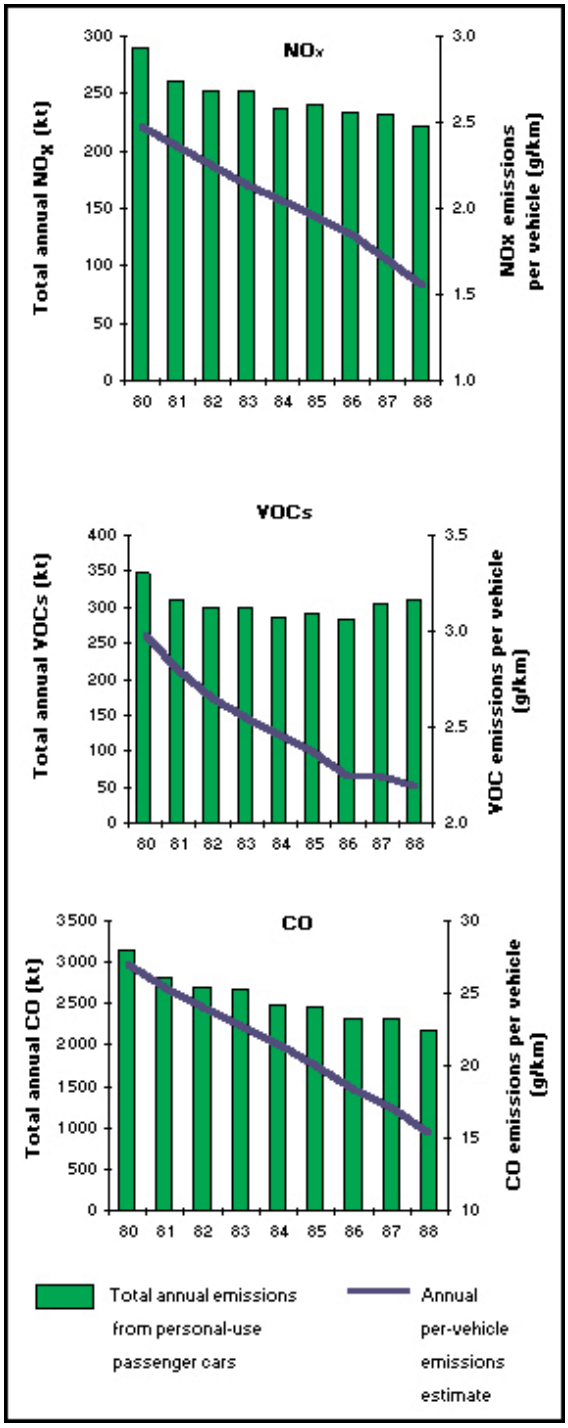

Figure 3: Total annual and per-vehicle emissions of NOx, VOCs, and CO from personal-use passenger cars, 1980–88

In spite of these improvements, the automobile remains a major source of some pollutants. A 1985 survey of national air emissions showed that gasoline-powered cars contributed 18.7% of total NOx emissions, 22.9% of total VOC emissions, and 37.1% of total CO emissions (Kosteltz and Deslauriers, 1990). Although emissions of these pollutants from the average personal-use passenger car decreased between 1980 and 1988, the total number of kilometres driven increased. As a result, the reduction in overall emissions was less dramatic than might have been expected (Fig. 3).

The occurrence of ground-level ozone, a product of the interaction of NOx, VOCs, and sunlight, should also be decreasing. However, because of the increased number of vehicles on the road, emissions of NOx and VOCs still lead to concerns about ground-level ozone, especially in urban centres where automobile use is concentrated. The Lower Fraser Valley, the Windsor–Quebec City corridor, and the Southern Atlantic Region have been identified as problem areas, as they exceed Canada's maximum acceptable ground-level ozone objectives most frequently (Hilborn and Still, 1990).

Canadian emissions of CO_2, which contribute to increasing CO_2 levels internationally and concerns of global warming, have decreased on a per-vehicle basis in recent years as average fuel efficiencies have improved. Nevertheless, between 1987 and 1990, total CO_2 emissions from automobiles rose slightly, from 48.4 to 49.0 million tonnes, as a result of the increase in vehicle numbers and use. In 1990, automobiles continued to be among the most important sources of CO_2 in Canada, accounting for almost 11% of our total emissions (Jaques, 1992).

Disposal. Large amounts of waste motor oil, containing a diversity of contaminants ranging from PCBs to metals, enter the environment because of improper disposal. Of the estimated 230 million litres of waste motor oil generated by motor vehicles in 1990, approximately 50% was rerefined and 34% was used as fuel to power incinerators and furnaces. The remaining 16%—over 36 million litres—is believed to have been disposed of in ways that allow environmental contamination, including dumping in landfills and sewers and use as a dust suppressant (Environment Canada, Office of Waste Management, unpublished data).

(continued)

Environmental Implications of the Automobile (continued)

Driving and Maintenance Habits

Technical improvements in fuel efficiency and emission controls can be offset by the driving and maintenance habits of automobile owners. A Vancouver study, for example, showed that passenger cars made up 98.4% of downtown rush-hour traffic but carried only 62.6% of the commuters (B.C. Transit, 1990)—an inefficient use of transportation energy when compared with the use of public transit vehicles (Table 3). In addition, traffic congestion reduces fuel efficiency and increases pollution, as engines not running at maximum efficiency tend to consume more fuel and release proportionately more emissions. It has been estimated that a 16-km trip taken in light traffic and requiring 11 minutes would produce 2 g of VOCs; the same trip in heavy traffic and requiring 30 minutes would generate 7 g—a 250% increase (Go Green, 1990).

Transportation mode	Fuel or electricity use (L/100 km)	Number of commuters	Energy use (MJ/person-km)
Automobile	15	1	4.74
		6	0.79
	10	1	3.16
		4	0.79
	7	1	2.21
		4	0.55
Van	20	15	0.42
	10	7	0.45
Diesel bus	56	40	0.52
Subway	2.61 kwh/km	75 (per car)	0.13
GO Rail	761	810	0.35

MJ = megajoule
Source: Modified from Healthy City Office (1991).

Table 3: A comparison of energy use by transportation mode

Car maintenance also influences fuel efficiency and emissions. New vehicle emission standards for NOx, VOCs, and CO assume a properly maintained vehicle. Unfortunately, many vehicles do not receive regular maintenance or may no longer have functioning emission control devices. Inadequate maintenance may result in emission levels 2–10 times higher, per car, than might be expected (B.C. Ministry of Solicitor General, 1991). As a result, a relatively small number of vehicles may account for an unusually large proportion of emissions. One recent study suggested that nearly 50% of total emissions may be produced by only about 10% of all vehicles—mostly those that are older and poorly maintained (Ontario Round Table on Environment and Economy, 1991).

Vehicle emissions may often be lowered by simple repairs, such as replacing the air filter or spark plugs, resetting the engine timing, or adjusting the carburetor, measures that may also increase fuel efficiency and improve driving performance.

Automobile Air Conditioners

Approximately 60% of the cars and light-duty trucks sold in Canada are equipped with air conditioners that contain chlorofluorocarbons, or CFCs, which contribute to stratospheric ozone depletion and global warming. Even well-maintained motor vehicle air conditioners leak CFCs during their normal functioning, and additional CFCs are usually released when air conditioners are serviced. Furthermore, old air conditioners release whatever CFCs they still contain when crushed at auto wreckers. In 1991, motor vehicles accounted for 23% of Canada's CFC consumption (Environment Canada, Commercial Chemicals Branch, unpublished data).

Disposal

Once automobiles, or any of their components, wear out, the issue of their disposal must be contended with. A great deal of material goes into the manufacture of a car, making discarded vehicles and components a significant source of metals, plastics, and rubber. Although some materials in scrapped cars are recycled, the disposal of others presents problems.

The disposal of tires illustrates the challenge. An estimated 19.5 million vehicle tires are discarded every year in Canada, about 13 million of which come from passenger vehicles (CCME, 1990). However, no process exists for converting old tires into materials suitable for manufacturing new tires, in the way that new metal products, for example, can be made from old.

At present, 62% of discarded tires are landfilled, 18% are recycled or retreaded, 6% are burned in an environmentally acceptable manner as a fuel source, and the remaining 14% are stockpiled (CCME, 1990). Although landfilling may not be a desirable method of disposal, stockpiling presents risks such as fires, the emissions from which contaminate adjacent air, land, and water. Such an event occurred in 1990, when 11.5 million discarded tires caught fire at a stockpile site near Hagersville, Ontario.

(continued)

Environmental Implications of the Automobile (continued)

New technologies may lead to uses for discarded tires and change their status from waste to resource. Researchers are now exploring the incorporation of rubber from waste tires into plastics and asphalt. However, considerably more research will be needed before such uses will be accepted as operationally, economically, and environmentally feasible.

Burning tires at Hagersville

Meeting the Challenge

A number of initiatives in Canada are aimed at addressing the multitude of environmental challenges presented by the automobile. Collectively, and in the long term, these actions will help to reduce the amount of environmental stress associated with automobiles.

Manufacturing

Manufacturing is a much cleaner process than it was a few decades ago, but many improvements can still be made through improved operating procedures, use of lower-risk materials, new technologies, emission controls, waste minimization, and energy conservation. The Canadian Motor Vehicle Manufacturers' Association, in co-operation with the Ontario and federal governments, now has a major program—the Automotive Pollution Prevention Program—to develop and implement strategies for pollution reduction in the industry. As a component of the Great Lakes Pollution Prevention Initiative, the program's first activities will focus on reducing the use and release of toxic substances in manufacturing.

Recycling

About 75% of the materials in scrap vehicles can be recycled (Siuru, 1991). In fact, automobile recycling already contributes significantly to national production levels of some materials. The salvage of platinum from old catalytic converters, for instance, accounts for one-third of domestic platinum production. In addition to extending the life span of nonrenewable resources, metal recycling requires 50–74% less energy for production and releases 86% less air pollutants, 76% less water contaminants, and 97% less solid waste than metal production from ores (Government of Canada, 1991).

Most metallic components, such as engine blocks, starting motors, and generators, can be and are reused or recycled, but nonmetallic items, such as plastics, fluids, and rubber, are more difficult to contend with. Car manufacturers are now intensifying their research on recycling, and especially on ways of dealing with nonmetallic components. In North America, one of the most recent initiatives has been the formation of the Vehicle Recycling Partnership to coordinate the research activities of the major automobile manufacturers and to establish recycling guidelines.

An important concept that has been receiving increasing attention is "design for recycling." The idea is that recyclability should be designed into the car from the beginning by selecting materials that can be recycled and by making the car easier to dismantle. Many manufacturers, for example, now label plastic components with standard codes to make it easier to sort them by chemical composition when they are recycled.

To encourage the recycling of certain other components, some provinces place a fee on their purchase. A few, for example, charge tire fees, with the objective of funding research into environmentally acceptable methods of disposal. In British Columbia, a similar system has been set up to facilitate the collection and recycling of lead-acid batteries, thus preventing them from being landfilled or burned. Such fees can help to reduce the landfilling of waste, particularly toxic items such as batteries.

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Environmental Implications of the Automobile (continued)

Inspection and Maintenance Programs

Inspection and maintenance programs are aimed at reducing in-use vehicle emissions and are designed to detect vehicles with excessive emission levels. The Greater Vancouver Regional District's program, possibly the most comprehensive in North America, consists of an annual visual inspection of emission control devices and the measurement of tailpipe emissions. Owners are charged a fee for the inspection, and those whose vehicles do not meet the standards are required to restore them to proper operating condition before being issued registration or re-registration documents. Inspection and maintenance programs are in place or being planned for other regions of Canada.

Employer-Sponsored Initiatives

Some employers have taken steps to reduce the dependence of their employees on automobiles. These include flexible schedules that allow employees to commute during off-peak times or to work longer hours per day but fewer days per week; telecommuting, or communicating with work by phone, fax, or computer, which allows some employees to work out of their homes on a full- or a part-time basis; subsidized parking for employees who carpool, to encourage groups of employees to coordinate their commuting; and satellite offices that enable some employees to work closer to home and reduce commuting distances.

Alternative Transportation Modes

Transportation mode	NOx	VOCs	CO
Light rail	43.0	0.2	2.0
Transit bus	95.0	12.0	189.0
Van pool	24.0	22.0	150.0
Car pool	43.0	43.0	311.0
Single-occupant car	128.0	130.0	934.0

Source: Modified from Lowe (1990).

Table 4: A comparison of emissions by transportation mode (g/person-100 km)

In areas of high population density, a shift to alternative transit modes can be encouraged by controlling access by cars, improving public transit systems, improving interfaces between cars and public transit (for example, park and ride), and creating and improving facilities for walking and cycling. In low-density suburban developments, where public transit is less practical, car- or van-commuting schemes may be more efficient (Reid, 1986). As well as using less energy, alternative modes of transit produce lower emission levels per passenger (Table 4).

Reduction to Accidentally Released VOCs

The Canadian petroleum industry has installed equipment in the Vancouver and Toronto areas to recover releases of VOCs that occur during the transfer of gasoline between facilities (CPPI, 1991a). In addition, refineries decreased the amount of butane added to summer gasolines in Canada in 1991 to reduce their volatility and thus minimize VOC releases during refuelling and transfer (CPPI, 1991b).

CFC Replacement in Air Conditioners

As part of Canada's commitment to phase out CFCs, automobile manufacturers will replace CFC-12 in air conditioners with hydrofluorocarbons (HFCs) and hydrochlorofluorocarbons (HCFCs) by the year 2000. HCFCs have considerably less stratospheric ozone-depleting potential than CFCs, while HFCs have virtually no capacity to deplete stratospheric ozone. Both groups of compounds appear to have significantly less impact on global warming than CFC-12. Some automobile manufacturers will voluntarily begin to use HFCs and HCFCs as soon as 1993 but will continue to service vehicles containing CFC-12 until the end of the century. Some also plan to install recycling equipment in authorized service centres to reduce CFC-12 losses during servicing.

New Emission Standards

Automobile manufacturers have voluntarily agreed to introduce, in Canada, vehicles that meet the stringent exhaust emission standards being progressively introduced in the United States beginning in 1994. These vehicles will emit 60% less NOx and 29% less VOCs than are currently allowed. The government is developing comprehensive emission control regulations to be effective in the 1996 time frame.

Alternative Fuels

Currently available alternatives to gasoline include propane, natural gas, methanol, ethanol, and oxygenated gasolines (varying mixtures of gasoline and alcohol) such as M85, which is 85% methanol and 15% gasoline. These fuels burn more efficiently than gasoline and thus emit fewer pollutants. Furthermore, ethanol and methanol can be produced from biomass

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Environmental Implications of the Automobile (continued)

and are therefore renewable. Domestic automobile manufacturers have recently begun to introduce flexible-fuel vehicles that can run on conventional fuel as well as M85 or ethanol.

Electric vehicles or those powered by hydrogen cells may provide a renewable and even cleaner generation of alternatives to gasoline. In fact, with the development of more efficient batteries, some car makers are now preparing to introduce electric cars to the market. Hydrogen fuels are still in the experimental stages and will require additional research before becoming available to consumers.

The Car and a Sustainable Environment

How can we ensure that the automobile is compatible with a sustainable environment? Certainly there is no simple answer. Cars are likely to be a permanent fixture of industrialized and semi-industrialized societies for some time to come.

Nor can we rely exclusively on technology to put the issue to rest. Technological improvements over the last 20 years have already done much to reduce the environmental impact of the individual car, and further improvements can be expected in coming years. But much of the ground gained through technological improvements is being lost as more and more cars crowd the roads. To offset the effect of growing numbers, we shall have to look to other solutions—urban planning initiatives, economic strategies, and education—to lessen our dependence on the automobile. Eventually, these solutions could give us a more varied choice of transportation options in which the car plays a more efficient role.

Whatever the solutions we choose, they must work within an international as well as a national context. Nothing is accomplished if some of the problems, such as those associated with manufacture or disposal, are simply transferred from one country to another, thus solving problems at home but passing on challenges to global neighbours.

With continuing population growth and rising standards of living, the demand for car ownership will continue to increase. Because of that, we are unlikely to find an ultimate solution to the environmental problems associated with the automobile. Instead, we shall always have to confront the task of balancing the demand for cars with our need for a sustainable environment. That means that the issue must constantly be readdressed, with new solutions devised and old solutions reworked as conditions change.

Above all, we have to recognize the complexity of the many issues surrounding the car and look for solutions on a multitude of fronts—technological, social, economic, political, and ecological. Such a holistic approach is our best chance for preserving the benefits of the car while keeping its environmental effects within the limits of sustainability.

1. In this fact sheet, the term “automobiles” is used synonymously with “passenger cars,” a group that includes both personal-use passenger cars and fleet vehicles. In contrast, “motor vehicles” is defined to include both passenger cars and light-duty trucks and vans.

Overhead—Environmental Implications of the Automobile

Environmental Implications of the Automobile (SOE Fact Sheet No. 93-1)

Outline

Introduction

The Car and the Economy

The Car and the Environment

Motor Vehicle Manufacture

- Use of non-renewable materials
- Consumption of energy

Infrastructure and Land Use

The Demand for Fossil Fuels

- Consumption of energy resources
- Energy production and delivery
- Fossil fuel combustion
- Disposal

Driving and Maintenance Habits

Automobile Air Conditioners

Disposal

Meeting the Challenge

Manufacturing

Recycling

Inspection and Maintenance Programs

Employee-Sponsored Initiatives

Alternative Transportation Modes

Reduction of Accidentally Released VOCs

CCF Replacement in Air Conditioners

New Emission Standards

Alternative Fuels

The Car and a Sustainable Environment

These graphics, figures, and charts accompany the article.

Graphic: Highway in an urban area at night

Figure 1: The automobile and sustainability

Graphic: Workers on an assembly line

Figure 2: The relationship between number of automobiles and Gross Domestic Product

Table 1: Weights and types of materials utilized in the construction of an average motor vehicle, 1989

Table 2: Major impacts of common pollutants associated with automobile use on human health and the environment

Figure 3: Total annual and per-vehicle emissions of NOx, VOCs, and CO from personal-use passenger cars, 1980-88

Table 3: A comparison of energy use by transportation mode

Graphic: Burning tires at Hagersville (a town)

Table 4: A comparison of emissions by transportation mode (q/person-100 km)

Fuel Economy Questions

In Canada, a car or truck's fuel economy is measured in litres per 100 kilometres (L/100 km). For example, a car's fuel economy rating may be 8.7 L/100 km. This means that, on average, the car burns 8.7 litres of fuel to travel 100 kilometres. By doing the following problems you will gain a better understanding of fuel economy.

1. Rank the following fuel economy ratings from best (most fuel efficient) to worst (least fuel efficient). Use the numbers from 1 to 5 to rank them—1 is the best, 5 is the worst.

   Your ranking (best to worst);

   12.6 L/100 km _____

   6.2 L/100 km _____

   9.5 L/100 km _____

   7.3 L/100 km _____

   10.7 L/100 km _____

2. A car has a fuel economy rating of 9.3 L/100 km.

   (a) How many litres of gasoline will be needed to travel:

   (i) 325 km?

   (ii) 750 km?

   (b) How many kilometres can this car travel on:

   (i) 45.7 L of fuel?

   (ii) 65.2 L of fuel?

   (c) The capacity of the fuel tank is 58.5 L. What is the cruising range of the car?

3. Find, correct to one decimal place, the fuel economy of:

   (a) a car that travels 450 km on 52.5 L of fuel.

   (b) a van that travels 415 km on 65.0 L of fuel.

   (c) a transport truck that travels 6000 km on 1482 L of fuel.

4. Two families drive to Florida for the March break. One family drives a car whose fuel economy rating is 7.3 L/100 km, and the other drives a car that is rated at 10.5 L/100 km. Each family travelled 5,200 km and the average cost for fuel was 45.7¢ per litre. Calculate the amount of fuel that each family used for the trip and also the cost for fuel for each family.

5. Suppose that you or your family drives a car whose fuel economy is 10.6 L/100 km. By having the engine tuned up you can improve the fuel economy to 8.9 L/100 km but the tune-up will cost $125. You drive an average of 20,000 km per year and fuel costs 58.9¢ per litre. Calculate the savings or the costs that will result over the next year by having the engine tuned up now.

(continued)

Fuel Economy Questions (continued)

6. Repeated tests show that the fuel economy of a car is 7.5 L/100 km for highway driving and 12.7 L/100 km for city driving. This car is to be taken on a vacation trip of 8,000 km that is 70% highway driving and the rest is city driving.
   (a) Calculate, correct to one decimal place, the expected overall fuel economy on this trip.
   (b) Use your answer to part (a) to compute the expected cost for fuel on this trip if the average cost per litre of fuel is 60.3¢.

7. Let's suppose that, on average, cars operate with a fuel efficiency of 9.3 L/100 km. Let's also suppose that we could increase the fuel efficiency of every vehicle to 7.3 L/100 km.
   (a) How many litres of fuel would be saved each year by a person who drives 20,000 km per year?
   (b) If there were 250,000 vehicles in a city, and each of them could burn that much less fuel, how many litres of fuel would be saved?
   (c) If the cost of fuel is 59.5¢ per litre, how much money would be saved?
   (d) Think of some worthwhile community projects that could be financed with this saved money.
   (e) There are over 12,000,000 vehicles in Canada. Perform calculations for Canada similar to those you did for the city in parts (b) and (c). Then suggest several worthwhile national projects that could be financed with the saved money.

8. Clearly there are financial advantages for the consumer to increasing the fuel efficiency of his or her car. Now try to think more globally (for example, think about society or the physical environment).
   (a) What are some other advantages to increasing the fuel economy of vehicles?
   (b) Suggest some ways that we could improve the fuel economy of our vehicles.
   (c) Do you see any disadvantages to increasing the fuel economy of vehicles? If so, what are they?

Air Pollution Questions

Emissions from vehicles and from industrial plants get mixed with the air that we breathe. Two of the more common pollutants in the air are nitrogen dioxide and sulphur dioxide. The rain dissolves these and other substances and they come back to the earth in the form of "acid rain." This rain falls everywhere and causes environmental damage.

To help prevent this, cars and factories have devices which "scrub" their exhaust. These scrubbers remove some of the pollutants from the exhaust before they can enter the atmosphere and produce acid rain.

The concentration of pollutants in exhaust is measured in parts per million (ppm).

Doing the questions that follow will help you to increase your understanding of the mathematics of cleaner air.

1. A scrubber unit installed in a factory removes half of the pollutants each time the exhaust gas passes through it. Untreated exhaust contains 2,000 ppm of contaminants.

   (a) Complete the table of values below which show values of

   n - number of times the exhaust gas passes through the scrubber

   c - the concentration in ppm of contaminants that remain in the exhaust gas

n	1	2	3	4	5	6
c						

   (b) Plot the ordered pairs from the table of values in part (a). Number of times breathed on an x axis and concentration in ppm on a y axis.

   (c) Could all of the contaminants in the exhaust gas be removed in this way? Explain.

2. A company installed a scrubber which removes one-third of the pollutants each time exhaust gas passes through it. Untreated exhaust contains 1,500 ppm of sulphur dioxide. In its annual report the company states that by passing exhaust gas through the scrubber three times, all of the sulphur dioxide will be removed. You believe this statement to be false. Write a short letter to the company which explains and corrects its error.

3. A scrubber removes two-thirds of the pollutants each time exhaust gas passes through it. Before treatment, the gas contains 1,200 ppm of contaminants.

   (a) What is the concentration of contaminants in the gas after it has passed through the scrubber 2 times?

   (b) After the gas has passed through the scrubber 2 times, what fraction of the contaminants has been removed and what fraction remains?

4. Before exhaust gas can be released into the air, it must contain less than 200 ppm of sulphur dioxide. If untreated exhaust contains 3,600 ppm of sulphur dioxide and if a scrubber can remove half of the pollutants each time the gas passes through it, how many times should the gas be treated before it is released?

5. A manufacturing plant passes its exhaust gas through three cleaning stations before it is released into the atmosphere. Station A removes three-quarters of the pollutants, station B removes one-third of the pollutants, and station C removes half of the pollutants.

   (a) What fraction of the pollutants will be removed after the gas passes through all three stations?

   (b) Does it matter in which order the gas passes through the three stations? Explain.

   (c) If untreated exhaust contains 4,500 ppm of pollutants, what will be the concentration of pollutants after the gas has been cleaned by all three stations?

   (d) A problem with station B is causing it to work at 50% efficiency. What percent of the pollutants will be emitted into the atmosphere after treatment by all three stations?

Greenhouse Gases: Background Information

Greenhouse gases are any gases that absorb infrared radiation and then emit that stored energy as heat. By trapping infrared radiation they contribute to warming of the atmosphere through a process known as the greenhouse effect.

1. **Water Vapour (H_2O)**

   Water vapour is the largest contributor to the greenhouse effect. The amount of water vapour in the atmosphere is determined primarily by the water cycle rather than by human activity. Water evaporates from the surface. Eventually this water condenses and returns to the surface as precipitation. Once global warming begins to occur the amount of water vapour becomes subject to a positive feedback effect. The warmer the air gets the more water vapour it can hold and the more evaporation will occur.

2. **Carbon Dioxide (CO_2)**

   Carbon dioxide is responsible for a majority (60%) of the anthropogenic greenhouse effect due to human activity. A small amount of carbon dioxide exists naturally in the atmosphere about 0.035% of all gases in the atmosphere. Humans also produce a lot of carbon dioxide. The United States produces the most on a per capita basis (over two tons per person annually). Visit the American Forests website if you want to know how much carbon dioxide you produce. To some extent the amount of carbon dioxide in the atmosphere is determined by the carbon cycle. The oceans and plants absorb some carbon dioxide, but human activity produces it faster than it can be absorbed. Carbon dioxide may last 50 to 200 years in the atmosphere before being "scrubbed out" through rainfall as weak carbonic acid.

   Sources

   - **Fossil Fuel combustion:** The burning of fossil fuels (coal, oil, and natural gas) is the largest single source of greenhouse gases from human activity. Coal produces the most carbon dioxide of all the fossil fuels.
   - **Deforestation:** Deforestation is the second largest source of greenhouse gases due to human activity. Destruction of the forests can release the carbon stored in trees if they are burned up. If trees are not replanted they cannot absorb carbon dioxide in the future.
   - **Cement manufacturing:** Carbon dioxide is produced during the manufacture of cement. When lime ($CaCO_3$), an ingredient in

(continued)

Greenhouse Gases: Background Information (continued)

cement, is heated carbon dioxide is released into the air.

3. **Methane (CH_4)**

   Methane, a hydrocarbon also known as natural gas, is used as a fuel in homes and industry.

   Sources

   - **Livestock:** Livestock produce methane through the process of "enteric fermentation" of food in their digestive tract, and through their manure. Cattle are the greatest source of methane through these processes, followed by swine.
   - **Agriculture:** The main source of methane in agriculture is flooded rice paddies where microorganisms and bacteria decompose anaerobically in the soil.
   - **Waste Dumps:** The anaerobic decomposition of wastes in land fills and dumps results in methane. Sometimes the methane is collected and used as a fuel.
   - **Coal Mining and Natural Gas Production:** Methane can leak when coal is mined. Sometimes it leaks or is deliberately vented during natural gas production.
   - **Wetlands:** The microorganisms and bacteria in wetlands create methane when they decompose anaerobically in the soil.

4. **Other Greenhouse Gases**

   - **Nitrous Oxide (N_2O):** This greenhouse gas enters the atmosphere from fertilizers used in agriculture, and from automobile exhaust.
   - **Chlorofluorocarbons (CFCs):** A very potent greenhouse gas. It is used as a propellant in aerosol cans, in creating foam plastics, coolant in refrigerators and air conditioners, as a solvent in cleaners, and as an ingredient in fire extinguisher materials. Because it destroys ozone, which is also a greenhouse gas, some of its contributions to the greenhouse effect are balanced out. Recently the levels of CFCs in the atmosphere have stabilized thanks to the Montreal Protocol of 1987 which restricts their use.
   - **Ozone (O_3):** This much publicized gas is known more for its ability to block harmful ultra-violet radiation than its ability to absorb infrared rays, but is nonetheless a greenhouse gas. The amount of ozone is declining in the upper atmosphere but is found in increasing amounts near the earth's

Focus Questions: Greenhouse Gases

Work together to answer the following questions in point form:

1. Define greenhouse gases.

2. Determine which gas is the largest contributor to the greenhouse effect. Explain how it contributes to a natural warming of Earth.

3. Identify the sources of $C0_2$ that contribute to the anthropogenic component of the greenhouse effect.

4. Suggest how livestock add to the greenhouse effect.

5. Contrast the contribution of CFCs to global warming to that of high atmosphere ozone loss.

6. Contrast the present concentration of greenhouse gases with the pre-industrial concentration. Hypothesize about why these specific changes have occurred.

Investigating the Carbon Dioxide Emissions of Automobiles

Background Information: (Summary) Today humans release around 5 billion tonnes of carbon to the atmosphere every year through fossil burning and cement manufacture. Approximately another 1.36 billion tonnes per year are released through land use changes such as deforestation. These releases result in another increase of atmospheric CO_2 about 1% per year. This increase is the most plausible explanation for the warming trend we have seen since the mid-19th century.

Problem: Ask students to hypothesize: Which type of vehicles are the biggest sources of CO_2 emissions? Is the amount of CO_2 they produce linked to certain characteristics of the vehicles, such as engine size, fuel consumption, or type of transmission (manual or automatic)? Record different hypotheses.

Hypothesis: Before doing the experiment, make an educated guess about the outcome.

Briefly explain the reasoning behind your hypothesis.

Investigating the Sources of Greenhouse Gases Observations:

1. **Determine and explain** whether the cars that emit the highest level of CO_2 have anything in common.

2. **Determine and explain** whether the cars that emit the lowest level of CO_2 have anything in common.

3. a. **Name** the type and year of automobile that emitted the highest level of CO_2 (of those you chose to investigate).

(continued)

Investigating the Carbon Dioxide Emissions of Automobiles (continued)

b. The lowest?

4. Verify whether the automobile with the largest engine displacement also has the greatest CO_2 emissions.

5. Describe your level of confidence in the accuracy of this data.

6. Suggest a better way, if there is one, to do this investigation.

7. List and explain our sources of experimental error (if any).

(continued)

Investigating the Carbon Dioxide Emissions of Automobiles (continued)

Conclusions:

Part A:

1. Was your hypothesis supported by this experiment? **Explain** why or why not.

2. **Suggest** ways that Canada can encourage people to drive less or use more efficient means of transportation as a way to reduce greenhouse gas emissions such as carbon dioxide.

Part B:

1. **Calculate** how many km your chosen car can go on 1ℓ of gasoline based on the data at <www.fueleconomy.org>.

2. **Given that** 10 kg of CO_2 are produced per 4ℓ of gasoline consumed, how many kg of CO_2 did your car produce from one tank of gas?

3. **Calculate** how many kg of CO_2 your car would produce in a year if you travel 300 kilometres per week.

(continued)

Investigating the Carbon Dioxide Emissions of Automobiles (continued)

5. **Given that** global warming is likely to be a reality over the next 200 years, human beings will have to make many changes in order to adapt to a warmer climate. However, this is nothing new. Over the course of history people have had to adapt to many different changes in their living environment. Keeping this in mind, agree or disagree with the following statement in a response of about 250 words: Given the adaptability of human beings, the estimated future troubles caused by the effects of global warming are overestimated.

Climate Change and Wildlife

Climate change caused by increasing emissions of greenhouse gases will affect the health and diversity of plants and animals in virtually every place on earth—and Canada's north is expected to be among the hardest hit.

Increases in surface temperatures, precipitation and the frequency of severe weather events, a rise in sea level and a decrease in sea-ice will cause many habitats to change ten times faster than they have since the last ice age.

These changes will force species to adapt or shift their ranges more quickly than they ever have in the past, or die off and be replaced by more adaptable species. Those at greatest risk of extinction are species that require different habitats at different stages of their lives, like amphibians, or that inhabit areas that are physically restricted, such as islands, isolated lakes, and mountain tops.

Hay River, south of Great Slave Lake, NT, Canada. Photo: Elaine Tucker

In keeping with predictions that changes will be greatest at high latitudes and altitudes, Canada's low Arctic tundra and Muskwa–Slave Lake boreal forests are among the most vulnerable regions in the world. Surface warming in the Arctic is expected to be significantly higher than in the rest of Canada and the world. The geographic ranges of plant and animal species are also expected to shift northward and upward in altitude, increasing competition with species already found in the area.

It is expected that the tundra will shrink by as much as two-thirds as other plant species move in to replace native vegetation. Most climate change scenarios suggest that the zone suitable for boreal forests could be displaced as much as 550 kilometres northward over the next century.

Moose caught on road between huge snow banks. Heavy snowfalls in Mount Pearl, NF, March 2001. Photo: Randy and Judy Boone.

Although milder winters could enhance the reproductive capacities of caribou and other species, heavy winter snows and the melting and freezing of snow cover could force them to expend more energy feeding or prevent them from reaching their food. Ice and snow layers may also trap carbon dioxide in the burrows of small mammals, and either poison them or force them to the surface.

Warmer temperatures could create other problems for animals by causing changes in the timing and extent of sea-ice cover. Polar bears in western Hudson Bay, which rely on sea-ice for hunting seals, will disappear from the region if predictions that the ice will melt completely by 2100 come true. Earlier breakup of freshwater ice on lakes and rivers in spring could affect migration patterns, and increase the likelihood of drowning.

Reductions in sea ice also mean reductions in the ice edge around open water. This important part of the marine ecosystem supports a large population of fish, which provide food for a variety of marine birds and mammals.

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Environment Canada: Climate Change and Wildlife (continued)

Warming makes ecosystems more vulnerable to disease, parasites and insects and other pests. The earlier emergence of mosquitoes in northern Hudson Bay has already resulted in the death of some incubating seabirds, and forced others to abandon their nests.

Coastal erosion, Prince Edward Island.

Although Arctic ecosystems are expected to be the hardest hit, more southern regions of Canada will also be affected. Fish on both coasts and in rivers, lakes and streams are expected to head further north. Changes in river and stream runoff, due to less snow pack, an earlier ice break-up, a stronger spring flow, and a reduced summer flow, will also greatly impact aquatic ecosystems.

Both the Atlantic and Pacific coasts will see a rise in sea level if global warming continues, resulting in an increase in coastal erosion and flooding, and a loss of coastal wetlands. Fire patterns are expected to change in most of Boreal Canada, affecting forestry practices and habitat available to wildlife. As temperatures increase, crops such as wheat can be grown farther north, causing further losses of wildlife habitat.

Despite projected increases in precipitation, scientists expect there will be a decrease in water availability in many southern regions of the country—particularly the prairies—due to increased evaporation caused by warming. This will further exacerbate water level problems in aquatic ecosystems such as wetlands and marshes, and may cause some to dry up completely.

Although there is no way to predict exactly how certain species will react to climate change, our global biodiversity will be altered irreversibly unless immediate steps to reduce national and international emissions of greenhouse gases are taken. Since the burning of fossil fuels is a primary source of the greenhouse gas carbon dioxide, individuals can take action to reduce climate change by cutting down on fuel consumption—at home, at work, and on the road.

Gapfill Reading: Why Do Some Species Become at Risk in Canada?

Instructions: Fill each gap with the best word from the Word List. Note that some words are used more than once in different forms.

The single most prevailing _____ responsible for the endangerment of species today is habitat loss and degradation. In fact, about 60 _____ of species that the Committee on the _____ of Endangered Wildlife in Canada (COSEWIC) _____ as being at risk are _____ by habitat problems. If a species cannot find suitable conditions in which to live, it simply will not _____.

As the human population grows, development increases and spreads over the landscape to satisfy human wants and needs. The _____ of houses, buildings, and roads; logging of vast tracts of forest for paper and building materials; mineral _____ and _____ of wild habitats into agriculturally productive fields all mean that habitat for wild species shrinks. And when habitat shrinks, species are squeezed out.

A habitat does not have to be totally destroyed to make it unsuitable for some species. The mere presence of people and associated disturbance can cause some species to _____ certain habitat or prevent them from breeding successfully.

And human presence _____ species in many other ways as well. _____ on roads are particularly dangerous to some snakes that like to bask on the warm pavement and to some birds that tend to feed near roadways. The lights from _____ and from street lights and buildings have been shown to seriously _____some moth populations. Control of water flow in rivers, usually for the _____ of electricity, changes conditions downstream, often rendering these water bodies unsuitable for certain species, or _____ their ability to travel to parts of the system they need for feeding or to reproduce. The building of dams or tilling of soil near rivers and streams causes siltation and increases water turbidity, _____ responsible in the _____ of some fish and mollusc populations.

Word List:

abandon

affect

affected

affects

construction

conversion

decline

extraction

factor

factors

file

generation

identified

percent

restricts

status

survive

vehicle

vehicles

Gapfill Reading: Why Do Some Species Become at Risk in Canada? (Answer Key)

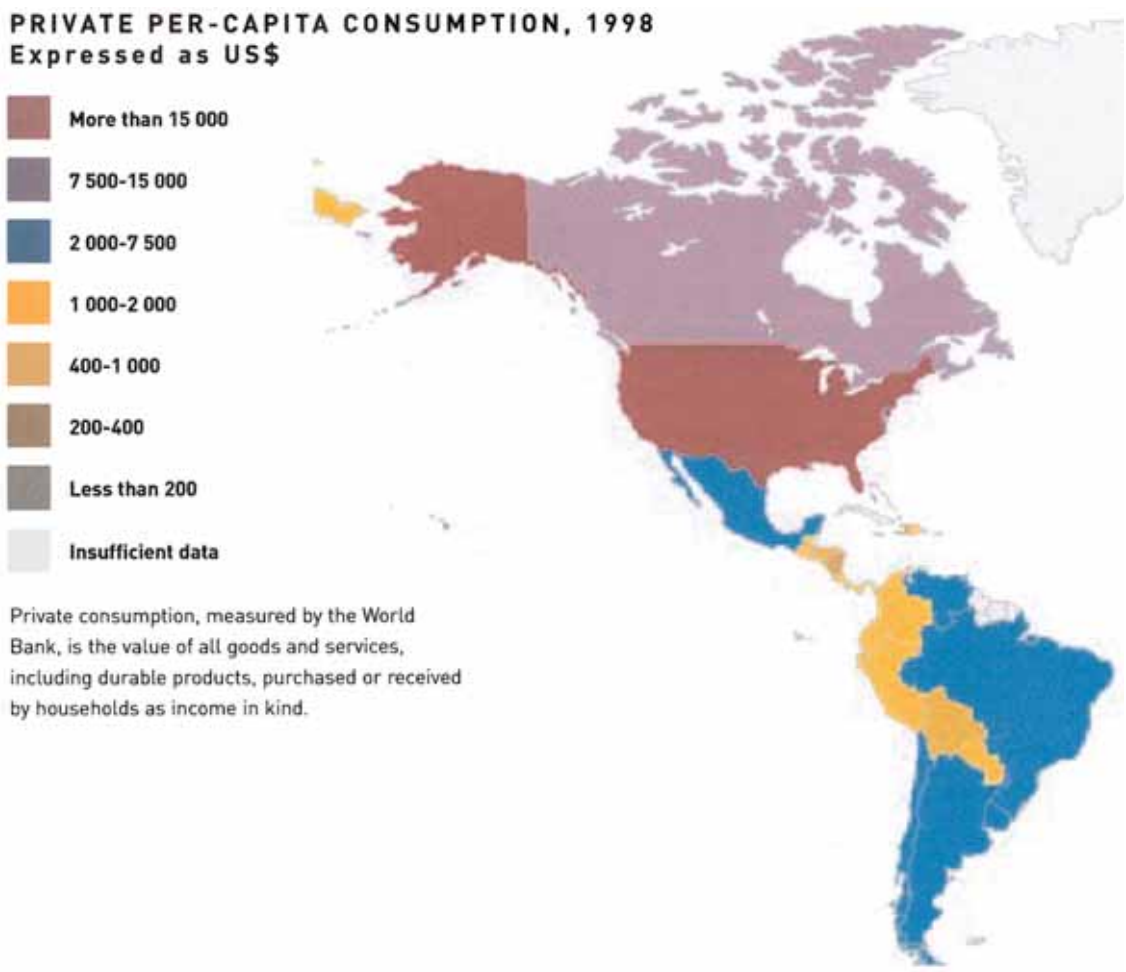
The single most prevailing **factor** responsible for the endangerment of species today is habitat loss and degradation. In fact, about 60 **percent** of species that the Committee on the **Status** of Endangered Wildlife in Canada (COSEWIC) **identified** as being at risk are **affected** by habitat problems. If a species cannot find suitable conditions in which to live, it simply will not **survive**.

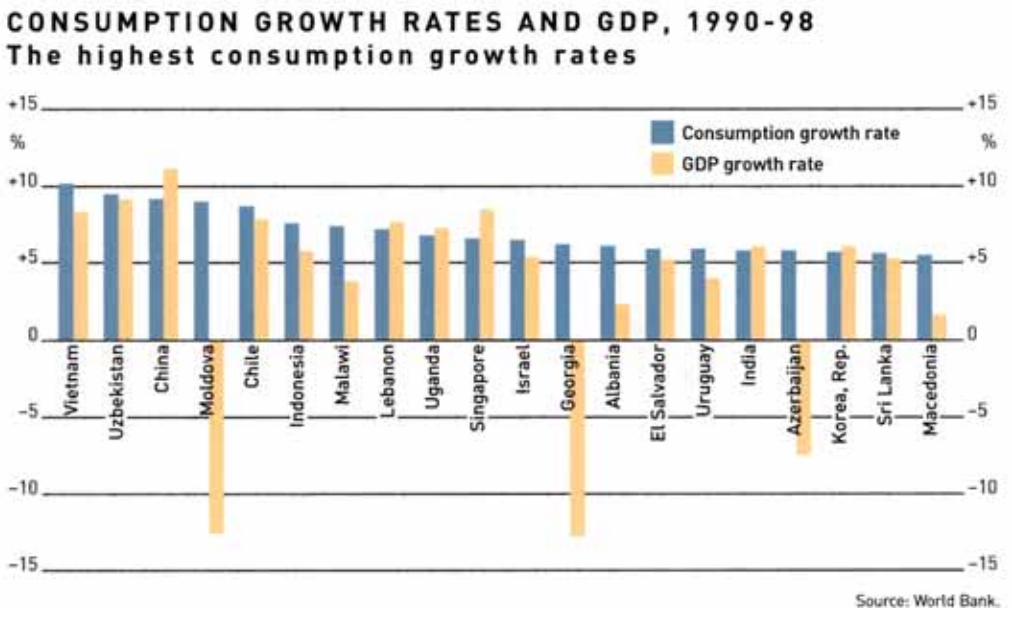
As the human population grows, development increases and spreads over the landscape to satisfy human wants and needs. The **construction** of houses, buildings, and roads; logging of vast tracts of forest for paper and building materials; mineral **extraction**; and **conversion** of wild habitats into agriculturally productive fields all mean that habitat for wild species shrinks. And when habitat shrinks, species are squeezed out.

A habitat does not have to be totally destroyed to make it unsuitable for some species. The mere presence of people and associated disturbance can cause some species to **abandon** certain habitat or prevent them from breeding successfully.

And human presence **affects** species in many other ways as well. **Vehicles** on roads are particularly dangerous to some snakes that like to bask on the warm pavement and to some birds that tend to feed near roadways. The lights from **vehicles** and from street lights and buildings have been shown to seriously **affect** some moth populations. Control of water flow in rivers, usually for the **generation** of electricity, changes conditions downstream, often rendering these water bodies unsuitable for certain species, or **restricts** their ability to travel to parts of the system they need for feeding or to reproduce. The building of dams or tilling of soil near rivers and streams causes siltation and increases water turbidity, **factors** responsible in the **decline** of some fish and mollusc populations.

Consumption Charts





Natural resources and wastes

POPULATION, consumption and technology impact on the environment by way of two major types of human activity. First, we use resources. We occupy or pre-empt the use of space, and so modify or remove entirely the habitats of many wild species. We extract resources – growing food, catching fish, mining minerals, pumping groundwater or oil. This affects the stock of resources available for humans and for other species in the future.

Resources fall into two main categories. Renewable resources like water or fish are replenished naturally. Non-renewable resources like oil or iron ore have a limited stock that is not replenished, except on geological timescales of millions of years.

Second, we dump wastes – not just those that consumers throw away, but all the waste solids, liquids and gases that are generated from raw material to final product. These affect the state of land, groundwater, rivers, oceans, atmosphere and climate.

Resources have traditionally been the main focus of concern about the impact of population and consumption on the environment. Frequent warnings were issued that we faced massive famines, or that we would "run out" of essential fuels and minerals. More recently it has become apparent that more serious, more immediate and more intractable problems lie in the global threats that derive from our wastes.

NON-RENEWABLE RESOURCES

Ultimately, all non-renewable resources on Earth are limited: if used constantly they must sooner or later run out. So far, however, the threatened exhaustion of non-renewable resources has not happened, thanks to market mechanisms which have ensured successful adaptation.

When shortages of any mineral resource begin to be felt, prices rise. This stimulates more exploration and research, and makes it economical to develop more expensive technology, and to exploit reserves that are more costly to work. Manufacturers find ways of making do with less, recycling increases, and cheaper substitutes are found.

Due to these mechanisms, the projected lifespan of many minerals has remained more or less level or in some cases grown with time, despite dramatic increases in use. In 1989, for example, recoverable reserves of oil and natural gas liquids were enough to cover 41 years of production at current rates. Nine years later they were enough to cover 43 years. Recoverable reserves of natural gas were enough to cover only 23 years of production in 1989; by 1998 this had grown to 57 years. Recoverable reserves of coal did fall, but were still sufficient for more than two centuries of production[1].

Prices are a good indication of impending shortage, and the prices of minerals have declined in real terms over the past four decades. In constant prices, between 1980 and 1996 the price of metals and minerals fell by an average 41 percent, while that of oil fell by 65 percent[2].

Of course, this conjuring trick cannot go on forever. But in modern times the human race has not run into shortages of any key non-renewable resource that has actually constrained the end use to which that resource was put. The mechanism of adaptation, based on free markets, resourceful

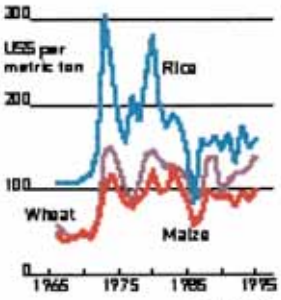
(continued)

Natural Resources and Wastes (continued)

companies, continual research and canny consumers, has worked very well in this sphere, and there is no strong reason to believe it will not continue to do so.

This is not to say that our use of non-renewable resources is problem-free, but the major difficulties arise from the wastes created in producing and consuming these resources. Extracting and processing fossil fuels and other mineral resources on an increasing scale produces water and air pollution as well as solid wastes.

CEREAL PRICES



Source: FAO.

Despite shrinking amounts of land per person and continuing soil erosion, food availability has improved in most parts of the world and cereal prices have not risen.

RENEWABLE RESOURCES

Renewable resources like freshwater, soil or wild fish stocks are much more problematic than non-renewable resources, because most of them are vulnerable to human overuse or pollution.

By definition, renewable resources are replenishable by nature – yet replenishment is not guaranteed. Renewal occurs only if they are given the chance to renew. If we exploit them faster than they can renew themselves, they deplete or degrade. The majority of renewable resources, including the most basic ones needed for human survival – land, food and water – are now affected by human overexploitation or pollution.

Food and land

The oldest question about human population and the environment was posed by Malthus. Can agricultural production keep up with potential human population growth? Malthus' answer was no: agricultural production can only increase arithmetically (3+3+3=9) whereas population can increase geometrically (3x3x3=27).

It followed, Malthus argued, that the human population would always be kept in check by the food supply. In reality, the reverse has usually been the case: market mechanisms have worked to expand the food supply in line with demand, and this expansion has more than matched the growth of the human population.

Land availability

Malthus' basic outlook still dominates the popular view, and some recent trends provide material for renewed concern.

In most parts of the world, cultivated land has not been expanding in line with population growth, so the amount of farmland per person has been declining. The area per person has declined only slowly in developed countries, from 0.65 hectares in 1965 to 0.51 hectares 30 years later. In developing countries, where population growth is faster, the area per person fell from 0.3 to 0.19 hectares over this same period[3].

The steepest fall was in Africa, where the extension of the farmed area has lagged far behind population growth. In 1965, Africa had half a hectare of cultivated land per person, but this dropped dramatically to a mere 0.28 hectares in 1995. If expansion continues at the same rate as it did between 1965 and 1995, and the UN's medium population projection is realized, then by the year 2040 Africa will have only 0.15 hectares of farmland per person. This is less than Asia had in 1995, and Asia has fewer problem soils and climates, and far more potential for irrigation. Many parts of Central, Southern-Central and West Africa still have abundant land, but much of this is subject to severe soil, climate or disease constraints. It seems likely that many African countries will run into serious land shortages[4].

Food availability

Overall, cereal production has not been keeping pace with population growth for the past decade and a half. The amount of grain available per person rose fairly steadily from 135 kilos in 1961 to 160 kilos in 1992, but since then has averaged about 157 kilos[5].

We must be cautious before concluding that we are seeing the harbingers of a coming global food crisis. If these developments were really reducing the ability of farmers to meet market demand then we would expect to see rising food prices and declining food intakes.

(continued)

Natural Resources and Wastes (continued)

Yet neither of these things is happening. On the contrary, allowing for inflation, the prices of most cereals have been on a falling, not a rising, trend. In constant 1990 US dollars, the prices of wheat and maize in 1996 were 40 percent lower than in 1980 and 50 percent lower than in 1960[6].

Nor was there any overall decline in average food intakes per person. Average daily calorie intake in 1998 was 2,790 calories[7], the highest on record, following fairly steady growth from 2,295 in 1963. Average daily protein intake was 74.9 grams, again the highest on record, up from 63 grams in 1961[8].

Improvements were notched up in all developing areas, most rapidly in Asia, but also in Africa, even though average calorie and protein intakes remained low.

How can we explain the simultaneous drop in cereal production per person and the rise in dietary intakes? The simple answer is that people do not live by bread alone: calorie intakes from cereals have been more or less static since 1984[9]. The increase has come rather from meat and fish, oils and other vegetable products. Global meat intake per person grew steadily from 24 kilos per person in 1963 to 37 kilos in 1998[10].

Within the cereal sector it is likely that cereals are being used more efficiently at every stage, with lower losses in storage and processing between harvest and table. Cereals used for livestock feed are increasingly being replaced by soybeans, and soybean production has been growing rapidly[11].

The continued improvement is a sign that markets are by and large matching production with effective demand. People are also adapting their diets as a result of health and environmental concerns. For example, all the 1963-98 increase in meat consumption per person came from pork (up 71 percent) and poultry (up 237 percent). It takes considerably less cereal and land to produce a kilo of chicken or pork than a kilo of beef[12].

Moreover, people's need for dietary energy is, on average, declining. Farming has the highest calorie requirements, followed in turn by heavy industry, light industry, services, and then non-employment. The general trend in all societies is to have higher and higher percentages of people represented in sectors with lower food energy needs.

Barring severe climatic change, it is very unlikely that we face catastrophic food shortages at global level. Research has shown that with relatively modest improvement in regionally specific agricultural practices, the world could feed 10 billion people with current land and technology levels[13].

Persistent problems

The agricultural sector has been very successful in raising food production since 1945 to meet growing populations and consumption levels, but this has often been at the cost of exporting problems to other ecosystems. High levels of fertilizer application have caused water pollution and eutrophication. The expansion of farmland has been to the detriment of wildlife habitat and biodiversity, which has been further harmed by pesticide use.

Population growth is directly implicated in all of these trends. For example, the area of land needed for any given crop is the product of population, multiplied by consumption per person, multiplied by the area needed to produce each unit of consumption. This latter element is the result of farming technology. Where this has been able to increase yield faster than the growth in population multiplied by consumption, the area needed for farming has fallen over time. But where yield has not kept pace, the area of farms and pastures has increased at the expense of forests and other wild habitats.

Unsustainable soil and water management practices have caused land degradation. A major assessment found that by 1990 soils had degraded on 38 percent of the world's cropland, 21 percent of pasture and 18 percent of forests[14]. Productivity has declined significantly on 16 percent of agricultural land in developing countries[15]. One recent estimate suggested that cropland productivity is 12.7 percent lower than it would have been without human-induced soil degradation[16].

Serious problems of food production will also continue in localized areas and in individual countries. These include many countries in sub-Saharan Africa and some individual countries outside Africa such as Bolivia, Haiti and Afghanistan. Many countries that cannot produce enough food

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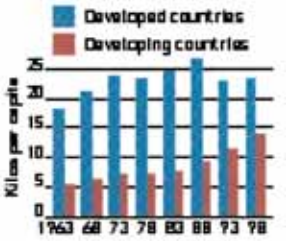
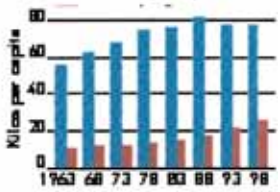
THE CLOSING GAP

Fish and seafood consumption



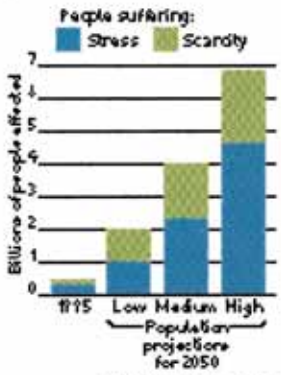
Meat consumption



Source: FAO.

Natural Resources and Wastes (continued)

FRESHWATER SCARCITY



Source: Population Action International.

The number of people in countries facing freshwater shortages, around 436 million in 1995, is set to rise steeply over the next half century, but will vary enormously depending on the rate of population growth.

for their own needs can pay for food imports by exporting manufactured goods or services. But many marginal areas, and many poor food-deficit or landlocked countries, especially in Africa, are badly placed to develop competitive industries or services.

There are millions of people who do not get enough food for a healthy, active and productive life. The estimated incidence of malnutrition in developing countries has halved from 35 percent of the population in 1969-71 to 17 percent in 1995-97, but because of the growth in population the absolute drop in numbers, from 917 million to 790 million, has been much more modest[17].

The numbers of malnourished will probably continue to decline slowly, while still remaining unacceptably high. However, malnutrition is not a sign that not enough food is available at global or even national level. It is a symptom of poverty and inequality – the poor lack enough money to buy, or enough good land to grow, sufficient food for the needs of their families.

Reducing the number of malnourished means taking measures to create jobs, redistribute land more equitably, and increase the productivity of small and marginal farms through targeted agricultural training, crop breeding, and soil and water conservation programs. Once the poor's own resources have been boosted, they themselves will grow, or the world market will produce, enough food to meet their effective demand.

Freshwater

We live on a planet whose surface is mainly ocean, but freshwater is a much more limited resource. Some 97 percent of all water is salty, currently useless for drinking or agriculture.

Most freshwater is locked up in ice and snow and in aquifers too deep to tap, and the rest is very unevenly distributed. Equatorial regions and some northern latitudes have a surfeit. Dry areas in between, including much of Africa, have supplies that are too scarce or too uncertain.

Freshwater is crucial for survival, for health, for agriculture, for industry, and for comfort and leisure. But the freshwater resources of any country are limited. There is only so much to go round: the larger the population, the less there is for each person.

In some countries, shortages are already biting. According to Swedish hydrologist Malin Falkenmark, a minimum of 1,700 cubic metres of renewable freshwater is needed per person per year to avoid serious problems. Below this level, a country is in a situation of water stress, when water supply problems may become chronic and widespread. There may be a need for long-distance water transfers, reuse of treated waste water, or supply interruptions in dry periods.

Where supplies fall below 1 000 cubic meters per person per year, a situation of water scarcity applies, and a society will face difficult choices between agriculture, industry, personal health and convenience which will hamper development[18].

In 1995 some 436 million people were already suffering water scarcity or stress. Even these levels of water shortage are causing severe development problems in some areas. There are conflicts among farmers and between farming and urban needs, and heightening tensions between countries dependent on the same resources, such as Israel and Jordan; Turkey, Syria and Iraq; India and Bangladesh; Sudan and Egypt[19]. Saudi Arabia, Israel and the whole of North Africa from Egypt to Mauritania are already withdrawing groundwater faster than it can replenish itself. Yet these countries face population increases of between 52 and 152 percent over the next 50 years[20].

Different population futures make a considerable difference to water futures. An analysis of the UN's 1996 population projections has estimated numbers likely to be suffering water shortage in the future. By 2050, on the medium projection, the number of people in countries suffering water stress or scarcity will have risen to 4 billion[21]. If the UN's low population projection could be achieved, then the total population in countries facing water scarcity or stress would amount to only 2 billion. By contrast, if the world were to hit the high projection, this total would be 6.8 billion.

POLLUTION AND WASTES

Perhaps the most intractable threats to the globe today relate as much to what we waste as to what we consume. Pollution places a mounting burden on local and planetary ecosystems. Ultimately it is

(continued)

Natural Resources and Wastes (continued)

exported to the global commons: the oceans and atmosphere, where our understanding of interactions is still inadequate. Sustainable management strategies are complex to devise and politically difficult to introduce.

In the process of making the end products we actually use, our machines dig up, churn over, swallow up and spew out gigatons of material. One study found that some 93 percent of materials used in production do not end up in saleable products but in waste, while 80 percent of products are discarded after a single use[22].

The result is a veritable avalanche of materials. In 1995, for example, the world produced 1.42 billion tons of cement – about a quarter of a ton for every man, woman and child on Earth. Some 2.57 billion tons of sand and gravel were produced in the 52 countries for which data are available[23].

Figures on carbon dioxide (CO_2) illustrate how the waste deluge has grown. Back in 1750, the human race produced only 11 million tons of CO_2 from fossil-fuel burning and cement production. A century later this had grown 18-fold to 198 million tons, and in another century a further 30-fold to around 6 billion tons. By 1995 our annual CO_2 output had multiplied by another four times to reach almost 24 billion tons[24].

These material flows have left deepening scars on the planet. The solid wastes that are not incinerated deface or pollute localized areas and water courses. Liquid and gaseous pollutants are more insidious and spread invisibly across the whole globe.

Humans raised the level of CO_2 in the air from 280 parts per million in pre-industrial times to 363 parts per million in 1996. Over this same period we raised methane concentrations by 145 percent. There were no gaseous chlorines in the atmosphere before industrial times. By 1996 there were 2,731 parts per trillion, most of these produced in the 20th century[25].

Significant traces of organic and metallic pollutants are now found in the deepest marine sediments, in the remotest glaciers and icecaps, and in the fat of arctic mammals. Studies of human breast milk have found traces of more than 350 contaminants, including 87 dioxin and dioxin-like compounds and 190 volatile compounds[26].

The rise of pollution and waste is not inexorable. Water and air pollution usually increase in the early stages of economic development, but once a certain income threshold has passed, people tend to value environmental quality more highly and have the resources to pay for protection measures. In most developed countries there have been significant reductions in emissions of lead, sulfur dioxide (SO_2) and particulates (smoke), and widespread improvements in water quality in rivers and around beaches. These are cases of immediate hazard, or easily noticeable local problems, or substances that have been the subject of intense media publicity, where political pressure for change is strong[27].

But even in rich countries waste emissions with less immediate, less visible or less dramatic effects have not been the subject of effective controls. The same is true where the costs are exported over a vast area or over the whole globe, or where remedial action would be costly and might affect powerful business interests or important groups of voters. These include, for example, emissions of the greenhouse gases CO_2 and methane.

Population is always a factor in waste and pollution, along with consumption and technology. The level of production of wastes or pollutants is the product of the number of people, the amount each person consumes, and the amount of waste created for each unit of consumption in the whole process from production and packaging to the consumer and his or her dustbin or sewage outlet.

Several efforts have been made to identify the relative shares of responsibility for rising pollution. Environmentalist Barry Commoner studied examples from the United States between 1946 and 1968. Population growth accounted for only 14 to 18 percent of the increase in synthetic organic pesticides, in nitrogen oxides and in tetraethyl lead from vehicles. It was responsible for only 7 percent of the increase in non-returnable beer bottles and a mere 3 percent of the increase in phosphorus from detergents. In almost every case, technology was the dominant factor. A later study by Commoner of nitrates, cars and electricity in 65 developing countries came to similar conclusions[28].

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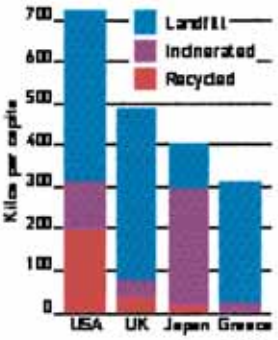
Waste

In the mid-1990s the rich countries belonging to the Organisation for Economic Co-operation and Development produced 1.5 billion tons of industrial waste and 579 million tons of municipal waste – an annual total of almost 2 tons of waste for every person. The United States alone produced 214 million tons of hazardous waste – almost half a kilo for every dollar of GDP[29].

MUNICIPAL WASTE PRODUCTION AND DISPOSAL, MID-1990s



Source: OECD.

In developed countries each person produces five to ten times their body weight in municipal waste per year. There are huge variations: the average Japanese produces 45 percent less waste than the average American. Industrial, mining and construction wastes are many times greater than municipal. The shares going to recycling, incineration or landfill also vary widely.

Natural Resources and Wastes (continued)

Clearly, technology is always implicated, and in many cases it may be the prime culprit. However, Commoner chose only cases where technological change was rapid. There are other cases where population or consumption are dominant, such as increased methane emissions from livestock or paddy fields. In more and more cases, technological change is a downward pressure, working to reduce our output of wastes, while growth in population and consumption continues to gear it upwards.

Studies of changes in air pollutants (SO_2, nitrogen oxides, smoke and CO_2) in countries of the Organisation for Economic Co-operation and Development (OECD) between 1970 and 1988 showed technology as a downward pressure in all four cases – mainly through increased energy efficiency in the case of CO_2 and nitrogen oxides, and through cleaner technology in the case of SO_2 and smoke. Population growth was responsible for a quarter of the upward pressure on emissions, while consumption was responsible for three quarters[30].

Our Footprints—They're All Over the Place

By David Schaller

The word "footprint" offers us many richly symbolic images: Neil Armstrong's "one small step"; Crusoe's Friday; the fog that comes "on little cat feet"; the Olduvai tracks of "Lucy;" and yes, even the caution expressed by my elementary school teacher to stay away from "Big Feet"—the junior high kids on the playground who loved to torment first and second graders.

Let's now look at another dimension of footprint, one equally symbolic and full of meaning to those concerned about environmental protection. If asked who had the bigger "footprint"—an adult female living somewhere in the developing world or your average eight-year-old American child—most of us would select the adult female. Now, insert the word "ecological" in front of "footprint" and repeat the question. The answer—in a moment.

The concept of an "ecological footprint" is an almost intuitive measure of the impact of individuals or societies on nature. It provides a simple yet elegant accounting tool that can help us see the impact of human consumption patterns on the earth. What we do about this information, of course, is the essence of a much larger policy debate.

As we live out our lives, we consume resources and we discard wastes. Each bit of consumption and generation of waste demands a certain amount of productive land and water. The amount of productive land and water needed to support the production of resources we consume and absorb the wastes we create can be considered as our Ecological Footprint. Individuals, households, cities, regions, nations—all can be measured as to their Ecological Footprint.

In their compelling book, *Our Ecological Footprint*, William Rees and Mathis Wackernagel lay out the approach and apply the methodology that is changing the way we look at broad issues of sustainability, ecological carrying capacity, environmental protection, and even social justice. Here, in a nutshell, is the essence of Ecological Footprint analysis applied to the world in which we currently live.

The ecologically productive land of the world currently totals some 3.6 acres for each of the 5.95 billion people now living. The average North American lifestyle currently requires almost 10 acres of ecologically productive lands to supply its resources and absorb its wastes. This tells us immediately that the ecological demands of average citizens in rich countries exceed per capita supply by a factor of three. Someone, lots of someones, somewhere are going without.

Said another way, if everyone currently alive were to consume resources and generate wastes at the pace of the average citizen in the United States (or Canada, or Western Europe, or Japan) we would need three planets in order to live "sustainably." For the projected global population of nearly 10 billion people in the year 2040 to enjoy the North American lifestyle of today, *a total of six planet Earths* would be needed.

(continued)

Our Footprints—They're All Over the Place (continued)

Neither scenario seems likely. These projections assume that there will be no improvements in either resource use efficiency or waste elimination techniques. However, we know that improvements in both are happening. The big question is whether they are happening fast enough!

It is, of course, in the inefficiency of resource production that wastes are created and our "environmental" problems manifested. But if we are not looking hard at how and where our "footprint" is being placed, we are missing the chance to do something about those inefficiencies. In looking at the resource consumption and waste generation practices of the average North American, it becomes clear that via trade and technology we have appropriated the ecological capacity of large areas outside our own national boundaries. We have, in fact, exported much of our "footprint." In their book, Rees and Wackernagel take us through the number crunching and data sources used to calculate footprints for our cities, our nations, and us. If anything, they significantly understate the resource demands needed to support consumption patterns and waste disposal practices.

The challenge posed to all of us is to find the means, and quickly, to reverse the "overshoot" condition we are already in with respect to human impact on the planet. Some would prefer to start with that hypothetical adult female in the developing world whose fertility promises/threatens to add billions more footprints to the earth's surface in the coming decades. The accounting tool of Ecological Footprints suggests, however, that the place to begin is with the resource consuming, waste generating "average" inhabitant of North America, western Europe, and Japan. The answer to the question posed earlier? It is the eight-year-old child (not to mention his parents, neighbours...) who now has the "Big Feet."

Humanity's Footprint

Today, humanity's Ecological Footprint is already over 30 percent larger than what the world can offer. This means we are overusing the planet and liquidating its ecological assets. Examples of our overuse include deforestation, collapsing fisheries, and the buildup of heat-trapping carbon in the atmosphere. At the same time, a significant percentage of the world's people do not have enough resources to meet basic survival needs.

To overcome this sustainability challenge, we need to do a better job of budgeting our planet's limited resources. Nature provides an average of 2.1 hectares (5.3 acres) of biologically productive space for every person in the world. By 2050 that available space will be reduced to 1.4 hectares (3.5 acres) per person if predictions of global population are accurate. Also, some of this area must be set aside for the estimated 10 million other species on the planet.

On average, people use 2.8 hectares (6.9 acres), but there is a wide range. In some countries, the average is as low as 0.5 hectares (1.2 acres), while others use as much as 13 hectares (32 acres) per person. Even within any given country, individuals' footprints vary widely.

By more carefully tracking human impacts on the Earth's resources, we can learn what needs to be done in order to protect our natural assets. We can all be part of the solution. Together, we can reshape the global economy in a way that will allow all people to meet their essential needs without destroying the limited capacity of our planet.

Population and natural resources

WHILE many of the environmental impacts of humankind closely map demographic indicators, this leaves out one vital component: consumption. The per-capita consumption of key natural resources varies hugely around the world. Typically, but not universally, the citizens of rich industrialized nations use more of the world's resources and produce more waste. Sometimes they thereby deplete their own environments; sometimes other people's.

For many resources, the United States of America is the world's largest consumer in absolute terms. For a list of 20 major traded commodities, it takes the greatest share of 11 of them: corn, coffee, copper, lead, zinc, tin, aluminum, rubber, oil seeds, oil and natural gas. For many more it is the largest per-capita consumer.

A typical example is meat. China, with the world's largest population, is the highest overall producer and consumer of meat, but the highest per-capita consumption in the world is that of the United States. The average United States citizen consumes more than three times the global average of 37 kilos per person per year. Africans consume less than half the global average, and South Asians consume the least, at under 6 kilos per person per year[1].

Other resources are used much more variably, depending on local circumstances. Fish, for instance, has been a cheap source of protein for hundreds of millions of poor people wherever it has been available. The highest consumption levels are in some of the world's poorest states, such as the Maldives or Kiribati, where fish is plentiful. Per-capita consumption is also very high in rich nations with well-established fishing traditions – 91 and 66 kilos per capita in Iceland and Japan respectively; way above the global average of 16 kilos per capita per year[2].

Some consumption patterns reflect the rate of industrial, urban and infrastructure development rather than simply current wealth. Cement, for instance, has in recent years been used in greatest quantities in the rapidly growing Asian economies. The top three places for per-capita use in 1996 were occupied by the Republic of Korea, Taiwan and Malaysia. Each used more than twice as much cement per capita as the United States and four times as much as a typical established industrial nation with well-developed infrastructure, such as the United Kingdom[3].

Water is also heavily used in a number of developing countries. It is a key strategic resource whose location is largely fixed, like land, but for which many countries rely on their neighbors. Egypt, for instance, relies for 97 percent of its water on flows that originate outside the country, mostly upstream on the Nile. Sudan, also on the Nile, is in a similarly vulnerable position, as are the Netherlands at the mouth of the Rhine, Cambodia on the Mekong, and Syria and Iraq on the Euphrates. All rely on foreign sources for the bulk of their water[4].

Water use is often as high or higher in poor, arid countries as in rich nations. When precipitation is lowest, demand for crop irrigation is typically highest, and where water-hungry cash crops are grown as well as food, the demands are higher still. When the country is in a poor state of

(continued)

Population and Natural Resources (continued)

development, with dilapidated infrastructure, then water use can be immensely inefficient, producing the highest water use of all, as illustrated by the rates in the arid, cotton-growing central Asian states of the former Soviet Union. During the 1990s Turkmenistan withdrew more than 5,000 cubic meters per person per year, with Uzbekistan, Kyrgyzstan, Kazakhstan, Tajikistan and Azerbaijan all withdrawing 2,000 cubic meters or more per person per year. By comparison, per-capita withdrawals in the United States were around 1,800 cubic meters, in France 650 and in the United Kingdom 200[5].

But for some resources, consumption depends upon the end use to which that resource is put, as typified by wood. While rich nations use more of it in the form of paper and packaging, poor predominantly rural nations rely on wood to a greater extent for construction and particularly for fuel. Finland, which produces large quantities of paper, is the greatest per-capita user of raw timber, but African and Asian countries are the largest users of fuelwood. Japan, though widely criticized for its harvesting of tropical timbers from Southeast Asian rainforests, lies well down the global list of timber consumers.

Two trends are causing nations, corporations and individuals to reassess their use of natural resources. Since the 1970s, there has been an increasing realization that many resources, notably metals and fossil fuels, will one day run out. And since the 1980s in particular, there has been growing concern about the environmental downside of their profligate exploitation, largely with respect to pollution and the degradation and conversion of land.

Some stories of inefficiency and extravagance have become notorious. It takes the mining of 6 tons of rock to produce a pair of typical gold rings. Only 2 to 3 percent of the energy produced by burning coal in a power station is eventually used to light a bulb or boil a kettle, because of inefficiencies at every stage of its conversion to electricity, its transmission and ultimate use. The average European uses 130 kilos of paper a year – the equivalent of two trees. The average American uses more than twice as much – a staggering 330 kilos a year. The paper and board industry is the United States' third largest source of pollution, while its products make up 38 percent of municipal waste[6].

Both governments and companies are now increasingly adopting strategies to reduce their environmental "footprint" on the world. They are doing this by reducing the amount of materials and energy used in providing their services (whether a car or a kilowatt of energy, a meal or a megabyte of information), and by reusing and recycling materials where possible. Much has been done. The gasoline consumption of the average automobile in the United States has halved since the 1970s. During the same period most European homes have been insulated to reduce heat loss by 50 percent or more. Some commercial farmers, particularly in the United States, have doubled the crops they grow with a given amount of irrigation water by using sub-surface drip irrigation.

Much more could be done at no extra cost. Modern technologies – plastic and carbon fibre, optical fibres, e-mail, drip irrigation, electronic systems controls – can all aid the process by making manufacture and communications more efficient and by substituting abundant materials for scarce ones.

Organized recycling, while not invariably energy-efficient, can also be beneficial. Growing concern at the damage to natural forests from paper production has led to a surge in paper recycling. Globally, 43 percent of paper fibre is recycled, a figure that rises to 46 percent in the United States and to 72 percent in Germany[7]. In Britain the film processing industry reuses 5 million film cassettes a year, retailers reuse 40 million clothes hangers, and the aluminum industry recycles some 2 billion cans a year. The latter saves sufficient electricity, which would otherwise go to smelting new aluminum, to power all the nation's television sets for a one-hour show every night of the year.

The Scale of Our Presence

The scale of our presence

HUMANS are perhaps the most successful species in the history of life on Earth. From a few thousand individuals some 200,000 years ago, we passed 1 billion around 1800 and 6 billion in 1999. Our levels of consumption and the scope of our technologies have grown in parallel with, and in some ways outpaced, our numbers.

But our success is showing signs of overreaching itself, of threatening the key resources on which we depend. Today our impact on the planet has reached a truly massive scale. In many fields our ecological "footprint" outweighs the impact of all other living species combined.

We have transformed approximately half the land on Earth for our own uses – around 11 percent each for farming and forestry, and 26 percent for pasture, with at least another 2 to 3 percent for housing, industry, services and transport[1]. The area used for growing crops has increased by almost six times since 1700, mainly at the expense of forest and woodland[2].

Of the easily accessible freshwater we already use more than half. We have regulated the flow of around two thirds of all rivers on Earth, creating artificial lakes and altering the ecology of existing lakes and estuaries[3].

The oceans make up seven tenths of the planet's surface, and we use only an estimated 8 percent of their total primary productivity. Yet we have fished up to the limits or beyond of two thirds of marine fisheries and altered the ecology of a vast range of marine species. During this century we have destroyed perhaps half of all coastal mangrove forests and irrevocably degraded 10 percent of coral reefs.

Through fossil-fuel burning and fertilizer application we have altered the natural cycles of carbon and nitrogen. The amount of nitrogen entering the cycle has more than doubled over the last century, and we now contribute 50 percent more to the nitrogen cycle than all natural sources combined. The excess is leading to the impoverishment of forest soils and forest death, and at sea to the development of toxic algal blooms and expanding "dead" zones devoid of oxygen[4].

By burning fossil fuels in which carbon was locked up hundreds of millions of years ago, we have increased the carbon dioxide content of the atmosphere by 30 percent over pre-industrial levels. We have boosted methane content by 145 percent over natural levels[5].

Through mining and processing we are releasing toxic metals into the biosphere that would otherwise have remained safely locked in stone. We are producing new synthetic chemicals, many of which may have as yet undetermined effects on other organisms.

We have thinned the ozone layer that protects life on Earth from harmful ultra-violet radiation. Most scientists agree that human activities are contributing to global warming, raising global temperatures and sea levels.

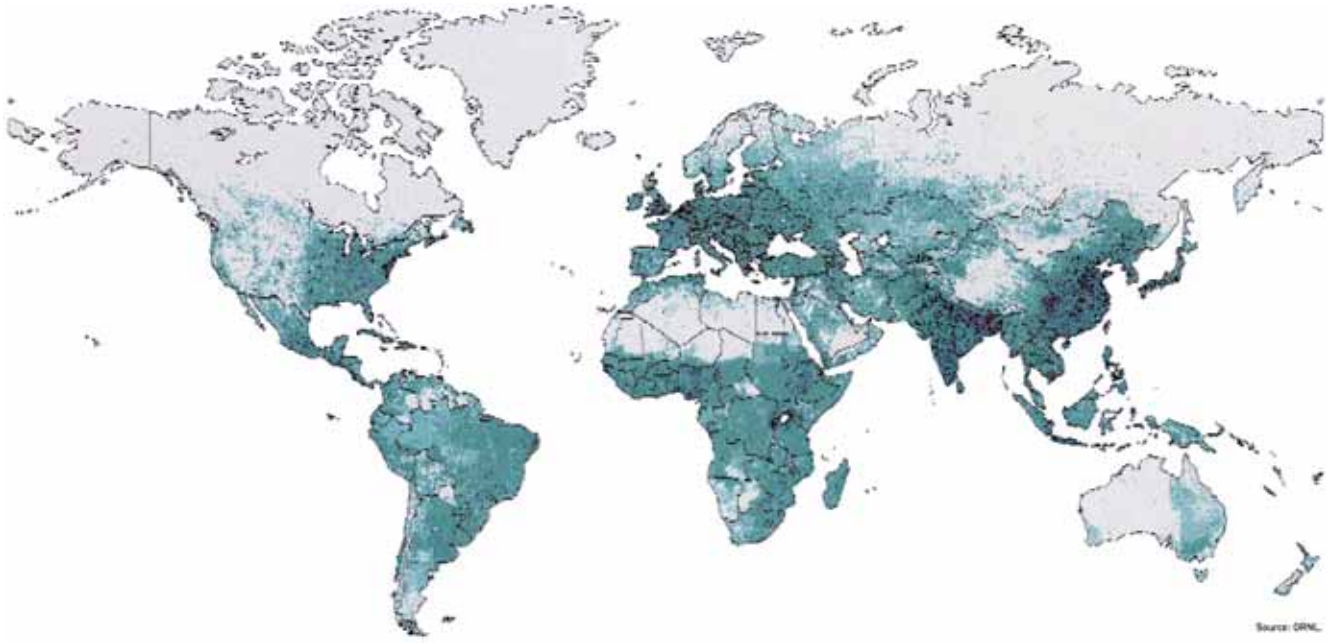
These processes affect the habitats and environmental pressures under which all species exist. As a result, we have had an incalculable effect on the Earth's biodiversity. The 484 animal and 654 plant species recorded as extinct since 1600 are only the tip of a massive iceberg[6].

We have become a major force of evolution, not just for the "new" species we breed and genetically engineer, but for the thousands of species whose habitats we modify, consigning many to

(continued)

The Scale of Our Presence (continued)

OVERVIEW **The scale of our presence**



The scale of human activities

The scale of human activities can be represented partly by observing population density, both over the globe and over time.

POPULATION DENSITY, 1998
Per square kilometre

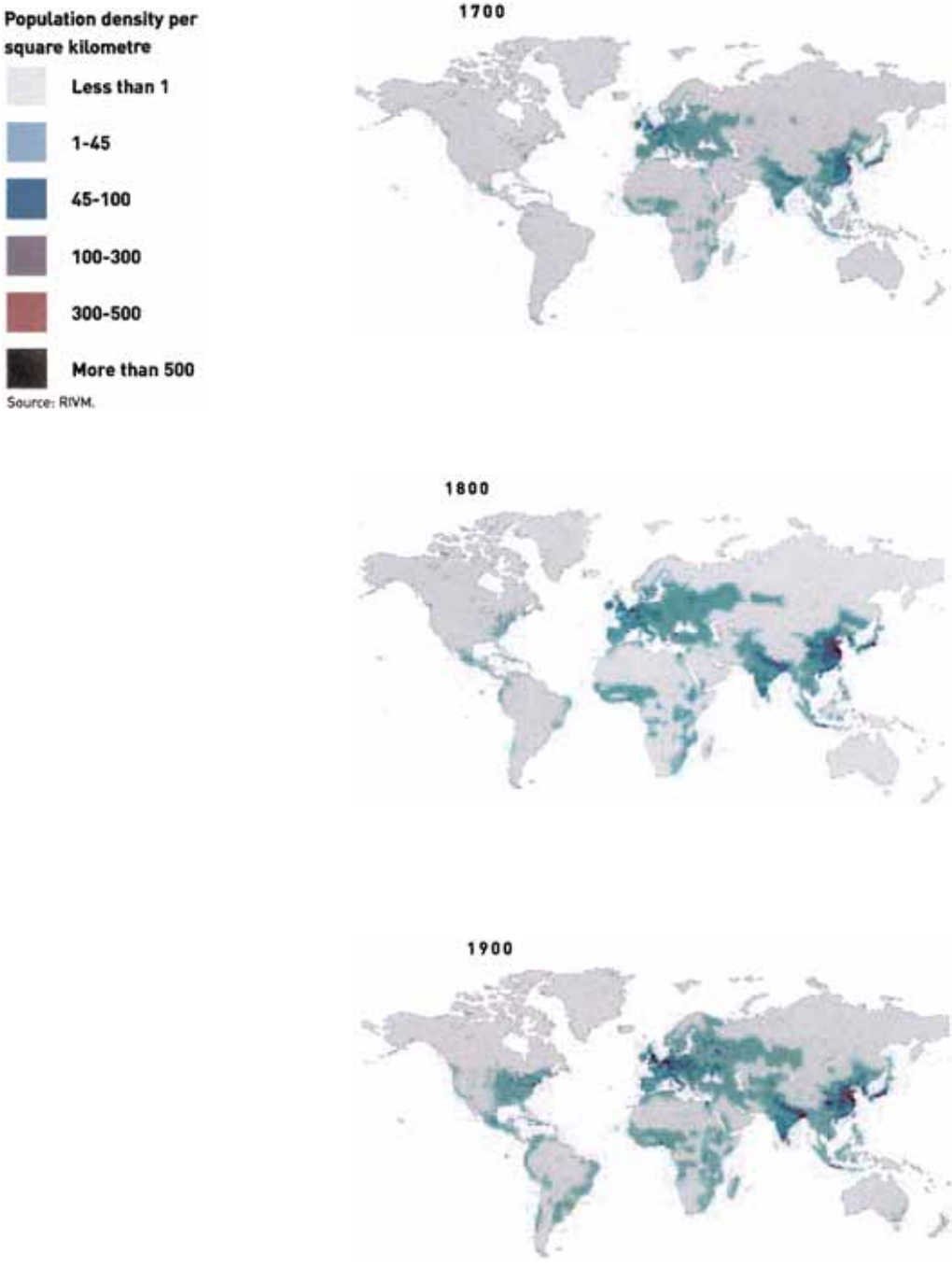
- 0
- Less than 1
- 1-45
- 45-100
- 100-300
- 300-500
- More than 500

Note: At the end of the 20th century the world average population density was 45 people per square kilometre.

(continued)

The Scale of Our Presence (continued)

OVERVIEW **The scale of our presence**



(continued)

The Scale of Our Presence (continued)

OVERVIEW **The scale of our presence**

extinction; compelling others to evolve and adapt to our pressures. We have become a force of nature comparable to volcanoes or to cyclical variations in the Earth's orbit.

The scale of our activities depends on our population numbers, our consumption and the resource or pollution impact of our technologies – and all three of these factors are still on the increase. The maps on the previous pages illustrate the increasing spread and density of the human population over the last three centuries.

As we enter the third millennium, the destiny of the planet is in our hands as never before, yet they are inexperienced hands. We are modifying ecosystems and global systems faster than we can understand the changes and prepare responses to them. All the factors in this vast equation affect each other constantly. In a globalized world the elements of human activity interact with each other and with local and planetary environments.

In this unprecedented situation, the need to be fully aware of what we are doing has never been greater. We need to understand the way in which population, consumption and technology create their impact, to review that impact across the most critical fields, and to find ways of using our understanding of the links to inform policy.

Consumption Cartoon

<www.newdream.org/feature/comics/kirk-neighbor.html>. Reproduced by permission.

Video Listening Guide

Instructions:

1. Read and pronounce the following words with your teacher.
2. As you view the video, listen for each word. Number it in the order you hear it.
3. After viewing, guess the meanings of the words, or look them up in the dictionary. Watch the video a second time, but this time write down as much as possible of the phrase or sentence in which the word occurred.
4. After the second viewing, use each word in a sentence that communicates the meaning of the word. Share your sentences with a partner.

Word + Surrounding Words	Order	New Sentence

Recycling Facts

3 Rs Tips

What else can I do?

So now you know it's important to recycle, but there is actually an overall strategy for reducing waste, called the **3 R's. How does Recycling fit in?** Recycling is actually the third **R** in the strategy, which includes:

REDUCE:

- Purchasing items with the least amount of packaging
- Buying in bulk when appropriate
- Not purchasing items that you don't need

REUSE:

- Using a refillable mug for your coffee
- Sharing newspapers and magazines with friends and family
- Avoiding disposable items

RECYCLE:

- Using your community recycling program
- Purchasing products made from recycled materials

Call your municipal office to find out about 3 R's programs in your community!

The Manitoba Product Stewardship Corporation (MPSC) was introduced on January 1, 1995 to encourage the expansion of convenient and efficient recycling services across Manitoba. MPSC is an independent, non-profit organization representing the interest of all sectors of Manitoba, including consumers, industry, municipalities and governments.

Under the Waste Reduction and Prevention Act (WRAP) the MPSC is mandated to establish and administer a waste reduction and prevention program for designated materials in Manitoba. Some of our current programs and initiatives are:

- Manitoba Product Stewardship Program (MPSP) — Provides financial assistance and technical support for community recycling programs throughout Manitoba. There are currently 160 municipal recycling programs active in the province for which the MPSC pays 80% of the net costs of recycling.
- Student Action for Recycling (STAR) — An education resource which provides K-Senior 4 schools in Manitoba with an annual $500 honorarium to encourage in-school recycling and waste reduction programs. MPSC also has an environmental education website at www.virtualrecycling.com.
- STAR Pins — A funding and support program for post-secondary educational institutions in Manitoba to recycle MPSP eligible materials.
- Litter Abatement Program — An annual spring media campaign targeted to reduce litter in Manitoba. Campaigns include "Slam Dunk Your Junk — Don't Litter," "Stash Your Trash," and "Keep Manitoba Beautiful."

All activities of the MPSC are currently funded by the 2 cent levy on beverage containers.

For more information contact:

Manitoba Product Stewardship Corporation

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Phone: 989-6222
or 1-800-280-9788
Fax: 204-989-6229
Email: info@mpsc.mb.ca
or visit us at:
www.mpsc.com

mpsc

(continued)

Recycling Facts (continued)

Recycling Facts

Recycle — convert (waste) to a reusable material.
(*Oxford Dictionary, Volume 9*)

We create a lot of waste. In one year each of us produces over 250 kilograms of waste in our home.

You have probably heard of Recycling. You probably even recycle a whole bunch of stuff from your home. Chances are that you live in, or close to, a community that has a recycling program. That's because there are over **160 recycling programs** in Manitoba, servicing almost **1 million Manitobans!**

But what exactly is Recycling? Recycling is a term that describes the process of converting our "waste" into resources that can be made into new products. It sounds simple, but there are several critical steps involved:

1. *First, it is up to us to separate recyclable material from our regular garbage.*
2. *Then, your municipality (or their recycling agent) will collect the materials, sort them, and send them to companies all over the world — and some right here in Manitoba!*
3. *These companies use the recycled materials to produce new products, conserving natural resources.*
4. *The process isn't over yet! Then we all need to buy items made from recycled materials to ensure that companies continue to use recycled material in their products. **Buy Recycled!***

But what happens to all the stuff I recycle? Keep reading for tonnes of Manitoba recycling facts!

Paper

Every year, Manitobans throw out about 32,000 metric tonnes of newspapers, magazines and flyers. Only about 20,000 metric tonnes of this material is recycled. That means about 30% of this material is still being landfilled, burned or littered. **What a waste!**

Did You Know…

- The amount of landfill space that is taken up by one tonne of newsprint is 3 cubic meters.
- One metric tonne of recycled newspaper saves about 17 trees.
- Using recycled newspapers and magazines reduces the need for mining clay soils, which is used to make newsprint pulp.
- The newspaper collected in your community recycling program is made into new newsprint (so the Sunday comics you're reading now may be the Sports pages you read two months ago!)

PET (#1) Plastics

Each year, Manitobans throw out about 2,000 tonnes of PET (#1) plastic. About 800 tonnes of PET is recycled… that's only about 40%! The rest… trashed. **What a waste!**

Did You Know…

- Plastics can take up to 400 years to break down in a landfill.
- PET plastic bottles collected for recycling in Manitoba are usually made into carpeting and fibrefill for pillows, sleeping bags and ski jackets, but can also be made into t-shirts and sweaters, automotive parts, and floor tiles!

Glass

Every year, Manitobans throw out about 14,000 tonnes of glass jars and bottles. Only about 4,500 tonnes are recycled. **What a waste!**

Did You Know…

- It takes one million years for a glass bottle to break down in a landfill.
- In Manitoba, most recycled container glass is used as aggregate material in roads and sidewalks.
- This saves your community recycling program energy and money because the glass doesn't have to be shipped to distant markets. Just think… you could be walking on old jam jars!

Aluminum

Each year, Manitobans throw out about 1,400 tonnes of aluminum cans. Only about 30% is recycled in community programs. **What a waste!**

Did You Know…

- Recycling one aluminum can saves enough energy to run your television for 3 hours.
- Aluminum takes 500 years to break down.
- Once aluminum cans have been remelted, they can be used in any product made from aluminum.
- Aluminum is the most valuable ($$$) recyclable material. Help your community keep recycling costs down. Don't trash cans!

Steel (Tin) Cans

Each year, Manitobans throw out about 5,000 tonnes of steel cans. Only about 1,500 tonnes of this steel is recycled. The rest? You guessed it — landfilled or littered. **What a waste!**

Did You Know…

- When scrap iron is used instead of iron ore to make steel, water consumption is reduced by about 50%.
- Most of the steel cans collected in Manitoba are recycled at local steel mills.

Recycling Facts (continued)

(continued)

Reduce Your Waste

Fact: When our trash disappears off the curb, it is buried in the ground where it can remain, unchanged for centuries.

Fact: More than 20% of the garbage thrown out by the average Manitoba household is packaging.

Fact: Canadians take home over 55 million plastic shopping bags each week.

You and I create a lot of waste. In one year each of us produces over 250 kilograms of waste in our homes. That's a lot of "garbage!" But did you know... we don't need to create so much waste in the first place? There are lots of ways you can **REDUCE** the amount of waste you create, simply by **Using Less and Living More!**

There are many ways to get the things you need without contributing to our "throwaway" society. By following the suggestions in this brochure, you can reduce the amount of garbage you throw out and reduce the amount of pollution in our environment. You'll also reduce the energy required to produce and transport goods while conserving valuable natural resources. That's what **Using Less and Living More** is all about.

Reducing consumption is the first step. It all starts with making smart choices while shopping and asking yourself whether the items you are purchasing are really necessary.

*Read on for ideas to **Use Less and Live More!***

Steps to Using Less

Buy Only What You Really Need
Before purchasing something, ask yourself if you really need this item. (How much junk do you have collecting dust in your basement or garage that you couldn't live without just a short time ago?)

Avoid Disposable Products
Keep in mind that nothing is really "disposable" — in most cases it doesn't go away, it just takes up space in a landfill site!

Buy Quality
Buy the highest quality item you can afford and have it repaired when necessary. Clothing is one area where this principle can be easily applied.

Buy in Bulk
When buying food or other products to be consumed in quantity, buy the largest amount you can easily store and use.

Avoid Over-packaged Goods
Always try to choose items with the least amount of packaging. Remember, it's what is inside the package that you want!

Buy Recycled Products
When possible, buy products made from recycled material. This helps to ensure stable markets for materials collected through recycling programs.

Carry Your Own Bags
Take your own bag when you shop, or reuse a plastic bag that you were given on a previous trip.

Buy Used Items
This applies to CD's, sports equipment, cars, building material, clothing, furniture — almost anything!

Rent or Share Instead of Buying
Many things that you need only occasionally, such as tools or party supplies, can be rented or borrowed.

And guess what? Many of these ideas are not only environmentally friendly, but will save you money too!

...and Living More!

Smart shoppers make a big difference in how much waste we create, but there are lots of other things that we can do to be kind to our environment and create less pollution. Here are a few suggestions:

1) Compost

Composting can help to reduce your household waste by about 1/3, and help your yard and garden as well. *For information on composting, call Resources Conservation Manitoba at (204) 925-3777.*

2) Reduce toxic wastes at home

Yard and garden — Avoid the use of pesticides and use only natural lawn care products.

Household Cleaning — Try homemade, alternative cleaning products around the house, such as:
- Glass Cleaner — 1 part vinegar to 10 parts water
- Furniture Polish — 1 part lemon juice to 2 parts vegetable oil
- Disinfectant — 1/2 cup borax to 1 cup water
- Chrome/Stainless Steel cleaner — baking soda and a damp cloth

Painting Supplies — When painting, buy only what you need. Swap leftover paint with friends.

Used Oil — Do you change your own oil? Call your municipality to find out where you can recycle it!

Household Hazardous Waste — Check with your municipality to see where you should dispose of anything identified on the container as flammable, caustic or toxic.

3) Don't forget to Recycle!

Note: Many of the ideas in this brochure came from some of the great books available about reducing waste. Check your local library!

Recycling Facts (continued)

MPSC's Anti-Litter Strategy

The MPSC encourages litter abatement activities to compliment waste reduction and recycling activities in Manitoba. Consistent with our anti-litter strategy the MPSC finances billboards with an anti-litter message across Manitoba. Those communities without billboards can take advantage of the posters that are produced with these same messages.

MPSC's anti-litter billboard campaigns have included "Slam Dunk Your Junk — Don't Litter" and "Stash Your Trash — Don't Litter." During the XIII Pan Am Games, "Keep Manitoba Beautiful — Don't Litter" was introduced, and displayed throughout Manitoba.

"Keep Manitoba Beautiful — Don't Litter" is a gentle reminder that littering detracts from the natural beauty of our province. Litter devalues our natural environment and affects the image that tourists have of our towns, cities and parks. The negative image litter portrays reduces the respect and pride that Manitobans take in their community.

Final Word on Litter

In the big picture, litter appears unable to compete with the ozone hole and the greenhouse effect. As an environmental problem littering is an individual decision to pollute our environment. Most of us know that littering is illegal but the challenge in catching people in the act of littering makes enforcement of these laws difficult. The only real way to stop litter is for each of us to be educated about the problem.

Consider this: it takes approximately 400 years for a plastic bottle to break down, 500 years for an aluminum can and an estimated 1 million years for a glass bottle to break down to dust. These commonly littered items don't just disappear, so choose not to litter — Keep Manitoba Beautiful.

All activities of the MPSC are currently funded by the 2 cent levy on beverage containers.

For more information contact:

Manitoba Product Stewardship Corporation

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www.mpsc.com

mpsc

Manitoba Product Stewardship Corporation

–Litter–
What Can You Do?

KEEP MANITOBA BEAUTIFUL

...don't litter.

MANITOBA PRODUCT STEWARDSHIP CORPORATION

MEDIACOM

Part 3 in a series about the 3 R's Reduce, Reuse, and Recycle.

(continued)

Recycling Facts (continued)

Who Litters?

The Seven Sources of Litter

Although we often assume that litter can be blamed solely on pedestrians and motorists there are actually seven primary sources of litter. It is important to recognize that these sources of litter can be either deliberate or accidental in nature.

1. Improperly handled household garbage and recyclables
2. Improperly handled commercial refuse
3. Construction and Demolition sites
4. Loading and delivery areas
5. Uncovered trucks
6. Pedestrians
7. Motorists

Litter costs your community, both financially and environmentally. Tax dollars are spent cleaning litter from parks, roads and public places. Litter pollutes our waterways, damages our landscapes and injures animals and people.

Litter and Recycling

Littering is contrary to the principles of environmental stewardship. Litter can negatively impact community recycling programs, too:

- Litter from recycling pickup or depots may result in negative perceptions regarding their effectiveness in cleaning up the environment
- Litter may include products and materials which are recyclable and should be recovered

What Can You Do?

- Set an example for others by not littering
- Make sure trash cans have lids that can be securely fastened
- If you own a business, check dumpsters daily to ensure that top and side doors are closed. Don't over fill dumpsters
- Use a litter bag inside your car, truck, boat and on your bicycle
- When outdoors hold onto trash until you reach a trash receptacle
- Cover open loads on all trucks
- Organize or take part in a community clean-up

Community clean-up Events

If you decide to organize a clean-up there are a number of tips to make your project work:

- Get permission from the property owner of the area you want to clean
- Visit the site before the day of the clean-up to decide the type of litter that will need to be removed (large debris may require large equipment)
- Take "before" and "after" photos
- Tell your local paper, radio station, or TV channel about your project
- Ask local businesses to sponsor bags, gloves, donuts, coffee
- Recruit community groups and any other community members who may want to participate
- Keep a diary of the event and a log of names and phone numbers if you decide to plan another clean-up next year
- Thank everyone who was involved!

STASH YOUR TRASH

don't litter.

When was the last time you saw someone littering? Maybe it was recently, or it may be difficult to think of a time when you witnessed someone littering. But, litter does not simply appear on its own. When it comes to littering people are the problem and people are also the solution. Knowing more about littering will help us all become less of the problem and more of that solution.

Litter is often most apparent in the spring and summer. The grass is greening, the trees are budding, the flowers are blooming and the snow has melted to reveal the litter that has been buried all winter. Studies show that people litter when:

- *They feel no sense of ownership or responsibility to the property*
- *They believe someone else will clean up after them*
- *Litter is already present*
- *Trash receptacles are not easily accessible*

Saving the Earth

I. **Pre-Listening Exercises**

1. Name the three most important environmental issues today and propose solutions for each.

II. **Listening Exercises**

1. Listen to the interview by pressing the "Play" button of the audio type you want to hear, and answer the questions. Press the "Final Score" button to check your quiz.

    1. What is the name of the girl being interviewed?
        A. Alice
        B. Ellen
        C. Alex

    2. She says we should save water when:
        A. washing cars
        B. cleaning clothes
        C. taking a bath

    3. The girl's second suggestion is about:
        A. separating different types of garbage
        B. disposing of trash properly
        C. having a family clean-up party

    4. By recycling paper, we can:
        A. protect the forests
        B. cut down on waste
        C. save money

    5. What does the girl do once a month?
        A. She visits a recycling center.
        B. She cleans a neighbourhood park.
        C. She collects newspapers.

2. Listen to the conversation again as you read the Quiz Script.

3. Review the Text Completion Quiz.

III. **Post-Listening Exercises**

1. Write a short article about the biggest environmental problem facing your country of origin and a solution to resolving this issue.

A Greener World

I. **Pre-Listening Exercises**

1. Name three environmental problems that face our world today.
2. How would you solve these problems?
3. What image comes to your mind when you think of "recycling?"

II. **Listening Exercises**

1. Listen to the conversation by pressing the "Play" button of the audio type you want to hear, and answer the questions. Press the "Final Score" button to check your quiz.

    1. What would be the best title for this lecture?
        A. Important Keys to Recycling Paper
        B. Technological Advances Improve Recycling
        C. Steps to Improving Recycling

    2. According to the article, paper materials that are difficult to recycle include:
        A. copy paper
        B. shredded documents
        C. food wrappers

    3. In some cases, recycling could be hazardous to the environment if special precautions are not taken because:
        A. industrial emissions are sometimes created in the process.
        B. chemical waste is sometimes produced as a result.
        C. a great deal of energy is expended to create new products.

    4. According to the lecture, the demand for recyclable materials in the manufacturing of new products is sometimes sluggish because
        A. some governments are unwilling to support expensive recycling methods.
        B. there is a lack of advanced technology to process the materials.
        C. businesses do not invest enough money into research.

    5. Which is NOT one of the main keys to recycling as mentioned in the lecture?
        A. government regulation of waste
        B. better technology
        C. more demand for recycled materials

---

2. Listen to the conversation again as you read the Quiz Script.

III. Post-Listening Exercises

1. Write one specific way individuals can have an impact on saving the environment.

Presentation Listening Guide

One Suggestion						
Two Good Points						
Solutions						
Effects						
Causes						
Speaker/Topic						

Senior 4 ELA:
ESL for Academic Success

Module Handouts

Module 3

Graphic Organizer:
The Good Ol' Days with Mrs. MacLeod

Take point-form notes as you watch and listen to this video. Decide which important points to record under each heading.

When you are finished, compare your notes with a partner. Come to a consensus on the most important points. Redo your notes to reflect this.

Topic	**Response**
1. School	
2. Travel	
3. Leisure time activities	
4. Meeting places	
5. Modes of communication	
6. Food and its storage	
7. What we've lost from the past in today's world	
8. Technology and advances that would have been helpful in the past	

Great Inventions

1. Who devised the calendar we use today?
2. What is the oldest known use of the wheel?
3. What company invented modern toothpaste?
4. When and where was the first use of swimming pools?
5. Where was paper first invented? When was it used in Europe?
6. When was the first working pair of eyeglasses made?
7. When and where did the oldest known counting board (abacus) come from?
8. When and for whom was the first flush toilet invented?
9. When was the first working bicycle invented?
10. Why was the zipper invented?
11. What was the first plastic called, and what was the problem with it?
12. How were self-stick notes invented?

Technology (Student Version)

Read this jumbled encyclopedia entry and number the sentences in the correct order.

Technology

a) Whereas science is concerned with how and why things happen, technology focuses on making things happen.

b) Technology includes the use of materials, tools, techniques, and sources of power to make life easier or more pleasant and work more productive.

c) It accelerated with the Industrial Revolution and the substitution of machines for animal and human labour.

d) Accelerated technological development has also had costs, in terms of air and water pollution and other undesirable environmental effects.

e) Technology began to influence human endeavour as soon as people began using tools.

f) Application of knowledge to the practical aims of human life or to changing and manipulating the human environment.

–Britannica Concise Encyclopaedia, 2003.

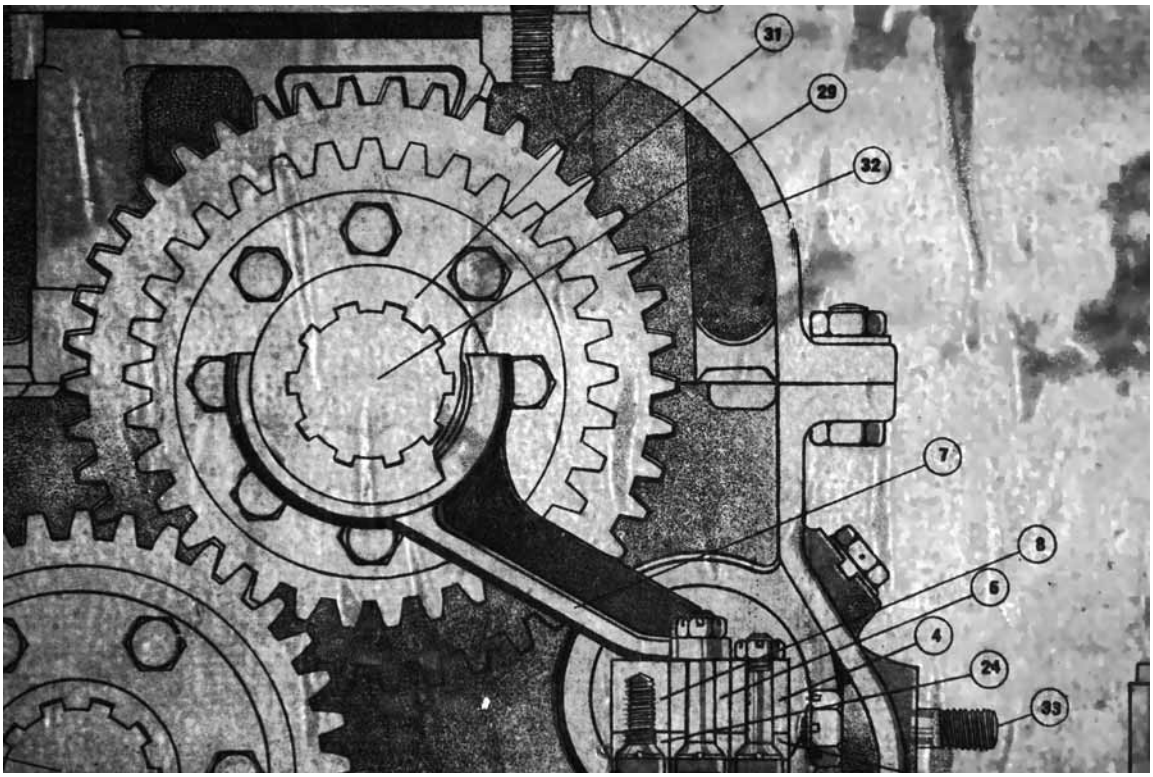
Technology: Britannica Concise Article (Teacher Version)

Technology:

Application of knowledge to the practical aims of human life or to changing and manipulating the human environment.

Technology includes the use of materials, tools, techniques, and sources of power to make life easier or more pleasant and work more productive. Whereas science is concerned with how and why things happen, technology focuses on making things happen. Technology began to influence human endeavour as soon as people began using tools. It accelerated with the Industrial Revolution and the substitution of machines for animal and human labour. Accelerated technological development has also had costs, in terms of air and water pollution and other undesirable environmental effects.

–Britannica Concise Encyclopaedia, 2003.



Sample Concept Attainment Chart

These are possible statements to separate the concepts. Note that the teacher is not agreeing or disagreeing with any statement, merely giving an example of what some people may think.

Worldview	*Ethics*	*Laws*
The greatest value in life is friendship. Most human beings are good and trustworthy. It is important to respect authority. This life is all there is. Truth changes with the times. Humans are just one type of intelligent animal. There is a personal God. People can't change their fate. It is important to be honest.	You should always help your friend. It is wrong to steal. It's okay to copy software and share it with a friend. I should be able to say what I want on the Internet. It's okay for the government to listen to suspected criminals' phone conversations. It's okay to sell information about my customers to another company. I won't buy products made by companies who treat their workers badly.	Taking something from a store without paying for it is against the law and will be punished. You must stand when the teacher enters the room. You must stop for a red light. Writing a newspaper article that encourages people to hate another race is against the law and will be punished. Entering someone's office without permission will be punished. You cannot use animals for experiments that will cause pain.

Technology, Information, and Worldview

Why would computer science majors in some Canadian universities be required to take an ethics course?

Badley, Ken. *Worldviews: The Challenge of Choice*. Irwin, 1996. Reproduced under the terms of the Access Copyright Licence Agreement (2006).

Zippy Scenarios for Teaching Internet Ethics

Describe the underlying Netiquette/ethics issue(s) in each scenario. What is your opinion of the behaviours involved? What equitable solutions can you suggest? Describe a parallel situation in which computers are NOT involved.

1. Jules has walked away from a lab computer without logging off. Trish sits down and, still logged in as Jules, sends inflammatory email messages out to a number of students and posts similar messages on the class newsgroup.
2. Lester sends email to the entire student body inviting them to a BYOB party at his house while his parents are out of town. Lester receives a message from a system administrator calling him in for a meeting with school officials. He objects because he feels that his email is his own private business.
3. Every time Abner posts a comment to a newsgroup, his posts are flamed by a group of "enemies." Abner has responded to each flame in turn, and a full-scale war is now in progress.
4. It seems like every time Melanie logs on to her account, Stanley knows about it and sends messages that cover her screen with text. At first she thinks it is funny, but now its really starting to bother her. The messages reformat the text on her screen and, besides, its kind of creepy the way he always knows she's logged on.
5. Sharon and Timothy are students at Big Suburban High School. They have designed a web page devoted to their favourite rock band, using their personal disk space on the schools web server. They have posted song clips, lyrics, photographs of each band member, and articles they have found in various web news sources. However, school authorities have asked them to shut down their site because of the obscene content of many of the lyrics. Sharon and Timothy object, noting that their First Amendment (free speech) rights are being violated.

Intellectual Property Issues

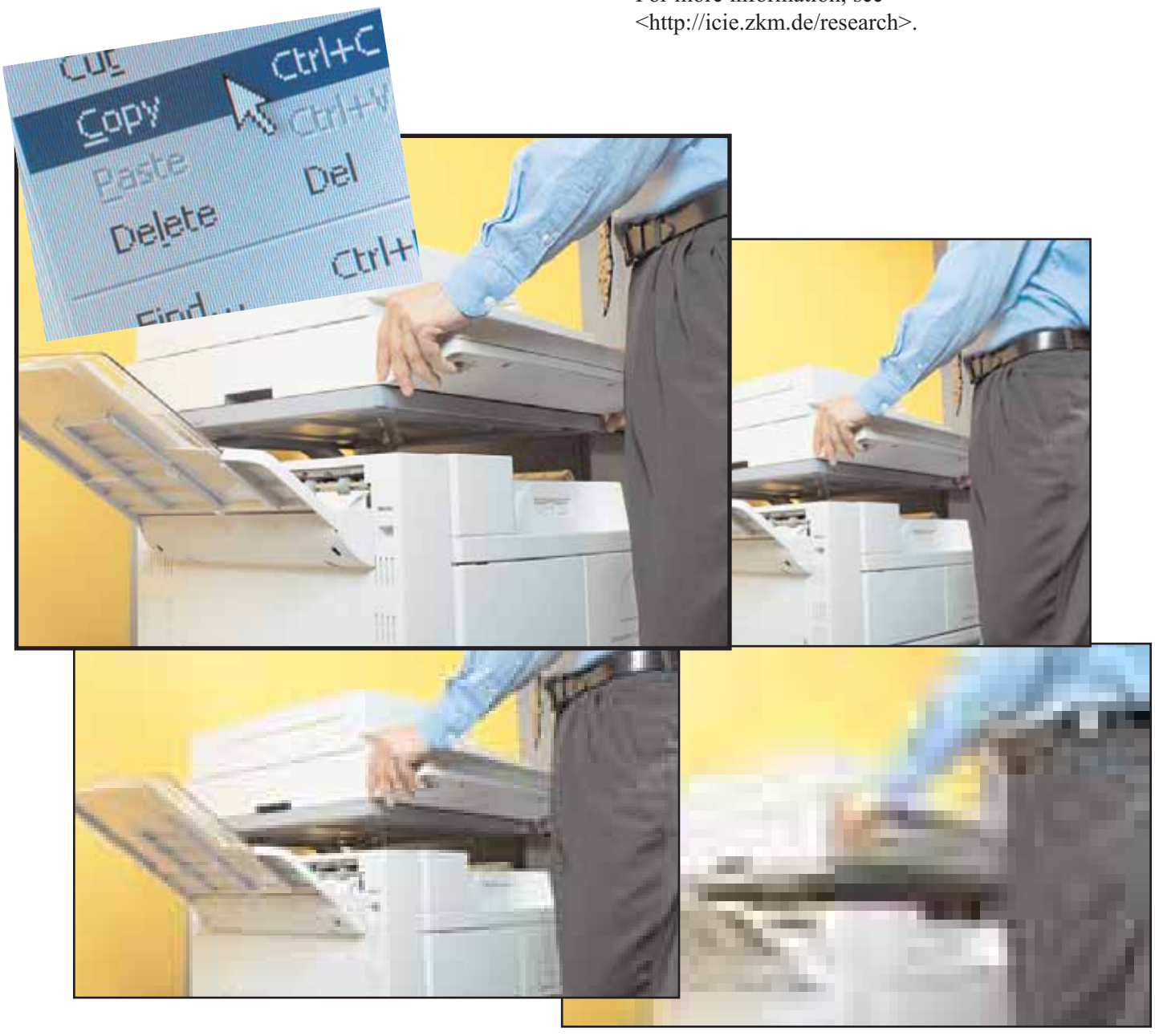
1. Tracy had a report to write on acid rain. She used several sources—books, magazines, newspaper articles, and a CD-ROM encyclopedia. She listed all these sources in her bibliography at the end of the report. She found the encyclopedia to be the most convenient source because she could highlight portions of the text and paste them into her word processing document.
2. Jason R. designed and posted a Star Wars website. Once the site started receiving 40,000 hits a day, he received a phone call from Lucasfilm asking him to shut it down. Jason posted excerpts of the phone conversation on his website. Lucasfilm was then flooded with angry email messages from fans who felt the company was exerting totalitarian control over products to which they felt a deep personal connection.
3. Ms. Harris received email from someone who liked the gargoyle image on the Uni High Library's web page and wanted to know if he could use it on his school library's web page. The art teacher, who created the image for the school, wrote back to him, explaining that the image belonged to the university and that, furthermore, it had special significance as the image that identifies Uni High. She thanked him for his interest, but told him that she could not grant permission for him to use it.
4. Richard asked Vicky if he could look at the essay she wrote for their history class. She told him "sure" and thought no more about it. Several days after the essays were turned in, the teacher asked her to stay after class. She showed Vicky that her essay and Richards were almost identical. She asked Vicky for an explanation.
5. Malcolm has a web page on the topic of sailboats. He has collected a truly astonishing amount of information and receives many complimentary email messages from sailing enthusiasts. He has downloaded numerous pictures and articles he finds on other websites, and is always careful to give credit by citing the original sources.

Ethical Issues of Information Production

The question concerning the protection of the intellectual property is one of the most important and difficult ethical, moral, and legal ones in the field of information production. Different traditions with regard to technologies and products have led to different protection laws in different regions of the world:

- The European tradition emphasizes the moral rights of the authors (droit d'auteur). These are related to the person of the author and concern the integrity and authorship of her or his work as well as her or his reputation.
- The Anglo-American tradition emphasizes the property or economic rights (copyright). These rights can be transferred. According to this tradition "original works of authorship in any tangible means of expression" (17 U.S.C. sect. 102[a]) should be protected.
- The Asian tradition(s) consider copying as a matter of emulation of the master. Conflicts arise when national and international laws and moral traditions protect different aspects of various media.

For more information, see <http://icie.zkm.de/research>.



The Ten Commandments of Computer Ethics

by the **Computer Ethics Institute**

1. Thou shalt not use a computer to harm other people.
2. Thou shalt not interfere with other people's computer work.
3. Thou shalt not snoop around in other people's computer files.
4. Thou shalt not use a computer to steal.
5. Thou shalt not use a computer to bear false witness.
6. Thou shalt not copy or use proprietary software for which you have not paid.
7. Thou shalt not use other people's computer resources without authorization or proper compensation.
8. Thou shalt not appropriate other people's intellectual output.
9. Thou shalt think about the social consequences of the program you are writing or the system you are designing.
10. Thou shalt always use a computer in ways that insure consideration and respect for your fellow humans.

<www.ccsr.cse.dmu.ac.uk/resources/professionalism/codes/cei_command.html>.

English Spelling Is Torchur

Some predikshuns just don't cum troo. Consider ower confusing English spelling. Ask any EAL stoodent, and he or she can give you lots of eggsamples. How about bough or colonel or knife? It's pretty klear that English is meant to befuddle.

In 1900, linguists thought that American English could use some simplification and economizing. According to the *Ladies Home Journal* of December 1900, by the year 2000 there would be no C, X, or Q in the alphabet. Their reasoning was there would be no need for these letters. They predicted that phonetic spelling would be the norm and that English would be the language most often spoken in the world, with Russian being the second most common language.

Internet Shorthand

The Internet has spawned a whole new subdivision of the language. I do not refer to legitimate neologisms, such as ".com" or "dotcom," "website," and "homepage," but to the new shorthand that looks like this: "Thnk u 4 ur msg i rly preshate it" (Thank you for your message. I really appreciate it.).

This kind of arbitrary use of abbreviations and (more or less) phonetic spelling makes several statements about the author, none of them complimentary: 1) He or she is lazy. Just how much effort is required to use the shift key to distinguish the pronoun *I* from the letter *i* or to mark the first word of a sentence? 2) He or she is probably a bad speller and wants to hide this unpleasant truth. 3) He or she is oblivious to the function of punctuation, regards it as mere decoration, and therefore has (from sheer ignorance) discarded it. 4) He or she is unaware that the purpose of writing is to communicate as clearly as possible with the reader, not to present symbols to be decoded. A writer's first obligation is to make the reader's task easy. Writing in code arrogantly ignores this silent contract that exists between reader and writer.

Furthermore, this style of writing (though style is too dignified a term for it) reveals a juvenile propensity to adopt anything that is new, with no consideration to whether it is good or bad. It says: "Whoa! Look at me! Ain't I trendy and cute." Sorry, baby, you "ain't"; you are just an annoying and immature hack, with no comprehension of or respect for civilized communication.

I reluctantly concede some minor exceptions. For instant messaging or real-time, online communications—particularly those that are one-to-one—shorthand is permissible because of time constraints, provided the parties in the exchange both (or all) agree to it. For expressing emotional reactions visually (via emoticons or agreed-upon acronyms such as LOL for Laughing Out Loud), Internet lingo has a limited value.

LOL

Otherwise, Internet shorthand is an abomination. It is linguistic anarchy, a frightening symbol of the "dumbing down" of communication.

:-) :-o

Source: <http://www.grammarmudge.cityslide.com/page/page/232347.htm>.

Bane or Boon: The Impact of "Text Messaging" on Student Writing

February 14, 2003

Adapting to a world of ever-shorter screens and ever-longer laundry lists of activities, today's tech-savvy teens are creating a whole new language of abbreviations as they use cell phones and computers to correspond via short electronic communications called "text messages." But the rise of this new form of alphabet-soup shorthand has educators debating its effect on students' writing habits.

The text messages on 13-year-old Margarete Stettner's cell phone are filled with shortcuts like "G2G" for "got to go" and "LOL" instead of "laughing out loud." Even when she isn't using her phone, the lingo sometimes makes its way into what she writes.

"It does affect, sometimes, how I do my schoolwork," the teen from Hartland, Wis., said as she shopped in a mall, where cellular phones are as common as low-cut jeans. "Instead of a Y-O-U, I put a U."

That alarms some educators and linguists, who worry that the proliferation of text messaging—where cell phone users type and send short messages to other phones or computers—will enforce sloppy, undisciplined writing habits among American youths. Other experts, though, don't think the abbreviations will leave their mark on standard English.

In June 2001, wireless phone users sent 30 million text messages in the United States, according to the Cellular Telecommunications and Internet Association, an industry trade organization. By June 2002, that number had increased to nearly 1 billion.

The method is most popular among teenagers, according to Upoc Inc., a New York-based firm that helps users of mobile devices share information on everything from the rapper Bow Wow to celebrity sightings. A study by Upoc in 2001 found 43 percent of cellular phone users ages 12 to 17 used text messaging, compared with 25 percent of those ages 30 to 34.

These teenagers, hampered by limited space and the difficulty of writing words on numeric phone keypads, helped create the text-messaging lingo.

Words are abbreviated (**"WL"** for **"will"**), and common phrases become acronyms (**"by the way"** turns into **"BTW"**). There are even dictionaries to sort out the meaning of, say, **"AFAIK"** (**"as far as I know"**).

"SOL" can mean **"sooner or later"** or **"sadly out of luck,"** but if you're unclear on which was meant, simply message back a **"W"** (**"what"**) or **"PXT"** (**"please explain that"**) for a clarification.

Jesse Sheidlower, principal editor of the U.S. office of the Oxford English Dictionary, said text messaging is going through the natural progression of language.

(continued)

Bane or Boon: The Impact of "Text Messaging" on Student Writing (continued)

Much text-messaging lingo was first used in instant-messaging programs on personal computers, and some phrases, such as **"SWAK"** for **"sealed with a kiss,"** have been used for decades, Sheidlower said.

As text messengers discover and share new abbreviations and acronyms, the language becomes familiar to a growing population of cell phone users. And as more people use the lingo for text messaging, Sheidlower said, it is more likely to spill into speech or writing.

That worries American University linguistics professor Naomi Baron, who said text messaging is another example of a trend in written communication.

"So much of American society has become sloppy or *laissez faire* about the mechanics of writing," Baron said.

Problems arise when people use the casual language in other forms of written communication, such as email, in which the sender might not receive the message for some time, or writings in which the reader might not even know the author, she said.

But other linguists said a simpler, more relaxed vernacular is acceptable for talking or text messaging.

"Language and languages change," said Carolyn Adger, director of the Language in Society Division of the Center for Applied Linguistics in Washington, D.C. "Innovating with language isn't dangerous."

And besides, Adger said, text messaging—like email and instant messaging—is making it easier for people to communicate.

"I think that all of this stuff is really wonderful, because it's expanding the writing skills of people," she said.

Chris Mahoney, director of technology for the Lake Hamilton School District in Arkansas, agreed.

"I think the students are actually writing more and are benefiting from instant messaging, simply because it encourages them to write and it is something they are interested in," Mahoney said. "They are using acronyms, but writing more that they would in a normal note or paper. Students are verbalizing and learning communication skills while using these new technologies. Teachers are holding students to the same grammatical standards in formal writing and, for the most part, do not accept linguistic shortcuts in their classrooms," he added.

Text messaging hardly appears to have hurt written language in Europe, where 10 billion text messages are sent each month, said Charles Golvin, senior analyst with Forrester Research.

In fact, as more adults began using text messaging in Britain and Germany, the lingo fell out of favour, said Alex Bergs, a visiting linguistics professor at the University of Wisconsin-Milwaukee. Even teenagers use the language for only a while, he said.

One teen in Milwaukee, college student Jeremy Rankin, spends quite a bit of time using wireless devices in his job at a cell phone store. The 18-year-old admits he sometimes finds himself abbreviating when he types.

"I might do it by accident, but I don't think that's a problem as far as school papers go," he said. "I proofread my stuff."

Text Messaging: Boon or Bane

By Ruby Jane L. Cabagnot

The proliferation of text messaging, as short message service (SMS) is known locally, has created a whole new culture in the country—it changes the way we communicate in more ways than we are aware of.

Yet, even as this phenomenon seeps into our society, opinions and sentiments are divided on whether this technological advancement is a boon or bane.

This new culture belongs to the Gen-txt community—as one local mobile phone service company has aptly described the people that have created for themselves a different way of communicating. And as the texting-proficient would put it: cd vwls dspr frm lng'ge altgthr? or cd evry wrd wd b nw abbrvtd?

Peter Fernandez, information technology professor at the Asian Institute of Management, expressed ambiguous feelings towards this texting boom, which he claims is already a culture here in the Philippines. He attributed the cradle of this culture to a medium that is relatively cheap and something that anybody can use—even "people who don't know how to spell properly."

"Text messaging is already a generational culture here in the Philippines, no matter how much we deny or ignore the fact," he said.

DUBIOUS DISTINCTION

Analysts said that there are about 4.5 million mobile phone users in the country today, and that among them about 60 million text messages are being exchanged in a day.

"It has been (an) accepted (fact) that the capability in English communications of high school or even college students is quite lacking, and I think that this could even be exacerbated by this technology," he said.

But Mr. Fernandez believed that since cultural problems generated by the wrong use of SMS are technology-driven, then chances are new technology would be the one to provide solutions. "With the availability of a much more convenient way of a correcting mechanism, then the minor de-skilling brought about by text messaging might be corrected gradually," he added.

Selwyn Clyde Alojipan of Mosaic Communications and a sometime high school teacher could not agree more, pointing out that "as technology advances, it will be possible to enhance the current SMS-input interface (keypads) with either dictionary-aided shortcuts, voice recognition, or other still-to-be-discovered means."

But although he believes that the extremely abbreviated spelling mode of texting might eventually fade away, he qualified in his email remark to *I.T. Matters* that people could still continue to communicate this way "even when the need for this has passed, if it has become so ingrained in people."

QUESTIONABLE SKILL

He is not overly concerned about that, however, because as he said "as with any popularly accepted activity of social convention, breaking or bending the spelling and grammar rules of our languages requires enough knowledge on what rules you can break, so that you can get away with it without being shunned."

Mr. Alojipan pointed out that "this type of activity can be done better by those who know the rules of language well than by those who do not. For instance, instead of asking "do you understand" you can now type, "do u undrstnd or Gets mo?" (Did you get it?), which is a major saving texting effort." The examples are endless: BCNU (be seeing you); XLNT (excellent); CUL8R (see you later); OIC (oh, I see); etc.

"I'm actually thrilled that a new form of communication is being developed by the people which matches their daily needs. It does not mean that traditional skills in English and Filipino spelling (or grammar) will necessary weaken," Mr. Alojipan said.

There are those who do not share his sentiments, however.

One speech teacher observed that although this use of SMS seems to enhance the creative skills of students, particularly when they try to think of ways to abbreviate or shorten words, it could likewise erode or stunt the vocabulary of students because they could soon start using simple words to express themselves.

(continued)

Text Messaging: Boon or Bane (continued)

Ateneo de Manila high school teacher, Paul Anthony Villegas, for one, has seen the effect of the kind of language use in texting on the essays of some of his students, who would tend to write, for example, the words: 4u or 2gthr yrs l8r or cd u ndrstnd wat m tlkng abt hr?

ALARMING PROPORTIONS

More alarming, he said, is not only the way these students would delete certain letters—mostly vowels—in certain words, but how they would also use shortcuts on sentence construction conventions. "Some students get too comfortable and apply the kind of shortened language in their compositions," he noted.

Mr. Villegas expressed concern that if this were to become habitual and embedded in a student's mentality, he might find it difficult to write better compositions, formal letters, or—worse still—documents and reports in an increasingly interdependent and fiercely competitive global economy.

La Salle Greenhills High School principal Lilia Vengco admitted that some teachers have complained of finding SMS language on some of their students' compositions, especially when text messaging started to become so popular among the youth.

Still, she downplayed the supposedly negative effect of this SMS technology on the educational formation of her wards. "I would like to think that they really know the correct spelling and grammar structure. And besides, we do not tolerate that kind of language in this school," she said.

To discourage the use of texting language in essays and compositions, both schools said they give deductions on a student's grade, while the use of mobile phones during and in-between classes has been banned.

Some high schools students say, however, that it is the "in" thing to do nowadays and the "shorter it is, the better," although they claimed they would be the first ones to say that SMS form is not the proper way to write English or Tagalog.

Mst f d tym dey usd ds knd f lng'ge 2 tlk 2 1 anthr nt 1ly n txt bt evn n wrtng ltrs 2.

Others even added that this "new skill of shortening words" helps them whenever they have to take down dictations.

But while Mr. Alojipan stressed that in order for someone to play around with spelling, he or she must have a relatively good understanding of spoken or written language, he admitted that "students should be guided that each form or mode of communication has its uses, advantages, and disadvantages, and that they must make sure that no matter how they send the message, it must still be understood by the recipient."

DANGER OVERSTATED?

Still, one is compelled to ask about the implications, if any, of the texting culture on the educational formation of our youth today—never mind the so-called professionals because, as AIM professor Mr. Fernandez said, they already have at least developed their communication skills.

"I am not saying that it will reduce our capability in communicating in English, but the form, specifically the written form, might be affected," Mr. Fernandez said.

He warned that rules are even more stringent in written than oral form in most languages.

One sure effect, he said, is that "English becomes ugly.

"It gets into your system, and if it gets into your system then chances are you are going to use it when you write, and this would impact (on) the college and high school students more profoundly, considering that text messaging is being widely used by these people," Mr. Fernandez said.

On the other hand, he said that this technology is creating a sense of community and making it easier for people to communicate with one another.

"There is also a positive impact, so the question is: with the minimal de-skilling that you get out of these technology—is it big enough to not justify the positive impact?" he asked.

Mr. Alojipan, for his part, opined that the "feared spelling and grammar breakdown is not a problem and won't cause the collapse of Filipino society."

Text Messaging No Effect on English Proficiency: Study

THE PRACTICE of using abbreviated spelling and grammatical shortcuts when sending short text messages on mobile phones had little or no impact on the senders' proficiency in the English language, a Philippine university study said.

The study, which involved 433 freshmen English students from De La Salle University in Manila and the University of the Philippines campus in Los Baños, Laguna, south of Manila, found that there were no significant differences in the grammar and spelling scores of mobile phone owners and non-owners.

Study author Mildred Rojo-Laurilla, an assistant professor at De La Salle University's department of English and applied linguistics, also found that students were still able to discern the difference between conventional English and the abbreviated English used in "texting."

The study found that respondents used a mix of English and Filipino words whenever they sent text messages.

The study's results were released amidst concerns that the abbreviations and phonetic spelling that text messaging users employed to get around tight character limitations and cumbersome phone keyboards would affect their ability to write conventional English.

President Gloria Macapagal-Arroyo, saying the country was losing its proficiency in English, recently ordered that English be reinstituted as the medium of instruction in Philippine schools instead of Filipino.

Source: <http://www.inq7.net/inf/2003/feb/03/text/inf_2-1-p.htm>. Author unknown.

Anticipation Guide: Playing Computer Games

Directions: Rate each statement according to the Strongly Agree/Strongly Disagree continuum and explain your choices. (You may be asked to write about them on a separate sheet of paper.) Then, in your groups, discuss each statement. You must come to consensus in your rating. (Optional: Ask two people outside your high school and over 19 years of age to rate these statements. How do their answers compare with yours?)

1. Playing computer games affects players more positively than negatively.

   ❑ strongly disagree ❑ disagree ❑ depends ❑ agree ❑ strongly agree

2. Most players cannot exert self-control in limiting the amount of time they play computer games.

   ❑ strongly disagree ❑ disagree ❑ depends ❑ agree ❑ strongly agree

3. Playing computer games helps develop important skills.

   ❑ strongly disagree ❑ disagree ❑ depends ❑ agree ❑ strongly agree

4. Playing computer games does not have any impact on one's level of physical fitness.

   ❑ strongly disagree ❑ disagree ❑ depends ❑ agree ❑ strongly agree

5. Computer games are only a passing fancy.

   ❑ strongly disagree ❑ disagree ❑ depends ❑ agree ❑ strongly agree

6. Playing computer games is a social activity.

   ❑ strongly disagree ❑ disagree ❑ depends ❑ agree ❑ strongly agree

7. Playing computer games can cause physical problems.

   ❑ strongly disagree ❑ disagree ❑ depends ❑ agree ❑ strongly agree

Graphic Organizer: Kevin and Joo

Questions	Kevin	Joo
Began playing when?		
Reasons for playing?		
How many hours per day?		
Effect of video games on students' lives? Recreation? Studying? Physical fitness? Socializing?		
Any positive aspects?		
Effect on obsessed/addicted players?		
Plans to control habit?		

Survey Instrument

This is a survey designed to gather information on students' video game habits. This survey is completely anonymous. Please do not put your name on the survey, but answer all questions as completely and honestly as possible. Thank you for your help. Your responses are a valuable contribution to this research.

For the purposes of this survey, "video games" refers to any electronic game that you play strictly for entertainment, alone or with others. This may include home video consoles (Playstation, Nintendo, etc.), computer games of all types (Solitare, Doom, etc.), online games (Everquest, MUDs), arcade games, or any other type of electronic games you play for amusement.

1. When was the last time you played a video game?
   TODAY THIS WEEK THIS MONTH THIS YEAR LESS RECENTLY NEVER
2. About how many times in an average week do you play video games? _____ times
3. About how many hours per week do you think you spend playing video games?_____ hrs.
4. What is the approximate value of the video games and related equipment in your home? $_____
   (Do not include computers or other equipment purchased primarily for other purposes.)
5. Among your leisure activities, where would you place video games?
   MOST IMPORTANT VERY IMPORTANT SOMEWHAT IMPORTANT
   NOT VERY IMPORTANT NOT AT ALL IMPORTANT
6. How often would you say video games have taken time away from other activities?
   VERY OFTEN OFTEN OCCASIONALLY RARELY NEVER
7. How and to what extent has time spent playing video games affected your performance in school?
   VERY NEGATIVELY SOMEWHAT NEGATIVELY NO EFFECT ON SCHOOL
   SOMEWHAT POSITIVELY VERY POSITIVELY
8. Has playing video games affected other aspects of your life? (Check all that apply)
   _____WORK
   _____OTHER HOBBIES/PROJECTS
   _____SLEEP
   _____HYGIENE
   _____CHORES
   _____SOCIAL LIFE
   _____RELATIONSHIPS
   _____OTHER (PLEASE DESCRIBE)

   _____

   _____

   IF YOU DID NOT CHECK ANY CHOICES ON QUESTION 8, SKIP TO QUESTION 10
   IF YOU CHECKED ANY CHOICES ON QUESTION 8, PLEASE ANSWER QUESTION 9:

(continued)

Source: <http://www.unc.edu/~jivory/app.html>. Cited from James D. Ivory's master's thesis, University of Wyoming. Reprinted by permission.

Survey Instrument (continued)

9. How has playing video games affected the above aspects of your life?

VERY NEGATIVELY SOMEWHAT NEGATIVELY NO EFFECT AT ALL
SOMEWHAT POSITIVELY VERY POSITIVELY

10. Overall, how much is your general productivity affected by time spent playing video games?

MUCH LESS PRODUCTIVE LESS PRODUCTIVE NO EFFECT AT ALL
MORE PRODUCTIVE MUCH MORE PRODUCTIVE

11-16: Complete these items by indicating how true you think the statements are about YOU :

11. I wish I did not play video games as much as I do.

STRONGLY DISAGREE DISAGREE UNSURE/NEUTRAL
AGREE STRONGLY AGREE

12. I would be better off if I spent less time playing video games.

STRONGLY AGREE AGREE UNSURE/NEUTRAL
DISAGREE STRONGLY DISAGREE

13. My video game play bothers other people I know.

STRONGLY DISAGREE DISAGREE UNSURE/ NEUTRAL
AGREE STRONGLY AGREE

14 I would be healthier if I played fewer video games.

STRONGLY DISAGREE DISAGREE UNSURE/ NEUTRAL
AGREE STRONGLY AGREE

15 I think that other people may become addicted to video games.

STRONGLY DISAGREE DISAGREE UNSURE/NEUTRAL
AGREE STRONGLY AGREE

16 I am addicted to video games.

STRONGLY DISAGREE DISAGREE UNSURE/NEUTRAL
AGREE STRONGLY AGREE

17. What is your age?_____

18. What is your gender? M F

19. What is your class standing?

FRESHMAN SOPHOMORE JUNIOR SENIOR
2nd DEGREE GRAD OTHER

20. Where do you live while attending school?

DORMITORY/UW HOUSING GREEK HOUSING OFF-CAMPUS ALONE
OFF-CAMPUS WITH OTHERS WITH FAMILY/PARENTS OTHER

21. When do you expect to graduate? (Term and year) _____

Biotechnology Attitudes Survey

On a scale of 1 to 4, mark your response to each statement.

Strongly agree	Agree	Disagree	Strongly disagree
1	2	3	4

a) Farmers have been doing genetic engineering for thousands of years as they breed traits they want in crops and livestock.	1	2	3	4
b) The potential danger in genetic engineering is far greater than the danger of using chemicals in agriculture.	1	2	3	4
c) Foods that contain genetically modified ingredients should be clearly labelled.	1	2	3	4
d) Genetic engineering may decrease the diversity of plant and animal species.	1	2	3	4
e) Improvements in food production achieved through biotechnology could help feed millions of hungry people.	1	2	3	4
f) It's acceptable to change genes between plant species and between animal species, but scientists should not change genes between plants and animals.	1	2	3	4
g) Scientists should not try to change the genes of human beings.	1	2	3	4
h) If I had a serious disease that could be treated by injecting me with genetic material from a frog, I would let the doctors treat me.	1	2	3	4
i) It would be acceptable to choose the characteristics of our children through genetic engineering, if it were possible.	1	2	3	4
j) Biotechnology research should be controlled by the government.	1	2	3	4

Genetic Engineering—Introduction

Genetic engineering, genetic modification (GM), and gene splicing (once in widespread use but now deprecated) are terms for the process of manipulating genes in an organism, usually outside of the organism's normal reproductive process.

It often involves the isolation, manipulation, and reintroduction of DNA into model organisms, usually to express a protein. The aim is to introduce new genetic characteristics to an organism to increase its usefulness, such as increasing the yield of a crop species, introducing a novel characteristic, or producing a new protein or enzyme. Examples are the production of human insulin through the use of modified bacteria and the production of new types of mice like the OncoMouse (cancer mouse) for research, through genetic redesign.

Since a protein is specified by a DNA segment or gene, future copies of that protein can be modified by changing the gene's underlying DNA. One way to do this is to isolate the DNA, cut it, and splice in a different DNA segment. Daniel Nathans and Hamilton Smith received the 1978 Nobel Prize in physiology or medicine for their isolation of restriction endonucleases, which are able to cut DNA at specific sites. Together with ligase, which can join together fragments of DNA, restriction enzymes formed the initial basis of recombinant DNA technology.

Naming

Genetic modification or genetic manipulation are claimed to be neutral and possibly more technically correct terms for what is claimed, controversially, to be genetic engineering. Opponents question whether the concept of "modification," with its implications of progress, are applicable here.

Many opponents of the use of the term "genetic engineering" argue the operations of genes in combination with cell biochemistry are rather poorly understood and sometimes lead to unexpected side effects.

Reluctance to recognize this field as "engineering" has become popular in the anti-globalization movement and safe trade movement, and is also widely held by most Green parties, and the major parties of France and Germany, which have resisted any agricultural policy favouring genetically modified food.

These groups tend to resist the label "engineer" as applied to such genetic modification most strongly.

Defenders of the term "genetic engineering" argue that animal husbandry and crop breeding are also forms of genetic engineering that use artificial selection instead of modern genetic modification techniques. It is politics, they argue, not economics or science, that causes their work to be closely investigated, and for different standards to apply to it than to other fields of engineering. These scientists, however, do not object to the term "genetic modification" as applied to what they do, although it is sometimes used to deny them the status of professionals serving society in an ethical manner, which is one implication of the term engineer.

The term "genetic engineering" is sometimes informally abbreviated as "genegineering."

Ethics

Genetic engineering proponents argue that the technology is not harmful and necessary for food production to continue to match population growth. However, some argue that it's not a problem of food production but of food distribution, and that the population growth is actually a result of uneven distribution of food (and wealth).

Others oppose genetic engineering on the grounds

(continued)

Genetic Engineering Introduction (continued)

that genetic modifications may have unforeseen consequences, both in the initially modified organisms and their environments. For example, certain strains of maize have been developed that are toxic to plant-eating insects (e.g., bt corn). However, when those strains cross-polinated with other varieties of wild and domestic maize, the relevant genes were passed on in unintended ways. This modified the very gene pool from which the maize was derived.

Anti-genetic-engineering groups propose that genetic releases such as this represent the opening of a Pandora's box which may ultimately accelerate the collapse of the modern system of agriculture, decreasing rather than increasing the food supply. They say that with current recombinant technology there is no way to ensure that genetically modified organisms remain under control, and the use of this technology outside of secure laboratory environments carries grave risks for the future.

Many also fear that certain types of genetically engineered crops will enable the elimination of all biodiversity in the cropland; herbicide-tolerant crops will for example be treated with the relevant herbicide to the extent that there are no wild plants ("weeds") able to survive, and plants toxic to insects will mean insect-free crops. This could result in major declines in other wildlife (e.g., birds), which depend on weed seeds and/or insects for food resources. The recent (2003) farm scale studies in Britain found this to be the case with GM sugar beet and GM oilseed rape, but not with GM maize (though in the last instance, the non-GM comparison maize crop had also been treated with environmentally damaging pesticides subsequently [2004] withdrawn from use in the EU).

Proponents of current genetic techniques as applied to food plants cite the benefits that the technology can have, for example, in the harsh agricultural conditions of third world countries. They say that with modifications, existing crops would be able to thrive under the relatively hostile conditions, providing much needed food to their people. While submitting that precautions should be made to ensure that any modified crops are contained, they say that their genetically engineered crops are not significantly different from those modified by nature or humans in the past, and by extension are not dangerous to other crops. The expansion of new croplands into areas currently too harsh to grow crops is also likely to have deleterious effects on the wildlife currently using these uncultivated areas. There is gene transfer between unicellular eukaryotes and prokaryotes. There have been no known genetic catastrophes as a result of this.

Economic and Political Effects

Many opponents of current genetic engineering believe the increasing use of GM in major crops has caused a power shift in agriculture towards biotechnology companies gaining far greater control over the production chain of crops and food then any previous industry, and over the farmers that use their products, as well.

Many proponents of current genetic engineering techniques believe it will bring higher yields and profitability to many farmers, especially those in third world countries.

In April 2004 Hugo Chávez announced a total ban on genetically modified seeds in Venezuela.

Genetic Engineering: Thought Flow Exercise

Start with sentence 1 and draw an arrow to connect the other sentences in the correct order. Underline the discourse markers that refer back to previous sentences or ideas. Compare your sequence with the original.

However, some argue that it's not a problem of food production, but of food distribution. However, when those strains cross-pollinated with other varieties of wild and domestic maize, the relevant genes were passed on in unintended ways. And that the population growth is actually a result of the uneven distribution of food (and wealth). Others oppose genetic engineering on the grounds that genetic modifications may have unforeseen consequences, both in the initially modified organisms, and their environments.	For example, certain strains of maize have been developed that are toxic to plant-eating insects. Genetic engineering proponents argue that the technology is not harmful and is necessary for food production to continue to match population growth. This modified the very gene pool from which the maize was derived.

WHO	to WHOM	WHAT	COMMENT

GM Foods—The Debate

Scan the following abstracts taken from EBSCO, a research database. For each one, determine the main idea about GM foods in the article and how the ideas are developed. Which articles would be useful if you wanted to argue for or against GM foods? Does the WHO and TO WHOM affect the WHAT?

Note: The words ***GM*** and ***foods*** are in bold because those were the search terms used.
Note: The *Lancet* is a British medical journal.

Title:	Europe imposes strict ***GM-food*** laws.
Subject(s):	GENETICALLY modified foods—Government policy; LABELS—Law & legislation; COMMERCIAL policy; CONSUMER protection—Law & legislation; PRODUCT safety; TRADE regulation; FOOD law & legislation; EUROPEAN Parliament
Source:	Lancet, 7/12/2003, Vol. 362 Issue 9378, p135, 2/3p, 1c
Author(s):	Bosch, Xavier
Abstract:	Reports that the European Parliament approved two proposals that established as system to trace and label ***food*** and feed products made with genetically modified ingredients. Argument of environmental groups that there is no evidence showing genetically modified ***foods*** are safe in the long-term; Reaction of the U.S. government; Praise of the Parliament's decision by Greenpeace.

Note: *New Scientist* is a British magazine that reports science developments to the educated public.

Title:	UN is slipping modified ***food*** into aid.
Author(s):	Pearce, Fred
Source:	New Scientist; 9/21/2002, Vol. 175 Issue 2361, p5, 3/4p, 1c
Document Type:	Article
Subject(s):	GENETICALLY modified foods FOOD relief UNITED Nations.—World Food Program DROUGHTS
Abstract:	Focuses on the genetically modified ***food (GM)*** serving as emergency aid from the United Nations World ***Food*** Program. Countries receiving the aid; Allegations that the U.S. is exploiting the drought in Southern Africa to drum up markets for its unsold ***GM*** maize and soya; Rejection of Zambian president Levy Mwanawasa on the **GM food** aid.

(continued)

GM Foods—The Debate (continued)

Note: The World Health Organization is a United Nations agency.

Title:	***UN*** to ***help developing countries assess safety*** of ***GM crops.***
Author(s):	Hagmann, Michael
Source:	Bulletin of the World Health Organization; 2002, Vol. 80 Issue 4, p336, 3p
Document Type:	Article
Subject(s):	GENETICALLY modified foods HEALTH risk assessment—Developing countries UNITED Nations—Environmental policy AGRICULTURAL biotechnology—Developing countries
Abstract:	Reports on the attempts of the Nairobi, Kenya-based United Nations Environmental Program to ***help developing countries assess*** the ***safety*** of genetically modified (***GM***) ***crops***. Principles of risk assessment for ***GM*** foods; Application of agricultural biotechnology to reduce world poverty; Increase in public investment in poverty-oriented agricultural research.

Note: What does the title of the following publication imply? What do you think the title of the article is trying to say?

Title:	***Pharming***
Subject(s):	GENETICALLY modified foods; FOOD—Health aspects; AGRICULTURAL innovations
Source:	Canada & the World Backgrounder, Mar2002, Vol. 67 Issue 5, p21, 6p, 1bw
Abstract:	Deals with the proliferation of genetically modified (***GM***) crops or ***foods*** around the world. Percentage of store-bought processed-foods with ***GM*** components in Canada; Arguments advanced by companies on the negative effect of switching back to conventional seeds; Health problems associated with GM food; Extent of consumer movement against ***GM foods***. INSET: ACCIDENTS DO HAPPEN.

Note: *Hydrocarbon Processing* is a magazine for the petrochemical processing industry.
What interest might its members have in this discussion?

Title:	***UN*** to ***help developing countries assess safety*** of ***GM crops.***
Author(s):	Whetton, Cris
Source:	Hydrocarbon Processing; Jun99, Vol. 78 Issue 6, p119, 5p, 1bw
Document Type:	Article
Subject(s):	TRANSGENIC plants FOOD—Health aspects GREAT Britain
Abstract:	Comments on the British public's concerns about genetically modified (***GM***) ***foods***. Role of activist groups, environmentalists and mass media in popularizing adverse information about ***GM foods***; Lack of proof that the risks of eating ***GM foods*** are any greater than the risks of eating unmodified ***foods*** such as eggs, pork, rhubarb and potatoes.

(continued)

GM Foods—The Debate (continued)

Note: Who is the intended audience for this article?

Title:	Effect of diets containing genetically modified potatoes expressing Galanthus nivalis lectin on rat small intestine.
Subject(s):	TRANSGENIC plants; POTATOES—Genetic engineering; LECTINS—Physiological effect; GASTROINTESTINAL system
Source:	Lancet, 10/16/99, Vol. 354 Issue 9187, p1353, 2p, 2 charts
Author(s):	Ewen, Stanley W.B.; Pusztai, Arpad
Abstract:	Diets containing genetically modified (***GM***) potatoes expressing the lectin Galanthus nivalis agglutinin (GNA) had variable effects on different parts of the rat gastrointestinal tract. Some effects, such as the proliferation of the gastric mucosa, were mainly due to the expression of the GNA transgene. However, other parts of the construct or the genetic transformation (or both) could also have contributed to the overall biological effects of the GNA-***GM*** potatoes, particularly on the small intestine and caecum. [ABSTRACT FROM AUTHOR]

Note: *Consumers' Research Magazine* is a Canadian independent magazine that offers practical advice to the general public.

Title:	Biotech ***Foods***: Right to Know What?
Subject(s):	FOOD—Labeling; UNITED States.—Food & Drug Administration—Rules & practice; UNITED States
Source:	Consumers' Research Magazine, Oct99, Vol. 82 Issue 10, p10, 5p
Author(s):	Spencer, Peter
Abstract:	Discusses the labeling of genetically modified (***GM***) ***foods*** in the United States. Definition of extra ingredients in ***food***; Reason for the clamor on the widespread and growing use of biotech-derived corn and soy ingredients in ***food*** products; Key factors behind the labeling mandates of the United States ***Food*** and Drug Administration.

Note: *Nation* is a U.S. news magazine, generally on the left politically.

Title:	***GM*** 'Assistance' for Africa.
Subject(s):	GENETICALLY modified foods; AGRICULTURE & state; FOOD—Biotechnology; HUMANITARIAN assistance, American; FOOD relief; EXPLOITATION
Source:	Nation, 8/4/2003-8/11/2003, Vol. 277 Issue 4, p7, 2p
Author(s):	Kanoute, Amadou
Abstract:	The author asserts that the administration of United States President George W. Bush is promoting biotechnology in Africa in order to provide so-called development assistance for U.S. farmers and to create new markets and business opportunities for U.S. agricultural businesses, but not, as it stated, to aid Africans. In late June, 2003 Bush spoke of Africa as a famine-stricken continent where the people are unable to grow enough ***food*** for themselves. According to the President, African farmers need biotechnology—and therefore should give a warm welcome to ***GM*** (genetically modified) seeds and ***foods*** supplied by U.S. agribusiness. (These announcements coincided with the U.S. decision

(continued)

GM Foods—The Debate (continued)

	coincided with the U.S. decision to proceed with a World Trade Organization suit against the European Union on genetically modified ***foods***.) Bush's assumptions are not accurate. Of course, some Africans are starving and many are chronically, poor, sick and hungry. But most Africans manage well in a difficult situation—growing crops that are adapted to their environment, with limited technology. Africans need many things to improve their lives—but biotechnology agriculture is not one of them. The insistence on using genetically modified (***GM***) corn as ***food*** aid rather than giving untied funds illustrates that "development assistance" is aimed at U.S. farmers rather than African needs. Unable to sell ***GM*** crops in the wider market, the United States prefers to subsidize surplus output as "***food*** relief." ***GM*** seed varieties have been of marginal benefit to American farmers, so they are likely to be even less beneficial in Africa, where around 70 percent of farmers are small-scale producers, saving seed from year to year. The challenge for African governments is to regulate and control the introduction of ***GM food*** and to adopt high standards of safety for ***GM*** products.

Note: The *Economist* is a general news magazine out of Great Britain.

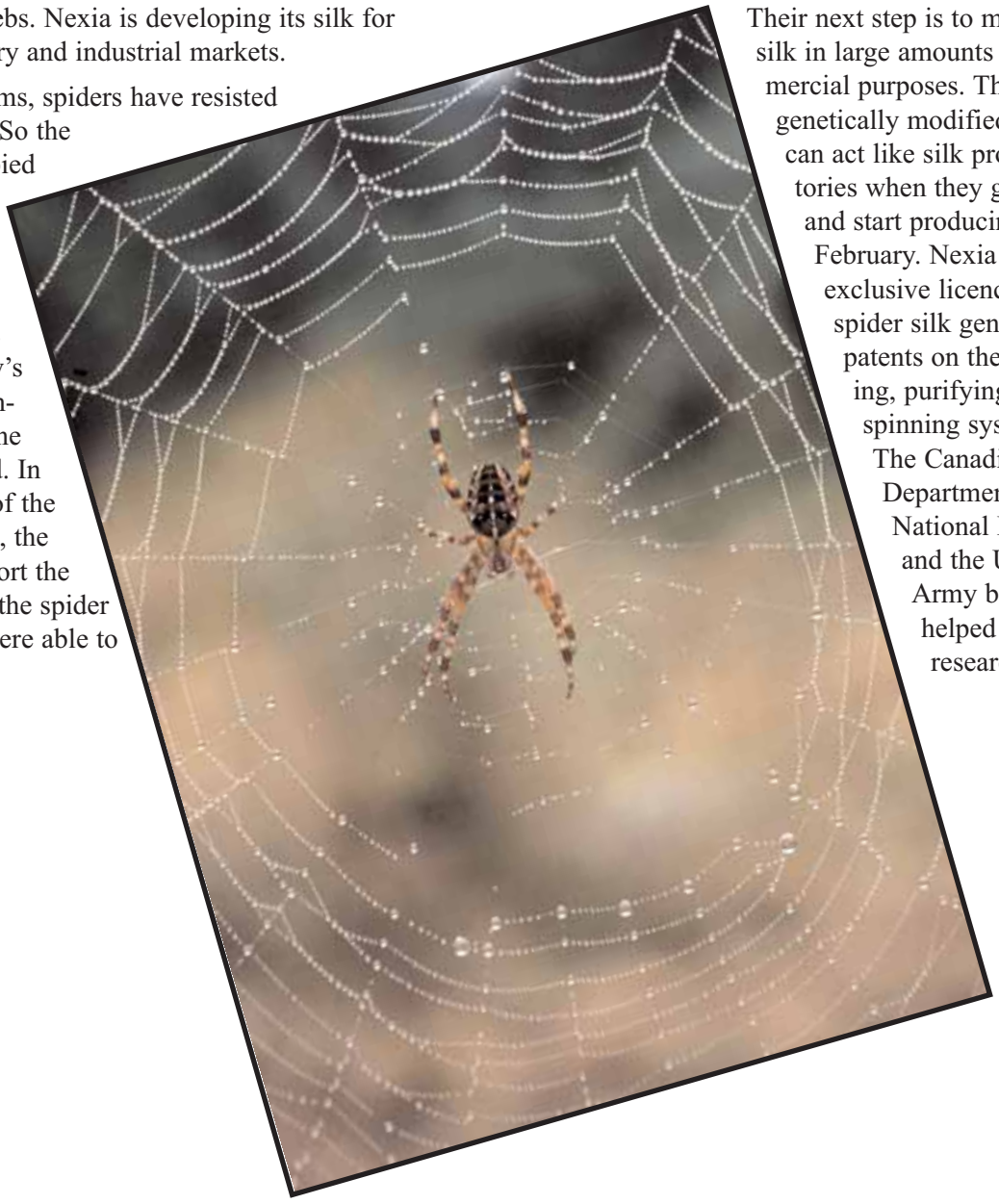
Title:	Far less scary than it used to be.
Subject(s):	GENETICALLY modified foods; PUBLIC opinion; CROPS—Genetic engineering; PLANT genetic engineering; FOOD—Safety measures
Source:	Economist, 7/26/2003, Vol. 368 Issue 8334, p23, 3p, 2 graphs, 2c
Abstract:	In Rochford, east of London, two dozen people gathered recently to discuss their hopes and fears about genetically modified (***GM***) ***food***. The assembled housewives, pensioners and farmers listened politely to a handful of guest speakers, and then they fired off questions: How can you be sure that ***GM food*** is safe to eat? The meeting in Rochford was one of more than 450 public gatherings in a month-long consultation exercise called "***GM*** Nation?". The exercise, which ended last week, is only one of several studies commissioned by the British government. Earlier this month, the Cabinet Office, a government department, published an assessment of the costs and gains of Britain embracing, or rejecting, ***GM*** agriculture. This week, a group led by the government's chief science adviser published a review of the scientific evidence of the risks and benefits of **GM** crops. The last time Britain saw such a flurry of interest in ***GM food*** was in 1999, when a series of events turned much of the population against "Frankenfoods" and drove the stuff from supermarket shelves. At issue are two broad types of genetic modification, which account for 99% of the almost 59m hectares of ***GM*** crops in commercial cultivation. One, called Bt, takes a gene from a bacterium and puts it in plants to give them resistance to certain insects without the use of chemical pesticides. The other uses genes also from bacteria and gives plants resistance to particular herbicides, such as glyphosate.

GM Spider Silk Spun by Canadian Company

MONTREAL – Genetically modified goats could soon produce milk loaded with spider silk tough enough to be used as body armour yet fine enough for medical sutures. Researchers at Quebec-based Nexia Biotechnologies have produced spider silk in mammalian cell cultures and found a way to spin it.

Spiders produce one of the toughest biological materials in their webs. Nexia is developing its silk for medical, military and industrial markets.

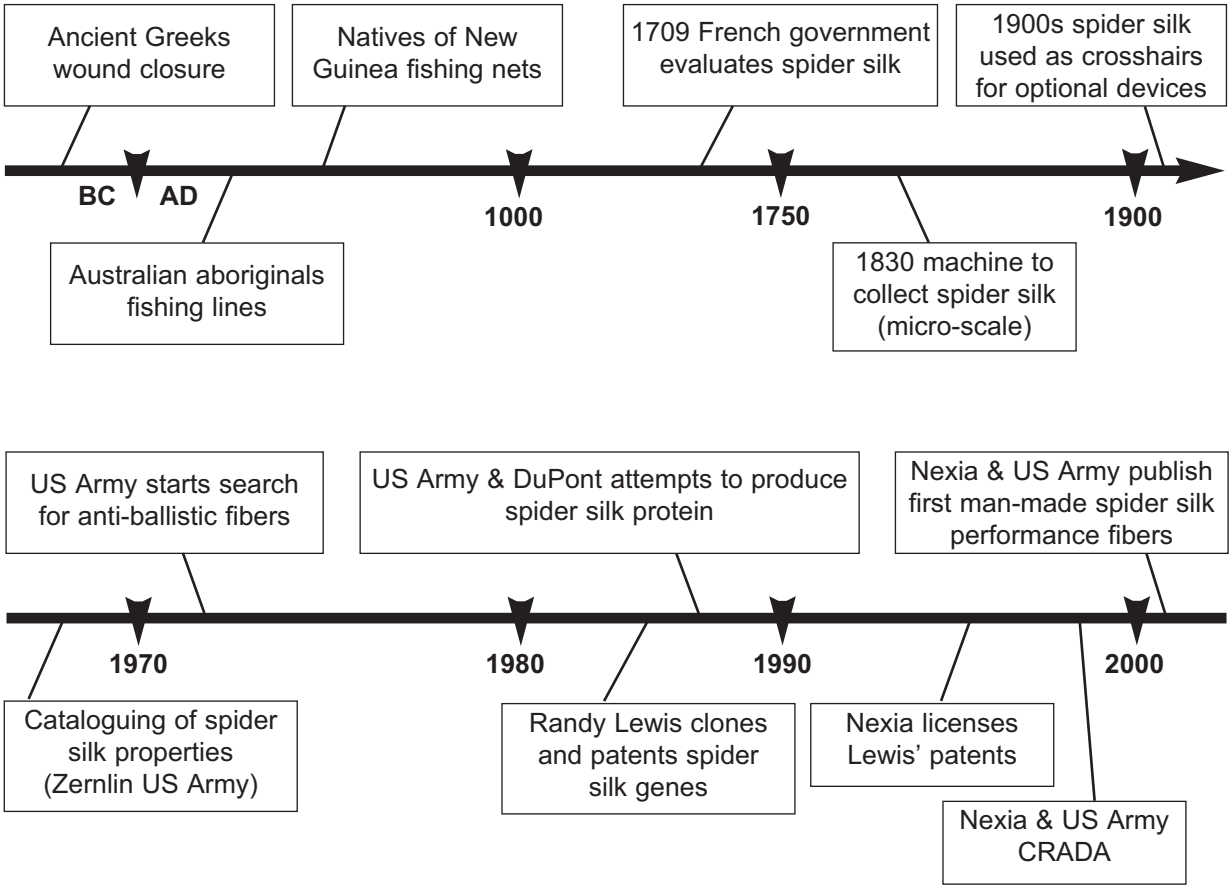
Unlike silkworms, spiders have resisted domestication. So the researchers copied the genes spiders use to make silk and inserted the genes into cells taken from cow's udders and hamsters to test if the process worked. In Friday's issue of the journal *Science*, the researchers report the cells produced the spider silk and they were able to squeeze it out.



Nexia president and chief executive officer Jeffrey Turner calls the product BioSteel®. "Mimicking spider silk properties has been the Holy Grail of material science for a long time and now we've been able to make useful fibres," Turner said in a release. The fine silk proteins were spun from an aqueous solution and are probably biodegradable, Turner said.

Their next step is to make the silk in large amounts for commercial purposes. The female genetically modified goats can act like silk protein factories when they give birth and start producing milk in February. Nexia has an exclusive licence to the spider silk genes and patents on the culturing, purifying and spinning systems. The Canadian Department of National Defence and the U.S. Army both helped fund the research.

The History of Spider Silk



"Plug in a Car and Give It Some Juice"/Quotation

by Matt Villano

Dan Bocek of Burbank, California, begins his daily morning commute by unplugging his car from an electrical outlet in his garage. Then he drives 30 miles to his office in Alhambra and plugs it in again.

Bocek's wife drives a gasoline-powered car, and at the end of every month, he says, the two compare expenses. Hers costs them about $80 a month; his costs only $4.

If only Thomas Edison could see the Bocek family today. In 1919, while he commercialized an electric battery of his own, Edison predicted widespread popularity for electric cars like Bocek's. Edison's battery ran on a direct current, and from his laboratory in West Orange, N. J., he said the invention could be the key to cheaper, more efficient transportation. "In fifteen years, more electricity will be sold for electric vehicles than for light," he said.

Source: <http://future.newsday.com/4/fbak0430.htm>. [28 June, 2003].

Quotation

"The cost of oil dependence has never been so clear… Oil is an indulgence we can no longer afford, not just because it will run out or turn the planet into a sauna, but because it inexorably leads to global conflict… What we need is a massive, Apollo-scale effort to unlock the potential of hydrogen, a virtually unlimited source of power… The technology is at the tipping point."

—Peter Schwartz and Doug Randall from *Wired*'s cover story in April 2003, "How Hydrogen Power Can Save America"

Source: The Hydrogen Economy.

http://www.stuartenergy.com/media_center/photo_gallery.html.

Questions: To Drive or to Heat, That Is the Question

1. Name three companies marketing the pollution-free hydrogen fuel cell vehicle.

   a. _____

   b. _____

   c. _____

2. a. What two things do these environmentally friendly cars combine to make electricity?

      i. _____

      ii. _____

   b. What two byproducts are left?

      i. _____

      ii. _____

3. When hydrogen gas is combined with oxygen and a catalyst, such as platinum, what is the resulting chemical reaction called?

   _____

   _____

4. Who is impressed with these vehicles because they omit no pollution?

   _____

   _____

5. a. How much of the world's oceans is made up of hydrogen?

   _____

   b. What remains a problem?

   _____

   _____

   _____

6. Name two ways hydrogen gas can be obtained or produced.

   a. _____

   b. _____

(continued)

Questions: To Drive or To Heat, That Is the Question (continued)

7. Hybrid vehicles have a secondary fuel source to help with what two things?

   a. _____

   b. _____

8. Under how much pressure is the hydrogen used as the primary source of fuel?

   _____

   _____

9. Name two types of secondary sources.

   a. _____

   b. _____

10. a. What company is testing a prototype heavy-duty transit bus to be propelled by a hydrogen fuel cell?

    _____

    b. In what city and province will this occur?

    _____

    c. What is the significant new function this bus will offer?

    _____

    d. List one reason Manitoba could be an important player in this process.

    _____

    e. What is important about electricity that comes from a renewable source?

    _____

    _____

    _____

To Drive or To Heat, That Is the Question (continued)

The vehicle of tomorrow is finally becoming a choice for today. The pollution-free hydrogen-fuel-cell vehicle is being marketed by successful car companies such as Toyota, Ford, and Honda. Daimler Chrysler is creating them in Europe. These environmentally friendly cars, which combine hydrogen from a tank and oxygen from the air to make electricity, leave as their only byproducts air and water. Amazing. But what if there were other uses for these vehicles? Imagine being able to travel pollution-free and use the same vehicle to heat your home!

First, a little background about the hydrogen cell as a fuel source. Essentially, hydrogen gas contained in a cylinder is combined with oxygen and a catalyst, such as platinum. The resulting chemical reaction, referred to as cold combustion, produces electricity to drive an electric motor. Environmentalists are impressed with the technology because hydrogen-powered vehicles emit no pollution at the point of use. In addition, hydrogen is the most abundant element in the universe, making up two-thirds of the oceans of the world; it cannot be monopolized by any country. Unfortunately, producing high volumes of hydrogen cleanly and efficiently for fuel cells remains a problem. The gas can be extricated from oil or natural gas or synthesized by splitting water molecules with electricity. However, such hydrogen merely transports energy derived from another fuel cell. Major automakers world-wide are feverishly researching to find viable solutions to these problems.

Most fuel-cell vehicles today are hybrids; that is, they have a secondary fuel source in addition to their fuel cell to help with acceleration and hill-climbing. The primary source, the hydrogen fuel cell, consists of one or more carbon-fiber-wrapped aluminum tanks filled with gaseous hydrogen at the pressure of 3,600 to 5,000 pounds per square inch. A fuel cell likes to run at a steady load, so when a driver must accelerate, it helps to have a secondary power source to give the necessary boost. Most companies use a battery as the secondary power source; however, Honda uses an ultracapacitator that stores energy in a physical form—on a pair of metal plates that accumulate positive and negative charges—rather than in a chemical form, as batteries do. Drivers who have test-driven these hybrid vehicles find their performance on the road quite impressive.

So how does this environmentally friendly vehicle become a heat source? In Winnipeg, Manitoba, New Flyer Industries will be testing a prototype heavy-duty transit bus to be propelled by a hydrogen-fuel-cell engine made by Hydrogenics Corporation of Mississauga, Ontario. The bus offers a significant new function: its engine is so efficient that even when the vehicle it powers is a rest, it can still be used to generate energy. This engine is also a hybrid and uses the ultracapacitator as the secondary power source. The Hydrogenics design takes the equation one step further. The engine will have a vehicle-to-grid capability to allow it to act as a stationary generator while at rest. So, while simply sitting in the garage or parking lot, this engine could potentially be running and providing electricity.

Manitoba could become an important player in this whole process. Since hydrogen is not naturally available and must be created, Manitoba's overabundance of hydroelectricity could be crucial. Electricity is one of the best ways to create hydrogen through the process of electrolysis, which separates the hydrogen and oxygen molecules in water. If the electricity comes from a renewable source, such as wind, solar, or hydro generation, then voila! We have an emission-free vehicle running on a fuel that was produced through an emission-free process. Icing on the cake!

The bus that functions as a stationary generator is still five years away from commercial viability (2008). Still, the convergence of water, power, and optimism has Hydrogenics-New Flyer looking toward the future. Who knows? Maybe one day soon, Manitobans will be comfy and cozy in their warm little houses on those long, cold winter nights because of the cars in their garages!

Sources: "Future auto to keep home warm, lit up" Winnipeg Free Press. 7 Dec. 2002. "The Car of Tomorrow." Discover: 18 and 20 (Oct. 2002).

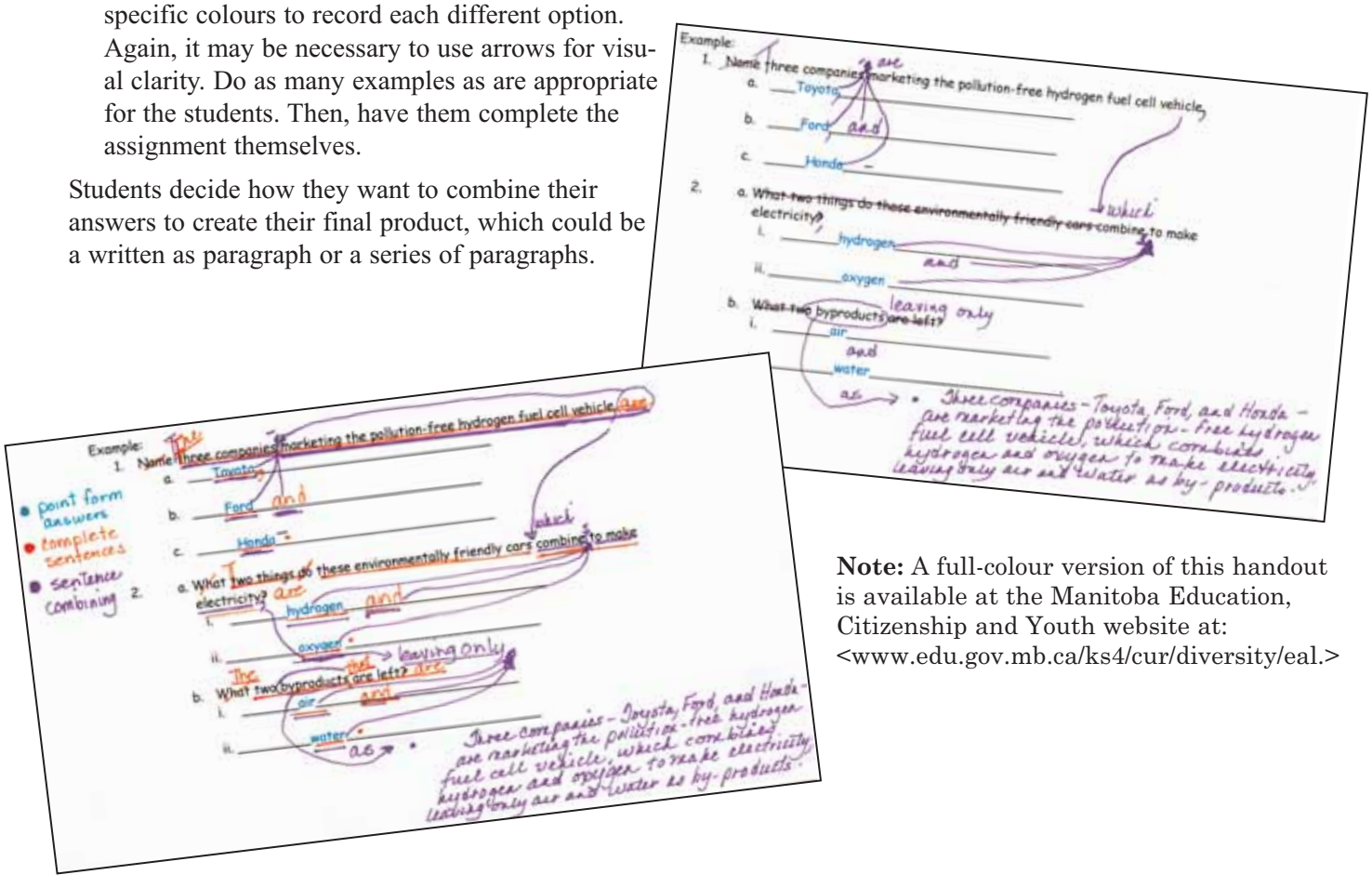
Creating Sentences from Notes Using Coloured Code

When working with students through the answers to a TQT lesson, as you move from point-form notes to simple sentences and, finally, to more complex sentences, use colour-coding for visual clarity. When modelling sample questions on the overhead:

1. Write the questions in one colour.
2. Write the point-form answers contributed by the students in another colour.
3. Have students discuss how to use words and phrases from the questions in combination with their point-form answers to create grammatically correct, complete sentences. Underline the appropriate parts of the questions and draw arrows to show how to combine these words and phrases with the point-form notes. Use a third colour for this step.
4. Students use sentence-combining to combine answers from questions with several parts or answers from related questions. Have students suggest a variety of ways to combine sentences. Record these options in another colour, or choose specific colours to record each different option. Again, it may be necessary to use arrows for visual clarity. Do as many examples as are appropriate for the students. Then, have them complete the assignment themselves.

Students decide how they want to combine their answers to create their final product, which could be a written as paragraph or a series of paragraphs.

Note: With advanced students who already know how to do Step 3, it may only be necessary to focus on the sentence-combining.

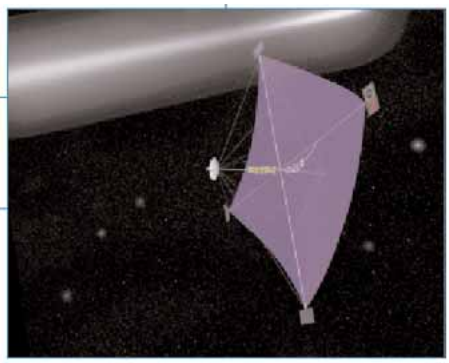


Note: A full-colour version of this handout is available at the Manitoba Education, Citizenship and Youth website at: <www.edu.gov.mb.ca/ks4/cur/diversity/eal.>

How Do Rockets Work?

Rockets push stored materials in one direction and experience a thrust force in the opposite direction. They make use of the observation that whenever one object pushes on a second object, the second object exerts an equal but oppositely directed force back on the first object. This statement is the famous "action-reaction" concept that is generally known as Newton's Third Law. While it seems sensible that when you push on a wall it pushes back on you, this situation is extraordinarily general. For example, if you push a passing car forward, that car will still push backward on you with an equal but oppositely directed force. If you push on your neighbour, your neighbour will push back on you with an equal but oppositely directed force, even if your neighbour is asleep! In the case of a rocket, the rocket pushes burning fuel downward and the burning fuel pushes upward on the rocket with an equal but oppositely direct force. If the rocket pushes its fuel downward hard enough, the fuel will push up on the rocket hard enough to overcome the rocket's weight and accelerate it upward into the sky and beyond.

Space Sails



Advanced Space Transportation Technology Summary

Space Sails

Sailing in space could be one way to go to the stars. Researchers at NASA's Marshall Space Flight Center in Huntsville, Ala., are pursuing space sails as an advanced concept for interstellar travel.

Thin, reflective sails could be propelled through space by sunlight, microwave beams or laser beams—just as the wind pushes sailboats on Earth.

The concept of space sails is nothing new. About the same time Jamestown was being established as America's first permanent colony, German astronomer Johannes Kepler penned a letter to Italian astronomer Galileo, advocating "ship or sails adapted to the heavenly breezes" to travel to Jupiter or the Moon. Having observed that a comet's tail always faces away from the Sun, Kepler concluded light from the Sun exerts a force that pushes its tail away.

The rays of light emanating from the Sun provide tremendous momentum that could push a solar sail about 150,000 mph. Space sails could make interplanetary travel four to six times faster than today's propulsion systems. In addition to moving remarkably faster than traditional systems, solar sails require no fuel. The Sun supplies all the energy.

And while the notion of sailing in space has been around for centuries, it's only become a real possibility in the last few years—with the advent of strong, lightweight composite materials.

Sails in space would have a very large surface area—almost a half-mile wide—but could be thinner than cellophane. The density of a space sail is less than one-tenth ounce per square yard, the equivalent of flattening one raisin to the point that it covers a square yard. A solar sail might be composed of a carbon fiber material with a thin coating of reflective aluminum.

Another space sailing concept, dubbed mini-magnetospheric plasma propulsion, or M2P2, uses a huge magnetic bubble as a sail. The "sail" would be pushed along by charged particles of the solar wind, instead of rays of sunlight. The charged particles of the solar wind would interact with the magnetic field to push the magnetic bubble, or sail.

Sail propulsion will be used initially for robotic missions and eventually could be considered for human space travel. A space sail may power an interstellar precursor mission NASA hopes to launch in the next decade to explore the edge of our solar system and study its interaction with nearby interstellar space.

The Marshall Center is leading NASA's propulsion research for the unmanned probes that will venture billions of miles in space. Its engineers are conducting laboratory experiments as they begin to evaluate and characterize materials for space sails. Challenges include how to build, package and unfurl a solar sail and control its direction of travel through space. Since the sail would get very close to the Sun, thermal protection is also of major importance.

Marshall is partnering with NASA's Jet Propulsion Laboratory in Pasadena, California, and the University of Washington in Seattle to develop sail propulsion for interstellar precursor missions. The Marshall effort is managed by the Advanced Space Transportation Program, NASA's core technology program for all space transportation. The Advanced Space Transportation Program is pushing technologies that will dramatically increase the safety and reliability and reduce the cost of space transportation.

Momentum Exchange Tether Propulsion

Advanced Space Transportation Technology Summary

Momentum-Exchange Tether Propulsion

NASA's Marshall Space Flight Center in Huntsville, Ala., is developing experiments to show that tether-based propulsion – which requires no on-board propellant but instead draws power from the near-Earth environment – could dramatically reduce the cost of raising and maintaining the orbits of other spacecraft, including communications satellites and probes destined for the outer planets of our solar system.

Using the scientific principle of "momentum exchange" – the action of transferring momentum from one body to another – tether propulsion systems provide a viable alternative to traditional chemical propulsion systems, enabling a variety of missions along the highway to space.

By briefly linking a slow-moving object with a faster one, the slower object's speed may be dramatically increased as some of its counterpart's momentum is transferred to it – much the way ice skaters play "crack the whip" to launch one another at high speed across the ice. Similarly, a spinning, tether-based satellite in low Earth orbit might snare slower-moving objects and hurl them at increased speed toward higher orbits.

Researchers at the Marshall Center are developing the "Momentum Exchange, Electrodynamic Reboost" tether propulsion system, or MXER, which would use momentum exchange to transfer satellites from low-Earth orbit to geosynchronous orbit – a fixed orbit roughly 22,300 miles (36,000 kilometers) above the equator – and beyond. MXER also would employ electrodynamic reboost to maintain its own elliptical orbit: an oblong circuit that would bring MXER to within 248 miles (400 kilometers) of Earth at perigee, or its nearest point, and shoot out to more than 4,970 miles (8,000 kilometers) at apogee, or its farthest point.

Intended for launch by rocket to a circular low-Earth orbit, MXER would deploy a 93-mile-long (150 kilometers) tether that uses a combination of electrical current and gravity to put the tether into a tight spin, altering its orbit into an elliptical pattern. As communications satellites and other high-orbit payloads are launched by rocket into low-Earth orbit, they could rendezvous with MXER, which would "snare" them via a net-like catch mechanism and hurl them toward their final destination – without the need for the costly, fuel-heavy upper-stage booster rocket usually associated with the climb to geosynchronous orbit.

And because MXER would remain in orbit, repeating its orbital transfer duties throughout its lifespan, it could greatly reduce costs associated with upper-stage rockets, which normally fall back into the atmosphere and burn up after a single use.

A tether-based propulsion system such as MXER could be flying in 10-15 years, raising or lowering satellites or deep-space probes for scientific and engineering purposes, and boosting commercial satellites to geosynchronous orbit. Some forward thinkers among NASA's industry partners are already developing ways to use the technology to cheaply and efficiently transport payloads beyond low-Earth orbit – paving the way for an eventual human return to the Moon, as well as journeys to Mars and the outer planets.

NASA's MXER technology development team includes the University of Illinois at Urbana-Champaign, Tennessee Technological University in Cookeville, and Tethers Unlimited of Lynnwood, Wash.

The MXER experiment is managed by the Marshall Center's Advanced Space Transportation Program, which is paving the highway to space by developing innovative technologies to dramatically reduce the cost of space transportation.

For more information about space tethers and their potential applications, visit:
http://www.tethers.com

Ion Propulsion

Advanced Space Transportation Technology Summary

Ion Propulsion

Ion propulsion – a futuristic technology that for decades catapulted spacecraft through the pages of science fiction novels – is now a reality. An ion engine, developed by NASA and measuring just 12 inches (30 centimeters) in diameter, is the main propulsion source for Deep Space 1, a 20th Century spacecraft now completing its primary mission: to validate technologies for 21st century spacecraft.

An ion propulsion system converts spacecraft power into the kinetic energy of an ionized gas jet. As the ionized gas exits the spacecraft, it propels the craft in the opposite direction. An ion engine is fueled by xenon, a colorless, odorless, tasteless and chemically inert gas. The xenon fuel fills a chamber ringed with magnets. When the ion engine is running, electrons emitted from a cathode strike xenon atoms, knocking away an electron orbiting each atom's nucleus and turning it into an ion.

The spacecraft contains a pair of electrically charged metal grids. The force of the electric field generated by the grids exerts a strong, electrostatic pull on the xenon ions, much the way bits of lint are pulled to a pocket comb that has been given a static electric charge by rubbing it on wool. The xenon ions shoot past the grids at speeds of more than 88,000 miles (146,000 kilometers) per hour, continuing out the back of the engine and into space. These exiting ions produce the thrust that propels the spacecraft.

Ion propulsion is 10 times more fuel efficient than on-board chemical propulsion systems. This greater efficiency means less propellant is needed for a mission. In turn, the spacecraft can be smaller and lighter, and launch costs lower.

Deep Space 1 carries 178 pounds (81 kilograms) of xenon propellant, capable of fueling engine operation at one-half throttle for more than 20 months. Ion propulsion will increase the craft's speed by 7,900 miles (12,700 kilometers) per hour over the course of the mission.

NASA has studied ion engines since the 1950s. Dr. Harold Kaufman, a technologist at NASA's Glenn Research Center (formerly Lewis Research Center) in Cleveland, Ohio, designed and built the first broad-beam electron-bombardment ion engine in 1959, using mercury as fuel. Suborbital ion engine tests were underway by the early 1960s.

In the early 1990s, NASA identified improved electric propulsion as an enabling technology for future deep space missions. Glenn Research Center and the Jet Propulsion Laboratory in Pasadena, Calif., partnered on the NASA Solar Electric Power Technology Application Readiness project, or NSTAR. Its purpose: to develop a xenon-fueled ion propulsion system for deep space missions.

Ion engines with extended performance and higher-power, NSTAR-type engines – in the 10-kilowatt and 0.08 pound-thrust range – are candidates for propelling future spacecraft to visit Pluto, the moons of Jupiter and other large bodies in the outer solar system. Low-power (100 to 500 watts) systems also could be used to deliver miniaturized robot spacecraft to visit and study comets, asteroids and other smaller bodies. Laboratory tests to develop high- and low-power, light-weight ion propulsion system components and subsystems are now underway.

For more information about the Deep Space 1 mission, visit:
http://nmp.jpl.nasa.gov/ds1/

Plasma Sails

Advanced Space Transportation Technology Summary

Plasma Sails

NASA researchers and their partners in industry and academia are pursuing plasma sail technologies as a potential future source of in-space propulsion — one that could enable a new era of scientific discovery throughout the solar system.

Plasma sail research is being conducted under the leadership of NASA's In-Space Propulsion Program, managed by the Office of Space Science in Washington, D.C. The program is implemented by NASA's Marshall Space Flight Center in Huntsville, Ala.

The concept of the plasma sail stems from NASA's goal of using natural energy sources found in the environment of space — rather than heavy and costly chemical fuels — to provide alternative means of propulsion for future interplanetary craft. Space-based sail technologies seek to harness the "solar winds," billions of tiny, electrically charged particles constantly jettisoned away from the Sun by the force of its powerful, overlapping magnetic fields. These particles travel through the solar system at top speeds of more than a million miles per hour.

Researchers say an innovative plasma sail craft could be carried on this constant, inexhaustible flow like a hot air balloon in a strong wind stream, reaching flight speeds previously unattainable by chemical propulsion.

Such an idea was first proposed by science fiction writer Carl Wiley in 1951, and advanced as a scientific possibility by physicist Richard Garwin later that decade. But it wasn't until the mid-1990s that practical research into harnessing plasma — or the super-energized gas that would serve as the foundation of such a unique propulsion system — were undertaken.

Now, NASA and its partners are developing an innovative, nearly weightless plasma-drive system that would inflate like a hot-air balloon to surround the entire vehicle, mimicking a natural magnetosphere — the bubble of magnetic power surrounding Earth and other planets — and allowing plasma particles to be converted to a source of propulsion.

Such a craft could, over a period of months, reach maximum flight speeds in excess of 100,000 mph. Compare its speed with that of Voyager 2, the deep space probe launched to the outer planets and beyond in 1977, and powered by a conventional chemical propulsion system. Voyager 2 now travels away from our solar system at roughly 795,000 miles per day. There is enough power in the solar winds to accelerate a 300-pound plasma-drive craft to speeds of up to 180,000 mph — or 4.3 *million* miles a day.

Using this technology, NASA hopes to increase the number and value of future planetary missions. Their ultimate goals: to send routine probes and survey craft to neighboring planets and their satellites in a fraction of the time; to increase payload sizes, duration of research, and communication between craft and researchers on Earth; and to lower overall mission costs.

Early research into innovative plasma-sail concepts was funded by the NASA Institute for Advanced Concepts (NIAC) in Atlanta, Ga.

NASA expects to award computational and experimental research activities for new and existing plasma sail concepts in 2003.

For more information about NASA's In-Space Propulsion Program and plasma sails research, visit:
http://www.spacetransportation.com
http://www.msfc.nasa.gov/news

Spinoffs from the Space Program

Educational Website

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Modules	NATO	U.N. & Peacekeeping	Canada's Armed Forces	NORAD & Space Command

Technological growth is a key to the increasing prosperity of society. Innovations in technology reduce the amount of resources (inputs), such as instance time or money, required to achieve a particular goal (output). For example, through technological innovations, computers are now many times more powerful yet cheaper to build.

How does technological innovation happen? A famous saying is that "necessity is the mother of invention"; this saying is catchy, but partly wrong. Dire need alone does not induce discoveries or inventions (otherwise we certainly would already have cures for AIDS and cancer). Rather, technological innovation is caused by a number of factors, including research and development, a strong education system, places where people can lend and borrow capital, and institutions for sharing information. But for many of society's most important innovations, chance or good luck had as much to do with their development as any other factor. Therefore, trial and error is also very important to the process of innovation.

Many innovations originally developed for one purpose are later applied for an entirely different purpose. The entirely new and originally unintended application of a technology is called a "spinoff." In some cases, the spinoff applications of technology are even more effective or successful than the original application. In the case of space and defence technology, technological spinoffs are extremely common and have led to a wide range of very important innovations, including the Internet, the Laser, Satellite Communications and Navigation, Virtual Reality, and the Artificial Heart.

Some examples of space technology spinoffs include:

(*continued*)

Spinoffs from the Space Program (continued)

- **CAT Scanners and MRI technology**

  CAT Scanners and MRI technology (Computer-Aided Tomography and Magnetic Resonance Imaging) came from technology developed to computer-enhance pictures of the moon for the Apollo program. The CAT scanner searches the human body for tumours or other abnormalities and is used in hospitals worldwide.

- **Artificial Heart**

  The technology used in Space Shuttle fuel pumps led to the development of a miniaturized ventricular assist pump (artificial heart).

- **Computer Reader for the Blind**

  Optacon is a spinoff technology that enables the blind and deaf-blind to read anything in print. A user passes the Optacon mini-camera over a printed page with his or her left hand. A control unit processes the camera's picture and translates it into a vibrating image of the words the camera is viewing, which the user senses the tactile image with his other hand. Optacon II is a newer version that provides access to both printed words and the electronic information available on most personal computers.

- **De-mining device**

  The same rocket fuel that helps launch the Space Shuttle is now used to save lives by destroying land mines. A flare device, using leftover fuel donated by NASA, is placed next to the uncovered land mine and is ignited from a safe distance using a battery-triggered electric match. The explosive burns away, disabling the mine and rendering it harmless.

- **Water Filter/Conditioner**

  Water filters and conditioners came from technology developed to purify water on the space shuttle.

- **Laser Technology**

  Lasers emit a narrow and very intense beam of light or other radiation and are used to transmit communications signals; to drill, cut, or melt hard materials; and in medical applications. All lasers are spinoffs of a concept developed at NASA's Jet Propulsion Laboratory (JPL) for optical communications over interplanetary distances.

- **Solar Energy**

  Solar energy is a useful alternative and environmentally friendly energy source. When sunlight strikes certain materials, such as silicon, electrons are set in motion that can be drawn off as electricity. This basic principle of

(*continued*)

Spinoffs from the Space Program (continued)

Solar energy is a useful alternative and environmentally friendly energy source. When sunlight strikes certain materials, such as silicon, electrons are set in motion that can be drawn off as electricity. This basic principle of photovoltaic conversion (PV) is used to provide power to nearly all man-made satellites. Although PV power is still too expensive for widespread use on Earth, it has proven a viable alternative energy source in areas where no conventional source exists, such as remote weather stations, sea-based navigational buoys, forest stations, and third world villages.

- **Cordless Products**

  One of the most successful commercial spinoffs of space-based technology is a line of cordless products dating back to the Apollo era. One of the Apollo astronauts' tasks was gathering rock and soil samples from the moon's surface and required a lightweight and compact drill with its own power source. Black & Decker Corporation developed a successful battery-powered, permanent-magnet motor device. Then they refined this technology into a line of consumer and professional cordless tools and appliances such as the Dustbuster handheld vacuum cleaner.

- **Scratch-Resistant Sunglass Coating**

  Scratch-resistant lenses came from technology originally intended to protect the plastic surfaces of aerospace equipment in harsh environments.

- **Virtual Reality**

  Virtual reality combines three-dimensional graphics and sound to create highly realistic simulations. In the mid-1980s, NASA developed one of the first practical VR systems. The Virtual Interface Environment Workstation (VIEW) was a head-mounted stereoscopic display that allowed the operator to virtually "step into" a scene and interact with it. Virtual reality permits three-dimensional scientific visualization, for example to enable medical students to operate on virtual patients in a simulated hospital. The technology has huge potential in entertainment and education.

- **Portable Laptop Computer**

  In November 1983, NASA flew a space shuttle mission that marked the space debut of a remarkable high-performance navigation monitoring computer dubbed SPOC, for Shuttle Portable Onboard Computer. The SPOC was the first true portable laptop computer.

- **Fabric Structures**

  During the Apollo program, NASA sought to improve upon the fabrics it used in space and began its search for a durable, noncombustible material that

(*continued*)

Spinoffs from the Space Program (continued)

was also thin, lightweight, and flexible. Owens-Corning developed a glass fiber yarn that can be woven into a fabric and then coated with Teflon for added strength, durability, and the ability to repel moisture. The material met NASA specifications and was used in space suits throughout the Apollo era.

The technology in this material spun-off into the construction field, where a heavier version of the fabric is used as a permanent covering for sports stadiums such as B.C. Place in Vancouver and the Olympic Stadium in Rome. The air-supported stadium at B.C. Place, Vancouver, British Columbia, was Canada's first covered stadium. It seats up to 60,000 and has a ten-acre fabric roof that weighs only l/30th as much as a conventional roof of that size. Sixteen giant fans blow air into the balloon-like envelope between the roof's outer membrane and its inner liner maintaining the pressure differential necessary for roof rigidity. The roof is made of space-based fabric that reduces lighting needs, cooling costs, and maintenance costs by increasing the fabric's resistance to moisture, temperature extremes, and deterioration. Kilogram per kilogram, the material is stronger than steel and weighs less than 1.53 kilograms per square metre.

- **The future technology**

  Research into space technology continues, bringing concepts that previously belonged only to science fiction into reality. One area of space research with great potential is into new propulsion systems. The goals in developing new spacecraft propulsion systems are to make space travel easier, faster, and less expensive. A lot of this research is into propulsion systems using antimatter, chemical, nuclear, laser, magnetic, or microwave technology. By developing more powerful and less costly ways to propel spacecraft, space travel will become more commonplace and further reaching. When this happens, the possibilities for colonization of other planets opens up as well.

Case Study: Satellites

Research and development for space and aerospace defence created a number of satellite technologies that resulted in very successful spinoffs. Most of these can be described in four broad categories: atmospheric and weather monitoring satellites, communications satellites, satellite navigation, and environmental monitoring and remote sensing satellites.

Atmospheric and weather monitoring satellites and the Alouette-I

Atmospheric and weather satellites collect information for scientists and meteorologists on the different parts of the earth's atmosphere. Atmospheric satellites are generally focused on the outer regions of the earth's atmosphere, particularly the gases and particles that make-up the different layers of the atmosphere. Atmospheric monitoring satellites investigate issues such as the depletion of the ozone layer and the effects of solar radiation on other satellites. Weather monitoring satellites focus on the lower regions of the atmosphere, where clouds condense and weather is formed. These satellites give meteorologists an indication of weather patterns and storm activity, including the tracking of hurricanes and typhoons.

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Spinoffs from the Space Program (continued)

The Alouette-I atmospheric satellite was Canada's entry into the space age when it was launched on September 29, 1962. The Alouette launch made Canada the first nation, after the Russian and American superpowers, to design and build its own artificial earth satellite. Launched into orbit by an American Thor-Agena rocket, the scientific purpose of Alouette-I was to study the earth's ionosphere (a charged layer of the atmosphere) from above. The Alouette-I was only designed to operate for only one year, but stretched out a 10-year mission that produced over one million images of the ionosphere. Alouette-I gave Canadian scientists information about the aurora borealis (the northern lights). The aurora borealis result when electrically charged particles from the sun cause gas atoms in the earth's ionosphere to release light. These same interactions in the ionosphere that create brilliant lights in the northern skies at night also disturb radio communications. As a result of the success of Alouette-I, Canada and the US launched further ionosphere observation satellites, including Alouette-II, ISIS I, and ISIS II.

Weather satellites provide real-time cloud photographs. In addition to the coverage of weather over land, weather satellites are extremely valuable because of the information they provide about weather over water, where few surface observations can be made. Before the deployment of weather satellites, many areas had no advance warning of impending severe storms. Today satellites can spot and accurately track hurricanes and typhoons while they are still far out in the ocean.

Two types of weather satellites exist, depending on what type of earth orbit they use. Geostationary (or geosynchronous) satellites orbit at a distance of 36,000 kilometres above a fixed point on earth. By doing so, these satellites are able to focus on a particular area of the earth, for example the Canadian west. Polar orbiting satellites travel over the North and South poles in a path that closely parallels the earth's meridian (North-South) lines. These satellites travel around the earth at a distance of 850 kilometres, much lower than geostationary satellites. By doing so, polar orbiting satellites give a much more detailed picture of cloud systems and violent storms.

Communications Satellites and the Anik I

Since the beginning of the satellite communications industry in the early 1970s, Canada has been a world leader in satellite communications. On November 9, 1972, Canada launched Anik A1 and became the first country in the world with a domestic communications satellite. Anik (which means "brother" in the language of the Inuit) made it possible to connect all regions of Canada, the world's second largest country. The launch also made Canada pioneers in the first, and now largest, commercial space sector: satellite communications. After Canada began domestic satellite service in 1972, it was joined by the United States (1974), Indonesia (1976), Japan (1978), India (1982), Australia and Brazil (1985) and others.

In 1973, the Canadian Broadcasting Company (CBC) began transmitting radio and television programs from coast to coast and into the North. The launch of more communications satellites in the late 1970s created the industry for satellite television, where people who purchased satellite dishes could receive hundreds and later thousands of television channels. Since 1980, the Toronto based Globe and Mail newspaper has used Anik satellites to transmit images of its pages from Toronto to other cities across Canada. The result is that the newspaper can be printed in cities such as Calgary at almost the

(*continued*)

Spinoffs from the Space Program (continued)

same time as Toronto. On January 3, 1996, Canada and the US launched the Mobile Satellite (MSAT). MSAT bounces powerful signals to small and portable antennae, like those found in cellular phones.

Since the launch of Anik A1, at least a dozen more Canadian commercial satellites have been sent into orbit, including five that are currently operational. The most recent of these, the Anik F1, was launched on November 21, 2000 as the most powerful communications satellite in the world. As a result of the Canadian investment in satellite communications, Canada is now one of the most connected nations in the world.

Satellite Navigation and GPS

Another use of satellite technology is to provide information about the precise location, speed, and time for a particular receiver. Global Positioning System (GPS) technology was originally developed by the US Department of Defense (DoD) for military purposes, but has now become incredibly popular for civilian applications. Imagine any activity where knowing your precise location or precise time is important and chances are you will have an example where GPS is useful. In the military, GPS is useful for many things, including allowing troops, pilots, or sailors to locate their positions, or in the accurate targeting of weapons. In particular, the military advantages of GPS were demonstrated in the Gulf War – so much so that since 2000 all US weapons platforms are required to have GPS integrated into them. Today, more civilians use GPS than military personnel. These people include commercial pilots and air traffic controllers, construction workers, farmers and fishermen, filmmakers, surveyors and cartographers, and outdoor recreational seekers.

GPS works by referencing the position of a receiver relative to satellite transmitters. The satellite transmitters emit radio signals at the speed of light (299,274 kilometres per second). Based on the amount of time it takes for the signal to travel from the satellite to the receiver, one can figure out how far apart they are (because speed multiplied by time equals distance). By receiving this information from four GPS satellites at once, the three dimensional position and time of the receiver can be established. In reality, the calculations are much more complex, because the radio signals used to measure the distance will bend and deflect off certain things, including parts of the atmosphere, rock formations, or buildings.

The entire GPS Operational Constellation consists of 24 satellites that orbit the earth every 12 hours. Each satellite is roughly 20,200 km from earth travelling at speeds of about 11,800 km/h. The Master Control facility for GPS is located at Schriever Air Force Base in Colorado. By using ground based radars such as the one at Schreiver, the US DoD keeps track of exactly how far each satellite is from the earth, since slight changes in the orbit of the satellite will affect calculations and must be adjusted for.

The concept of GPS was developed in the 1960s. Earth testing in the 1970s culminated with the first GPS satellite launch in 1978. Originally only available for the military, the US government made GPS commercially available in the mid-1980s. GPS provides its signals as coded information that, until 2000, was delivered in two levels of service. Prior to 2000, the most precise signals (P-code) were reserved for the US military. Today all GPS signals are available free of charge to the commercial public, giving people with a receiver the ability to locate their position within about 15 metres. Newer "Differential GPS" technology can pinpoint locations to inside a few metres, because it incorporates ground-based receivers to correct errors and improve accuracy. As technology continues to advance and

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Spinoffs from the Space Program (continued)

GPS precision increases, more applications become possible. In the future, GPS will likely be able to pinpoint locations down to the centimetre. This type of accuracy may enable self-guided cars to drive themselves or pilots to land in zero visibility.

Environmental monitoring satellites, remote sensing, and RADARSAT

Remote sensing is the process of using satellites to collect information about the land from high above the Earth. Remote sensing allows both land mapping and observation. The U.S put LANDSAT, the world's first remote-sensing satellite, into orbit in 1972. Outside the US, Canada became the first country in the world to use LANDSAT. Canada uses LANDSAT for many things, including helping to manage its forests and crops, look for minerals, and make very accurate maps.

In November 1995, Canada launched its own remote-sensing satellite, RADARSAT, to monitor environmental change and the planet's natural resources. RADARSAT uses radar instead of light to form pictures of the earth and thus can produce accurate pictures at night and on cloudy days. Specifically, RADARSAT uses a microwave instrument that sends pulsed signals to Earth from its orbiting altitude of 798 kilometres and processes the received reflected pulses. The data from RADARSAT is received at the ground stations operated by the Canada Centres for Remote Sensing in Prince Albert, Saskatchewan and Gatineau, Quebec.

RADARSAT performs a number of features related to environmental monitoring. The satellite monitors ice conditions in the Arctic and disasters such as oil spills, floods, and earthquakes. RADARSAT also maps structural features of the Earth, such as fault lines, and thus provides clues to the distribution of ground water, mineral deposits, and oil and gas in the Earth's crust. Information provided by remote-sensing satellites such as RADARSAT improves the ability to manage major natural resource industries such as mining, fishing, farming, and forestry. As the need for understanding the environment becomes increasingly important, the work remote-sensing satellites do also becomes more important. A second RADARSAT satellite is scheduled for launch in late 2003.

Case Study: The Internet

The idea behind the modern Internet was born from a Cold War era problem: in the event of a nuclear war, how could US authorities successfully communicate? A command-and-control network was needed that would link people at military bases and in various cities around the US. The problem was that any central authority and wiring used to connect the different sites was vulnerable to attack; no amount of armour could protect such things. The American defence industry think-tank RAND puzzled over this problem and made the following conclusions in 1964: the network must have no central authority and must be designed to operate even while certain parts were destroyed or disabled.

To overcome this dilemma, the designers assumed the network was vulnerable at all times and that no particular part was perfectly reliable. Each node in the network was made equally important (or rather, equally unimportant). Each node retained the ability to originate, pass, and receive messages. Messages were passed in packets; the direction that the packets took through the system was unimportant, only that they reached their final destination. If a big piece of the network were destroyed, the packet en route through

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Spinoffs from the Space Program (continued)

that part would just traverse other parts of the network until it found a route that worked. Although this "packet-switching" system wasn't as efficient a way for information to travel, it was very durable.

Beginning in the mid and late 1960s, scientists at RAND, MIT (Massachusetts Institute of Technology), UCLA (University of California Los Angeles), the Pentagon, and Great Britain's National Physical Laboratory tested ideas for the network. In 1969 the first node (a supercomputer) was set up at UCLA. By the end of that year, four nodes existed on the infant network. Because the US Department of Defense's Advanced Research Project Agency (ARPA) led the creation of the network, it was named ARPANET.

The computers on ARPANET shared information on high-speed transmission lines and programmers could work on each computer remotely from another on the network. The supercomputer nodes continued to expand throughout the 1970s because unlike standard computer networks, the ARPANET could accommodate many different kinds of machines. Also, since connecting to the Internet cost little or nothing, the network was easy to join.

By only the second year of ARPANET's operation, the people using the network were using it to trade notes, news, and personal messages (including gossip) rather than long distance computing. Users had their own personal addresses for electronic mail and soon mailing lists were born, where identical messages were broadcasted to a large number of subscribers.

The birth of the Internet as we know it today happened with the introduction of Transmission Control Protocol/Internet Protocol (TCP/IP) software. TCP/IP is the 'language' by which data is communicated across the Internet. It surpassed the ARPANET's original communication tool, Network Control Protocol (NCP), in the late 1970s and early 1980s. TCP converts messages into streams of 'packets' at the source computer and reassembles them at the destination computer. IP handles the addressing of the packets and makes sure the packets are routed across several nodes and networks. Together, TCP/IP software is responsible for taking data from one computer and connecting it to another via multiple nodes.

The rapidly expanding network was growing at an amazing rate. First called the "Internet" in 1982, by 1984 it had more than 1,000 hosts. By 1987, more than 10,000 hosts had sprung up. The military part of the network separated to become MILNET in 1983. ARAPNET itself formally expired in 1989/90 as a victim of its own overwhelming success, leaving behind a network of networks involving more than 300,000 hosts. By this time, the four main functions of the Internet were email, discussion groups, long-distance computing, and file transfers.

Success brought problems for the Internet, specifically with regard to privacy and security of the hosts on the network. In 1988, when the terms 'hacker' and 'electronic break-in' were being used for the first time, a malicious program called the "Internet Worm" temporarily disabled 6,000 of the 60,000 hosts on the Internet.

In 1991 four huge events changed the shape of the Internet. Prior to 1991, commercial traffic on the Internet was banned by the National Science Foundation's NSFNET, the backbone of the Internet. When this restriction was lifted in 1991, the age of online commerce began. Also in 1991, a programming team at the University of Minnesota led by Mark MaCahill, released "gopher," the first point-and-click way of navigating the Internet. Gopher was freely distributed and MaCahill called it "the first Internet application my Mom

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Spinoffs from the Space Program (continued)

can use." The third major event in 1991 occurred when Tim Berners-Lee posted the first computer code of the World Wide Web [add to glossary information on the difference between Web and Internet – see file on this in readings] in a newsgroup. This code allowed for the combination of words, pictures, and sounds onto web pages. A fourth major event occurred with the development of Mosaic, a graphical browser for the World Wide Web, by Marc Andreesen (who later founded Netscape) and a team of student programmers.

By the next year (1992), the Internet surpassed 1 million hosts and in 1993 expanded at an annual rate of 341,634%. The Government of Canada came online in 1995 (www.canada.gc.ca). By 1996 the number of hosts approached 10 million and more than 40 million people were connected to the Internet in over 150 countries. "E-commerce" had grown to over $1 billion (US) per year.

Today, more than 30 years after its birth, the Internet has grown from a military strategic for communicating in a post-nuclear world to the "information superhighway," a technology that has dramatically impacted the way people live and work.

Senior 4 ELA:
ESL for Academic Success

Module Handouts

Module 4

Point-form Notes Organizer: Baby Boomers' Babies Have Bad Habits

Intro:

What does the title of the video clip suggest to you? _____

_____

_____

What do you think the following expressions and idioms mean?

baby boomers: _____

put up a stink: _____

red flag: _____

Can you think of any bad habits that may be discussed in this clip? _____

_____

_____

Through:

Carefully read over all the questions below before you watch the clip. Try to figure out what might go in the blanks. As you watch the clip, record information to fill in the blanks and answer the questions.

1. Kids put up a stink. Why? _____

   _____ .

2. Kids in the mall:

   Play _____ .

   Don't _____ except in _____ .

3. Kids with parents who smoke _____

   _____ .

4. This adds up to failing on _____ .

5. Statistics showed the following about baby boomers' children:

   a) Nutrition:

      _____ do not get enough fruit and _____ .

      _____ do not get enough _____ and cereals.

   b) Physical activity:

      _____ do not get enough.

   c) Second-hand smoke:

      _____ are exposed.

(continued)

Handout 4-1

Point-form Notes Organizer:
Baby Boomers' Babies Have Bad Habits (continued)

6. Baby boomers' children do not have healthy habits because of their _____ .
7. Baby boomers:
   a) _____ badly
   b) _____ T.V.
8. Obesity: _____ of Canadians at the time of the story were overweight.
9. It is _____ that has kids _____ and parents _____.
10. Habits formed in childhood are _____ .
11. Unless parents _____ their kids _____ , thousands of children will grow and die of _____ .

Beyond:

Write a personal response to this video clip. You may compare the situation in Canada to that in your country of origin, or you may discuss how this video clip applies to you, personally.

Graphic Organizer for Listening:
Seniors Are Cool!

I. Mrs. Seal	Intro:
	Why did you choose Tae Kwon Do?
	Do you enjoy teaching?
	What do you say to people who think seniors are slow and helpless?
	So, will you tell us your age?
	Do you feel more secure?
	Conclusion:

(continued)

Graphic Organizer for Listening: *Seniors Are Cool!* (continued)

II. School Volunteers	Intro:
	So, how does your problem work?
	First speaker:
	So what are you guys doing here today?
	So, will you tell us your age?
	What's your favourite part of this?
	Conclusion:

(continued)

Graphic Organizer for Listening: *Seniors Are Cool!* (continued)

III. Mr. Robertson	Intro:
	Mr. Robertson speaks:
	How long is your average snowshoe trip?
	What ages of people come on these hikes?
	Mr. Robertson, why do you snowshoe?
	Mr. Robertson, how do you stay in shape?
	Conclusion:

(continued)

Graphic Organizer for Listening: *Seniors Are Cool!* (continued)

IV. i. Mr. Strutwa: Restoring cars	Intro:
	Why did you decide to restore old cars after you retired?
	What's your favourite type of car to work on?
	What kind of car is this one here?
	Is that a real Ferrari?
	How long have you been restoring cars?

(continued)

Graphic Organizer for Listening: *Seniors Are Cool!* (continued)

IV. ii: Mr. Strutwa: Keeping fit	Intro:
	Mr. Strutwa, how long have you been working out?
	What does your average day look like?
	What would you say to younger people wanting to start an exercise program?
	What's the secret of your success?

NewsHour Extra for Students: The Big Question

By Heather Jones, 17, Texas

The Human Genome Project has opened up new opportunities for mankind. What will the future hold?

Perhaps someday people will never need glasses because genes from eagles' eyes have been combined with their parents' DNA.

Wings! We could all have wings! Beautiful feathered wings that would be utterly useless because of our body weights, but still, it'd be awesome!

There could be immunity to disease or viruses, such as anthrax, AIDS, or influenza. But at the same time, there is the possibility for abuse. As in any realm of science, progress brings not only the ability to do good, but also the ability to do ill.

A Better Human?

With the information scientists are gathering from their mapping of the genome, we can make the same substances our bodies make. A case in point is insulin, which is grown by combining the piece of genome which codes for human insulin with a chunk of bacteria. The bacteria doesn't recognize that anything has changed, it merely starts pumping out insulin, which scientists can then use to save the lives of millions who suffer from diabetes.

Clearly, there are many benefits to be derived from such technology, from medicines to the enhancement of our natural abilities.

But what happens when obsessive parents try to genetically engineer their kid to be the ultimate basketball player?

Is this fair to the child? What if the child doesn't want to be eight feet tall? What if the child's true calling in life is to be a jockey, only they can't, because their parents messed with their genes?

And how would this overly tall child be accepted among his peers? As anyone who's ever been made fun of well knows, being different from the other students means your school life is straight from heck.

Before we can answer these questions, we must ask ourselves who would actually use this technology? Certainly it's not going to be the average Joe and Josephine who'll be able to afford something as expensive as a designer baby. It will probably be the rich, the powerful, the well connected, and a gaggle of scientists.

But more than that, mapping the genome could place stress on not only the social structure but the foundations of democracy itself. Our country was founded on a premise that "all men are created equal." But what happens when all men are not created equal? Specifically, when the rich and powerful are created superior to the average and the poor?

(continued)

NewsHour Extra for Students: The Big Question (continued)

The Genes Made Me Do It

Another question has to do with the use of genetic information. Let's say that someone has a gene that makes them susceptible to cancer if they're exposed to chlorine. Can their insurance company refuse to cover them if they go swimming? Can their company, since they are providing them insurance, decree that they may not go swimming?

If a student is found to have a violence gene, can the schools refuse to enroll them even if the student has never acted out? Could someone be denied a job because they're considered a genetic "threat"? Could a determination that someone has the gene for "violent" (or even "generous") be accepted as character evidence in a court of law?

Will a person who's been told all their life they have "bad" genes, which make you selfish and violent, eventually become selfish and violent?

We're still unclear about how much of our personalities are determined by genes, and how much by environment. Aside from the whole nature vs. nurture debate, there is also the question of free will vs. determinism, a philosophical concept much like fate and destiny.

People who believe their actions are dictated entirely by their genes might take even less responsibility for their actions. A man or woman who becomes angry while in heavy traffic and ends up shooting a rubber-necker for driving too slowly may argue it isn't their fault because they have genes that make them snap very easily, and they can't be held responsible for their actions.

Genetic screening can, of course, be useful. Parents who carry recessive genes for deadly biological diseases such as sickle-cell anemia or Tay-Sach disease can find out their children will be affected. With some sort of gene replacement therapy, the defective genes that would normally cause the child to die early could be replaced with normal, healthy ones so that the parents could have a healthy child.

The government and military could also use the new information for either good or bad. They could develop new and better ways to resist biological warfare attacks. On the other hand, however, they could develop new and "better" biological weapons, specially tailored to attack certain parts of the human system. Perhaps they could develop a weapon that would render enemy soldiers blind and deaf. Will the good here outweigh the bad?

The Map of Uncertainty

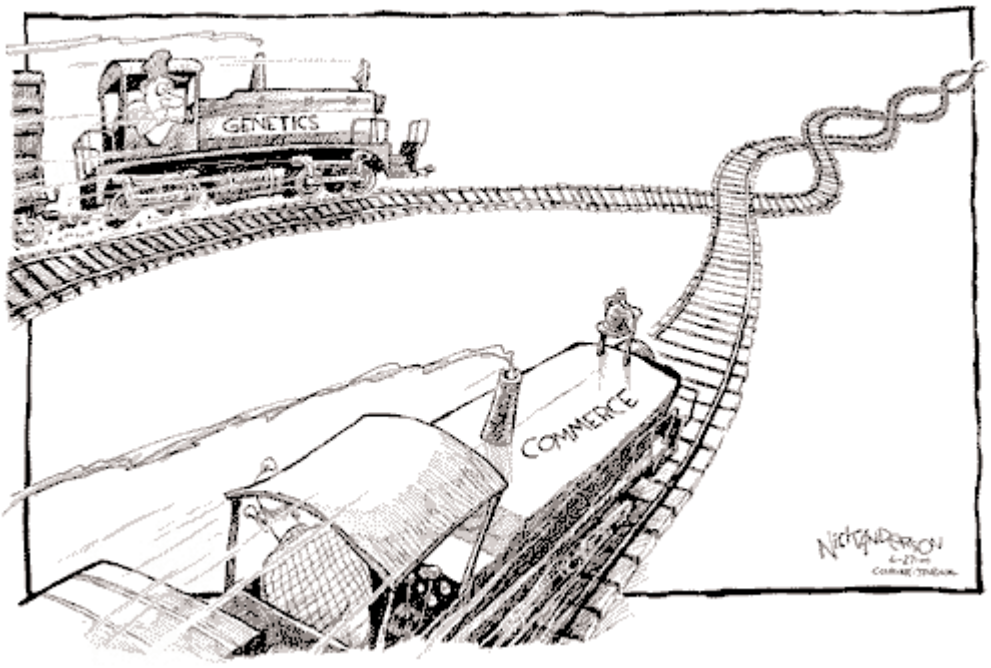
The study of genetics, much like other scientific endeavours, has both good points and bad. On one hand, great strides are being made in understanding how the human body functions. We could find out where we came from and the migration patterns of ancient man.

Children that otherwise might have been born with rare and deadly diseases may be born healthy and happy.

But at the same time, ethical and philosophical questions must and will be addressed. A psychologically dangerous attempt at "normalization" could result as people begin to view their differences as unwanted diseases or defects that must be removed from the genetic structure of their children.

In the end, we can only look to the future with wide eyes, hopefully ready to accept the good and to fight against the evil.

Genetics and Commerce



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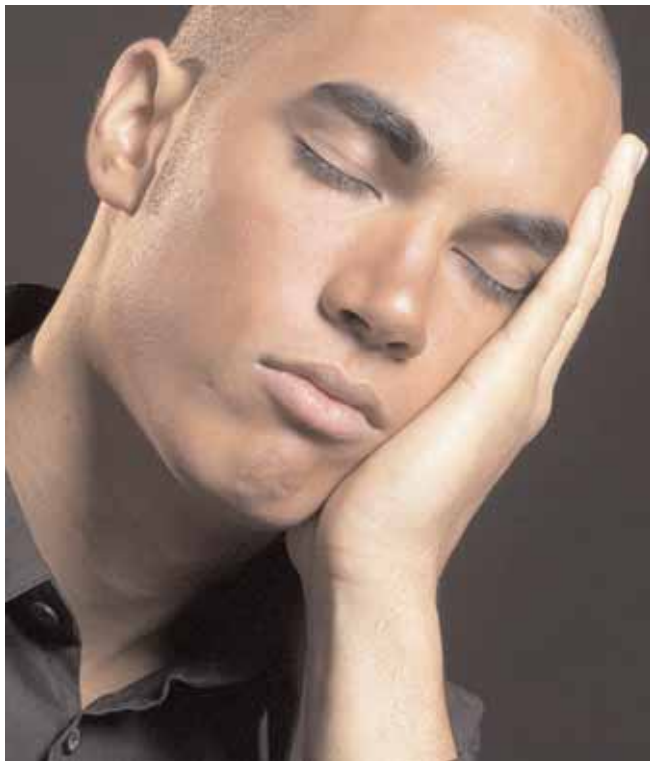
Sleep Quotations

1. "...to sleep, perchance to dream..."
   —Shakespeare, Hamlet, Act III, Scene 1
2. The best bridge between despair and hope is a good night's sleep.
   —Anonymous
3. You know I can't sleep, I can't stop my brain
   You know it's three weeks, I'm going insane.
   You know I'd give you everything I've got for a little peace of mind.
   —Beatles, "I'm so Tired"
4. The woods are lovely dark and deep,
   But I have promises to keep,
   And miles to go before I sleep,
   And miles to go before I sleep.
   —Robert Frost
5. It is a common experience that a problem difficult at night is resolved in the morning after the committee of sleep has worked on it.
   —John Steinbeck
6. When action grows unprofitable, gather information; when information grows unprofitable, sleep.
   —Ursula K. LeGuin
7. Sleep is better than medicine.
   —Proverb



8. There is a time for many words, and there is also a time for sleep.
   —Homer, (800 BC–700 BC), *The Odyssey*
9. To achieve the impossible dream, try going to sleep.
   —Joan Klempner
10. [Sleep is] the golden chain that ties health and our bodies together.
    —Thomas Dekker (1572 - 1632)
11. "I reached for sleep and drew it round me
    like a blanket muffling pain and thought together
    in the merciful dark."
    —Mary Stewart
12. "Methought I heard a voice cry 'Sleep no more!
    Macbeth does murder sleep,' the innocent sleep,
    Sleep that knits up the ravell'd sleave of care,
    The death of each day's life, sore labour's bath,
    Balm of hurt minds, great nature's second course,
    Chief nourisher in life's feast."
    —Shakespeare. Macbeth (2.2.46-51)

School Start Times

Types of Sleep

Experts divide sleep into two basic categories based on the electrical activity in the brain. During rapid eye movement (REM) sleep, the pulses are short and fast. It is sometimes called paradoxical sleep because the brain seems to be as busy as when it's awake. Our most vivid dreams occur during REM sleep. Higher parts of the brain dedicated to decision making and some kinds of memory are quiet, while areas involved in emotion are active. REM sleep may be one way the brain processes the unruly emotional content of our lives.

Slow wave sleep (SWS) is characterized by relatively slow waves of electrical activity. Various restorative metabolic processes take place during this phase. Researchers have divided slow wave sleep into four stages defined by brain activity and ease of wakening, with stages 3 and 4 being the deepest.

The quality of sleep changes with age. Starting at about age 65—some experts say it happens sooner—the brain struggles to get into the deeper stages (3 and 4) of slow wave sleep. At age 75, it may not be able to get into stage 4 at all. This may explain why older people are easily awakened by noise and don't feel well rested even after an apparently full night of sleep. REM also changes. Half of the sleep that infants and young children get is REM. In adults, REM plateaus at 20% to 25%.

Excerpt from "Sleep Well to Age Well." *Harvard Health Letter* 27.7 (May 2002).

Excerpt from The Consequences of Insufficient Sleep for Adolescents

by Ronald E. Dahl, M.D.

Links Between Sleep and Emotional Regulation

Any review of adolescent lifestyles in our society will reveal more than a dozen forces converging to push the sleep/arousal balance away from sleep and toward ever-higher arousal. What harm could there be in trying to push back a little toward valuing sleep? The potential benefits, according to Dr. Dahl, seem enormous.

Adolescents often "get by" with relatively little sleep, but it may be far less than they need. The observations of many parents, educators, and clinicians are in close agreement with a wealth of scientific data about the growing frequency of this worrisome pattern of behaviour. As discussed in other articles in this special section, there has been recent progress in understanding many of the factors that contribute to adolescent sleep loss, including the role of early school starting times and the role of various biological and social influences on adolescents' self-selected bedtimes.

The increasing evidence that teenagers seem to be getting less sleep leads inevitably to the pragmatic question "How much sleep do adolescents really need?" Unfortunately, the medical/scientific answer to this question seems tautological. Sufficient sleep is defined as "the amount necessary to permit optimal daytime functioning."

As impractical as that answer may appear, there are two important reasons for such a definition. First, sleep requirements can be remarkably different across individuals. Second, at a physiological level, sleep and waking states are closely intertwined aspects of a larger system of arousal regulation. (Sleep researchers often use the Chinese symbol of yin/yang to designate the interrelationship of sleep/wake states.)

At the centre of this discussion is a critical and pragmatic point: any evaluation of the sleep habits of adolescents must include a careful consideration of the waking consequences of sleep loss. The question becomes, in essence, "What are the daytime signs of diminished functioning that indicate insufficient sleep?" While there is a shortage of well-controlled research studies that seek to answer this question, this article focuses on the convergence of evidence suggesting that changes in mood and motivation are among the most important effects of sleep loss. Thus an important place to begin looking for evidence of insufficient sleep among adolescents is in the area of emotional or behavioural difficulties.

(continued)

The Consequences of Insufficient Sleep for Adolescents (continued)

There is no shortage of epidemiological and clinical studies documenting recent increases in the rates of many psychiatric disorders among adolescents. Certainly many complex factors are likely to have contributed to the emotional and behavioural problems of teenagers, but the possible link to adolescent sleep patterns bears some scrutiny. There is clear evidence that sleep loss can lead to the development or exacerbation of behavioural and emotional problems. The key question is "How great is the contribution of sleep deprivation to these problems?" The magnitude of this link remains an open question that can only be answered through careful empirical research.

In the meantime, these issues have enormous ramifications for the fields of medicine and education with regard both to the physical and mental health of adolescents and to detriments to effective learning and social development. Many policy decisions will be influenced by our understanding and interpretation of the importance of sleep in these areas.

In this article I provide an overview of current scientific and clinical information regarding the consequences of insufficient sleep in adolescents. I pay particular attention to links between sleep and emotional regulation. The following is a brief outline of the main points to be presented:

1. Sleepiness. This is the most direct consequence of adolescent sleep loss, and it manifests itself most significantly in difficulty getting up on time for school and in falling asleep in school. These problems can further contribute to conflicts with parents and teachers and to poor self-esteem. Sleepiness is also associated with a strong tendency toward brief mental lapses (or micro-sleeps) that greatly increase the risk of motor vehicle and other kinds of accidents.
2. Tiredness. This is a symptom of sleep loss and includes changes in motivation—particularly difficulty initiating behaviours related to long-term or abstract goals and decreased persistence in working toward goals.
3. Mood, attention, and behaviour. Sleep loss can have negative effects on the control of mood, attention, and behaviour. Irritability, moodiness, and low tolerance for frustration are the most frequently described symptoms in sleep-deprived adolescents. However, in some situations, sleepy teenagers are more likely to appear silly, impulsive, or sad.
4. Impact of emotional and behavioural problems. Emotional arousal and distress can cause both difficulty falling asleep and sleep disruptions. Behavioural problems and family chaos can contribute to even later bedtimes and to sleep schedules that are ever more incompatible with school schedules.
5. Bi-directional effects. There are bi-directional effects between sleep and behavioural/emotional problems. It can be difficult at times to identify the causal links. For example, a depressed adolescent with severe sleep problems may be showing sleep disturbances that stem from depression or mood problems that stem from sleep disruption. Sleep loss can also contribute to a negative spiral or vicious cycle of deterioration. That is, sleep loss can have a negative effect on mood and behaviour, which leads to subsequent emotional/behavioural difficulties that further interfere with sleep. This produces a sequence of negative effects in both domains. In some clinical cases, such negative spirals appear to be a pathway to withdrawal from school or serious psychiatric problems.

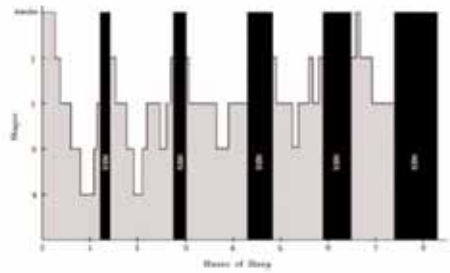
Normal Sleep and Sleep Hygiene

How much sleep do you need?

Humans adapt to the 24-hour cycles of light and dark using their internal clocks (circadian rhythms). These clocks dictate that adults have one major episode of sleep at night typically lasting about 8 hours - ranging from 6 to 9 hours per night. Each person must determine his or her own sleep need. You can determine this ideal amount of sleep by simply paying attention to whether or not you feel rested in the morning and alert throughout the day. If no amount of sleep will make you feel rested on the next day, then you may want to seek medical advice, including being be evaluated for a sleep disorder. People tend to sleep about 30 minutes longer on weekends, indicating that they may be accumulating a sleep debt during the week. It is important to understand that you cannot "catch up" on lost sleep, or store sleep for the future, by getting more on weekends! This is because lost sleep on any given night has immediate consequences for the very next day (e.g. driving, work performance, memory and learning). Research indicates that sleep loss impairs your response time, motor ability, visual acuity, memory and attention.

What is a typical night's sleep?

The depth and character of sleep change in a predictable manner across the night. Healthy, young adults will fall asleep in 10-20 minutes after "lights out". Thereafter, the sleeper will cycle through 5 different stages of sleep in the course of the night. As you fall asleep, your thoughts begin to wander and your awareness of the outside world is reduced (this is called "stage 1"). As much as 50-60% of the night is spent in stage 2 sleep, a relatively light stage of sleep (i.e., easy to awaken from sleep). Stages 3 and 4, occurring predominately in the first half of the night, are referred to as deep sleep since it requires a more meaningful or intense stimulus to awaken the sleeper (e.g., baby's cry or your own name). Together, stages 1 through 4 are referred to as non-REM sleep. REM sleep (or rapid eye-movement sleep) will occur approximately every 90 minutes throughout the night. You can thus expect to experience 4-5 REM sleep episodes per night. The first REM period is typically very brief, lasting less than 10 minutes, while the final episode may continue for more than an hour. This means that you get most of your REM sleep during the second half of the night. REM sleep is commonly associated with dreaming because your most vivid and bizarre dream reports occur during this stage of sleep, although dreaming or mental imagery takes place in all stages of sleep. The sleep/wake histogram below illustrates how a healthy, young adult would cycle through the stages of sleep on a typical night.



Changes in sleep across the lifespan

The timing and duration of sleep change dramatically as we age. A newborn baby may sleep as much as 16 hours per day! Adolescents will sleep 9 hours on average although they prefer to go to bed later and wake up later than the usual 11 to 7 bedtime. This shift to a later sleep time is a normal pattern for teens; however, their school schedules preclude this desired pattern and as a result many teens are chronically sleep deprived. Sleep in adults can be quite organized and efficient (meaning they sleep at regular clock times, fall asleep quickly, and have very little wakefulness during the night); however, lifestyle factors, behaviours, and poor sleep habits can grossly disrupt sleep in otherwise healthy adults. During later life, sleep becomes shorter in duration (about 6 hours on average); there is less time spent in deep sleep; arousals during the night are more frequent and for longer periods of time; and there is a tendency to nap during the day. Older adults prefer go to bed earlier and wake up earlier. This shift to an earlier sleep time is a normal pattern for older adults. Just as the teenager does not stay in bed later because they are lazy, the older adult does not go to bed earlier for lack of anything better to do with their time – the timing of when we sleep and when we wake is governed by our internal circadian clocks. If you find that you are sleeping less at night than you used to, yet your daytime functioning is not impaired, then there may be no cause for concern about these changing sleep patterns. If you are distressed by the fragmented nature of your sleep at night (and long bouts of wakefulness during the night specifically), it is not recommended that you compensate with naps.

What about naps?

Daytime napping is natural for most toddlers. At about age 6 to 12 years, however, sleep begins to occur in a single nighttime episode. Napping behaviour is usually put aside until retirement age. Naps are generally only acceptable for people who have no difficulty falling asleep or staying asleep at night. Otherwise, the time you spend napping during the day may take away from your total sleep time at night. The optimal duration for a nap, whether during the daytime or while on the job for shift-workers, is 10-20 minutes. Twenty minutes is sufficient to feel rested, yet short enough not to interfere with nighttime sleep or your alertness on the job upon awakening. If you cannot get through the day without a long nap, despite also sleeping long hours at night, you should be evaluated for a sleep disorder.

Tips for a good night's sleep

1. Make sleep a priority! In today's busy world, too many people simply do not make the time for sleep. Are you allowing yourself enough time in bed to get the sleep you need? It is a good idea to keep track of how much sleep you are getting by keeping a "sleep diary" You can do this by making note of your lights-out and wake-up times each day, taking care to note any time out of bed during the night. Also keep track of

(continued)

Normal Sleep and Sleep Hygiene (continued)

NORMAL SLEEP AND SLEEP HYGEINE

CANADIAN SLEEP SOCIETY

2003

How to complete a sleep/wake and activity diary:
Each morning, make note of the time you went to bed and woke-up, taking care to mark any time out of bed during the night. Throughout the day, also keep track of the timing of your major meals, exercise and consumption of alcohol or caffeine. Keep track your habits for a 2-week period to gain some insight into your sleep/wake habits.

Activities key: M = meals, C = caffeine, A = alcohol, X = exercise, S = snack, T = toilet during night
Note: ↓ indicates bedtime and ↑ time out of bed, the solid lines represent time asleep

Prepared for the CSS by:

Kimberly Cote, PhD,

Department of Psychology, Brock University

the timing of your major meals, exercise and consumption of alcohol and caffeine. You may begin to see patterns emerge that will allow you to predict a good night versus a poor night of sleep. As a general rule, you should strive to keep a regular sleep/wake schedule. If you are experiencing difficulty sleeping at night, then a strict schedule becomes even more important. People suffering from insomnia should attempt to get out of bed at the same time each morning, even on weekends. An example of a sleep/wake diary is included in this brochure.

2. *Practise good sleep hygiene!* If you have trouble getting the sleep you need, work shifts, or simply cannot seem to find the time for sleep, then "sleep hygiene" is a practice that you need to work on more than others.

- Go to bed only when sleepy. Try a relaxing bedtime routine (e.g., soaking in a bath).
- Establish a good sleep environment with limited distractions (noise, light, temperature).
- Avoid foods, beverages, and medications that may contain stimulants.
- Avoid alcohol and nicotine before going to sleep.
- Consume less or no caffeine.
- Exercise regularly, but do so around midday or early afternoon. Over-training or exercising too much is not advisable.
- Try behavioural/relaxation techniques to assist with physical and mental relaxation.
- Avoid naps in late afternoon and evening.
- Avoid heavy meals close to bedtime.
- Avoid fluids before going to sleep.
- Use the bed only for sleep and intimacy (do not eat, read or watch TV in bed!).
- Establish a regular waketime schedule.

Excerpt from "Missed ZZZs, More Disease?"

The first part of the article describes research studies that connect insufficient sleep to a number of chronic illnesses. Then it acknowledges the other side…

Virtue or Indulgence?

Some scientists remain skeptical that sleeping 8 hours should be the next great health virtue. They say that getting from the current evidence to a firm link between sleep loss and disease requires a giant leap of faith.

"Some people don't have time to sleep, or they'd rather watch television. Should we condemn them before the evidence is in?" asks Daniel F. Kripke of the University of California, San Diego. Kripke argues that telling people that they'll get sick if they don't sleep enough may, ironically, worry them into insomnia.

Kripke and his colleagues published results in February that, on the surface, contradict the idea that more sleep is good for you. During a large epidemiological study lasting 6 years, people were more likely to die if they initially reported sleeping 7.5 hours or more a night than if they reported sleeping 5.5 to 7.5 hours a night. The researchers took into account such factors as age, weight, diagnosed illness, and medication use.

The amount that the average person in the United States sleeps per night, about 7 hours, is consistent with good health, Kripke concludes. "People who are saying you should sleep more don't have the evidence," he adds.

Anything more than 7 hours is optional sleep, which can be taken for relaxation and indulgence but is not necessary for good health, agrees sleep scientist Jim A. Horne of Loughborough University in England.

Vgontzas disagrees. Underlying depression and sickness probably explain the apparent association between sleeping 8 or more hours and increased mortality in Kripke's study, he says.

However, neither Horne nor Kripke is swayed by the studies that show physiological changes in sleep-deprived subjects in the lab. The changes are probably real, they agree, but may not be meaningful—either because they're not severe enough to cause long-term health effects or because they're artifacts of the experimental situation.

The immune system probably does crank up and go on red alert when a person is awake longer, Horne explains. After all, a body is more likely to come across pathogens when it's up and about. But there's no evidence that this activity undermines health, he says.

The argument that people are evolutionally programmed to sleep 8 or 9 hours a night doesn't hold up, at least in European history, Horne adds. Hundreds of years ago, people worked 14- or 15-hour days and were lucky to get 6 hours of sleep at night, he says. Moreover, their sleep patterns were different than those of modern slumberers. In England, people went to bed an hour after sundown, got up a few hours later for a midnight meal, and then slept a few more hours until sunup, Horne says. People are probably designed to sleep 6 or 7 hours at night and take a short afternoon nap, he suggests.

Bleary Picture

(continued)

Source: <www.sciencenews.org>.

Excerpt from "Missed ZZZs, More Disease?" (continued)

Research on sleep deprivation and health is still in its infancy, Van Cauter admits. Nevertheless, she maintains that 8 or more hours of sleep a night is optimal.

"To suggest to people that you can maintain average sleep time of 6 hours and get on the road and drive your truck is criminal," she asserts. It's too early to say whether sleep loss causes disease, but sleeping certainly hinders performance and diminishes safety, she says.

There's no reason to believe that sleeping more than 8 hours could be harmful or that insomnia could be good for you, Vgontzas adds.

"My general appraisal of the literature is, in terms of more or less normal variations in sleep amount and effects on health, we really don't know," reflects sleep specialist Alan Rechtschaffen of the University of Chicago. There's a consensus that the extreme—below 6 hours a night—isn't advisable, he says. Beyond that, distinguishing the health effects, if any, of 6 versus 7 versus 8 hours of sleep is going to take large, well-controlled studies that follow people over long periods. Optimal sleep also probably varies with age and gender, says Vgontzas.

So, as to whether millions of cases of obesity, diabetes, and cardiovascular disease could be prevented if people in the United States were simply to increase their sleep from 7 to 8 hours a night, the issue hasn't been put to bed. But the early data are at least provocative.

"We have all the dots or a lot of the dots, and it looks like there's a picture there, but the science that actually connects those dots hasn't been done yet," Dinges says.

Guess How Much Sleep These Animals Need?

Choose one of the following animals for each blank below:

dogs	pythons	human	tigers
giraffes	cats	children	cows
brown bats	horses	African elephants	

If you don't know, don't worry. Just make a guess!

1) _____ sleep 12 or more hours every 24 hours. They sleep mostly at night, but also during the day.

2) _____ may be big, but they sleep only 3 hours every 24 hours.

3) Lucky for us humans, slimy _____ sleep 15 to 20 hours and _____ sleep 16 hours every 24 hours.

4) _____ and _____ sleep only 4 hours every 24 hours because they need more time to eat.

5) _____ need at least 9 hours of sleep every 24 hours!

6) When they aren't eating insects, _____ sleep nearly 20 out of 24 hours every day.

7) _____ don't need pillows, because they sleep less than 2 hours each day standing up!

8) Some types of _____ sleep more than others, usually 10 hours every 24 hours.

(see over for answers)

Guess How Much Sleep These Animals Need?—Answers

1) **Cats** sleep 12 or more hours every day. They sleep mostly at night, but also during the day.

2) **African elephants** may be big, but they sleep only 3 hours a day. They need the rest of the day to consume large amounts of food.

3) Lucky for us humans, slimy **pythons** sleep about 15 hours (if they are hungry) or as many as 20 hours after feeding. **Tigers** sleep 16 hours a day. Both animals conserve precious energy for hunting.

4) **Horses** and **cows** sleep only 4 hours each day because they need more time to eat. Like elephants, horses and cows need plenty of time to eat and digest enough food.

5) **Human children** should sleep at least 9 hours each day! This is an important point to emphasize with your students.

6) When they aren't eating insects, **brown bats** sleep nearly 20 hours each day. As with pythons and tigers, bats need to conserve energy for hunting.

7) **Giraffes** don't need pillows, because they sleep less than 2 hours each day standing up! Giraffes sleep in short bursts. Some scientists speculate that they "semi-sleep" while they are eating as well—a form of "zoning out."

8) Some types of **dogs** sleep more than others, but most sleep around 10 hours a day. Some, however, sleep as many as 14 hours a day.

Survey: Personal Experience with Herbal Remedies

Answer the following questions:

1. Have you ever taken an herbal remedy? Yes___ No___
   (If no, skip to question 3.)

2. Mark with a tick each of the following health problems that have caused you to try an herbal remedy:
   sleeplessness _____
   lack of energy _____
   headache _____
   cold _____
   stomach ache _____
   allergies _____
   depression _____
   forgetfulness _____
   weight loss _____
   weight gain _____
   beauty aids* _____ (*makeup, hair products, deodorants)
   building immune system _____
   building muscle _____
   skin disorders _____
   aches and pains _____
   other* _____ (*describe)

3. Do you take conventional medications on a regular basis? Yes__ No___

4. With which of the following statements do you most agree? Place a tick beside each.
   ____ Herbal medicine is an ancient, worthless practice that has no basis in science.
   ____ Herbal medicine may work for some, but I prefer to take conventional medicines.
   ____ Herbal medicine may be a viable medical practice, but I need more information to justify its use.
   ____ Herbal remedies are as reliable a medical practice as conventional medicines.
   ____ Herbal medicine is a better way to treat many illnesses than is conventional medicine.
   ____ I would be confident in taking a combination of herbal and conventional medicines.
   ____ I believe in prescriptive rather than preventative medicine.
   ____ I do not believe in taking any kind of medicine.

5. Are herbal supplements as closely regulated as other drugs? Yes___ No___

6. Do you believe that herbal supplements are safe? Always___ Sometimes___ Never___

_____
Source: <www.nytimes.com/learning/teachers/lessons/19990209tuesday.html?searchpv= learning_lessons>.

Americans Gamble on Herbs as Medicine

by Jane E. Brody

Herbal medicine, the mainstay of therapeutics for centuries before modern purified drugs relegated it to the status of near-quackery, has in the last five years emerged from the fringes of health care with an astonishing flourish and now shows clear signs of joining the medical mainstream.

Despite many cautionary tales about adulterated and even dangerous products, herbs formulated as capsules, tinctures, extracts and teas—and increasingly as additions to common foods like potato chips and fruit drinks—are now routinely used by a third of American adults seeking to enhance their health or alleviate their illnesses. Each day the herbal realm wins new converts, particularly among those who have become disillusioned with the cost and consequences of traditional drugs, distrustful of conventional physicians and convinced that "natural" equals "good."

Yet, because herbal products are classified as dietary supplements, not drugs, and face none of the premarket hurdles drugs must clear, consumers have no assurance of safety or effectiveness. Indeed, scores of products sold in the United States are listed by European and American authorities as ineffective, unsafe or both, and manufacturing standards to assure high quality have been proposed but are not yet in force.

Thus, countless consumers are wasting their money on useless products or jeopardizing their health on hazardous ones. Among the serious side effects that have been linked to herbal remedies are high blood pressure, life-threatening allergic reactions, heart rhythm abnormalities, mania, kidney failure and liver damage. A few widely available products, including sassafras and comfrey, contain known carcinogens.

At the same time, according to a report last year in the journal *Psychosomatics*, unsuspecting consumers "have used herbal remedies with good results only to discover that the benefit was actually derived from the presence of undisclosed medicines," including steroids, anti-inflammatory agents, sedatives and hormones.

"The lack of quality standards is the No. 1 problem in the whole industry," said Dr. Varro Tyler, emeritus professor of pharmacognosy (the study of active ingredients in plants) at Purdue University. Tyler, who has no financial connection to herbal products and is arguably the nation's leading independent expert on herbal medicine, said: "I feel sorry for the typical consumer. How is he or she to know what is best, what products are reliable and safe? Even when a label says the product has been standardized, the consumer has no way to know if it actually meets that standard." And even if an herbal product has been reliably made in some standard dose, it does not mean that scientific studies have shown it to be effective.

The industry itself is promoting a "good manufacturing practices" doctrine. Annette Dickinson, director of scientific and regulatory affairs for the Council for Responsible Nutrition, a trade organization for producers of dietary supplements, said a consortium of associations submitted a document of manufacturing standards to the Food and Drug Administration two years ago. Although such a standard would say nothing about an herb's safety or effectiveness, it would result in reliable methods that the industry would have to use to assure the identity and quality of its products. The agency has issued a notice of proposed rules but no final ruling as yet.

Nonetheless, botanicals—as herbal products are more accurately known—are enjoying an annual retail market approaching $4 billion, up from $839 million in 1991 and growing about 18 percent a year. Hundreds of products formulated with virtually no government oversight are crowding shelves of health food stores, food markets and pharmacies nationwide. Supplements are also widely sold by marketers like Amway, through

(continued)

Source: <www.nytimes.com/learning/teachers/featured_articles/19990209tuesday.html>.

Americans Gamble on Herbs as Medicine (continued)

catalogs and on the Internet.

Now, even major pharmaceutical companies like Warner Lambert, American Home Products, Bayer and SmithKline Beecham are introducing herbal products, adding respectability to this marginalized market.

Some herbs—like echinacea, goldenseal, American ginseng and wild yam—have become so popular that their continued supply from natural sources is in danger. As the plants become scarcer and more expensive, products containing them are increasingly likely to be adulterated and may even contain none of the herb listed on the label. Peggy Brevoort, president of East Earth Herb Inc., a company in Eugene, Ore., that produces botanicals, said the demand for St. John's wort, used for mild depression, and kava, a calmative said to reduce anxiety, now exceeds their supply, introducing the "danger of adulteration" by "unscrupulous dealers."

At the same time, two major new publications—a 1,244-page *Physicians' Desk Reference for Herbal Medicines*, produced by the same company that publishes the *Physicians' Desk Reference*, and an English-language edition of Germany's therapeutic guide to herbal medicines, *The Complete German Commission E Monographs*— have been issued to help educate physicians, pharmacists and interested consumers about the known uses, proper dosages and safety concerns of more than 600 botanicals now sold in this country. The evaluations in both books are based on studies, most done in Germany and reviewed by teams of experts.

Last month, the National Institutes of Health began listing on the Internet international bibliographic information on dietary supplements, including herbal products. The address is www.nal.usda.gov/fnic/IBIDS/.

In addition, a few medical and pharmacology schools have recently introduced courses in phytomedicine, the study of botanicals. And next month the American Pharmaceutical Association will conduct a two-day program on herbal medicine as part of its annual meeting. Still, most doctors remain wary of botanicals, especially when patients choose self-medication with plant extracts over established medical remedies.

The very act of Congress that has fostered this growth—the 1994 Dietary Supplement Health and Education Act—has also permitted chaos to reign in the botanical marketplace, with no mechanism to assure that products are safe or effective. Pushed heavily by Republican Senator Orrin Hatch of Utah, the home base of many supplement makers, and passed over the objections of the FDA, the law created a new product class, the dietary supplement, that was not subject to regulations applied to drugs. Now any substance that can be found in foods, regardless of amount or action and including substances that act as hormones or toxins, can be produced and sold without any premarket testing or agency approval.

Marketed as neither a food nor a drug, herbal products are not obliged to meet any established standards of effectiveness or safety for medicinal products, which require extensive laboratory and clinical trials before approval. As with other substances classified as dietary supplements, the FDA can restrict the sale of an herbal product only if it receives well-documented reports of health problems associated with it. The agency took four years, and more than 100 reports of life-threatening symptoms and 38 deaths, to act against ephedra, often sold as the Chinese herb ma huang, a stimulant that can prove disastrous to people with heart problems.

With FDA authority limited by the 1994 law, the Federal Trade Commission, which monitors advertising, has taken a more active role in monitoring supplement makers.

The FTC last year took legal action against seven manufacturers that had broken rules requiring advertising be truthful and verifiable. The companies were selling remedies or purported cure-alls for ailments like impotence, cancer and obesity.

The commission also sent e-mail warnings to 1,200 Internet sites that it said had made "incredible claims" for drugs, devices and supplements, including herbal remedies that would supposedly ward off AIDS. Also, the commission late last year issued its first set of advertising guidelines

(continued)

Americans Gamble on Herbs as Medicine (continued)

aimed specifically at the supplement industry.

Still, the current regulations have created a quagmire of consumer confusion and set up potential health crises that even industry officials say could ultimately hurt producers as well as users of herbal products. Under the 1994 law, consumers have no assurance that an herbal product contains what the label says it does or that it is free from harmful contaminants. Independent analyses of some products, particularly those containing costly or scarce herbs, revealed that some have little or none of the purported active ingredient listed on the label.

Adding to the confusion is that botanical makers are allowed to describe products only in terms of their effects on the structure or function of the body, not their potential health benefits. Thus, a product label might say "promotes cardiac function" but it cannot say "lowers cholesterol."

Likewise, although the law does allow health warnings on the label, most manufacturers have yet to include them.

Consumers are warned, however, that federal drug safety officials are not watching the store. All botanicals must display a disclaimer on the label following the description of the product's structural or functional role: "This statement has not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure or prevent any disease." To which Tyler commented, "If that is true, why on earth would anyone use it?"

The seeds of the modern herbal market were sown in the '60s when "green, organic and natural became buzzwords," Tyler said. But they did not mature until the '90s with the growing consumer interest in "self-care and controlling one's destiny," he said. Many turned to herbs as a gentler way to treat health problems and a potential tool for preserving mental and physical health.

The interest has spawned scores of Internet sites and hundreds of books on various herbs. But much of the literature is replete with poorly documented health claims and, with few exceptions (among them, Tyler's books), advocacy prevails over objectivity.

Because plants contain a mixture of relatively diluted chemicals, they naturally tend to have milder actions, both in their therapeutic benefits and side effects, than the concentrated, single chemicals in most drugs. Thus, botanicals generally take longer to act than regular pharmaceuticals and few have the potency of a prescription, the one possible exception being saw palmetto, which a well-designed study indicated may be as helpful for an enlarged prostate as the more expensive and riskier drug, Proscar®.

The combination of chemicals in botanicals is potentially both a plus and a minus. When two or more chemicals enhance one another's activity, the therapeutic benefit could theoretically exceed that of an isolated substance formulated as a drug. Mark Blumenthal, who heads the American Botanical Council, noted that the herb St. John's wort, widely used in Germany and increasingly in the United States to counter mild depression, is standardized for a substance called hypericin. But, he explained, "hypericin is not directly linked to its antidepressant activity." Rather, other substances in the herb seem to have diverse actions on brain chemicals, all of which work together to counter depression.

Equally possible, though, when using an herb with two or more active chemicals, is that one will cancel the benefits of another or introduce a hazard. Without careful chemical tests and large, well-controlled clinical trials such actions are often hard to detect.

Consumer confidence in herbal medicine is bolstered by the common but erroneous assumption that "natural" equals "safe" and the public's failure to realize that many plants contain chemicals that are potent drugs or outright poisons. Natural laxatives like the herb Cascara sagrada are just as habit-forming and harmful to the colon as laxatives sold as drugs.

Indeed, one quarter of prescription drugs and hundreds of over-the-counter products were originally isolated from plants. Ephedra, for example, contains a natural stimulant that is approved for use as a decongestant and bronchial dilator in some pharmaceutical products. However, when used in

(continued)

Americans Gamble on Herbs as Medicine (continued)

uncontrolled dosages or by people with certain underlying health problems, it can cause a dangerous rise in blood pressure and, in its herbal form, has been responsible for serious adverse reactions and dozens of deaths, mainly among people who inappropriately used it as a stimulant or diet aid.

Complicating the safety issue is the fact, shown in several recent surveys, that most patients fail to tell their physicians they use herbal supplements and thus sometimes risk dangerous drug interactions or endure costly tests or treatments when an herb causes an unrecognized side effect. Experts say many patients withhold information about herbal drug use because they fear being ridiculed by their doctors.

Although all German physicians must take courses on herbal remedies, only a handful of American medical and pharmacology schools offer courses in this field.

A year ago, the President's Commission on Dietary Supplement Labels recommended that the FDA appoint a committee to evaluate the safety and effectiveness of herbal products. "This could be the most important step in the United States toward legitimizing herbal medicine," Tyler said.

However, the agency responded that it lacked the budget to support such an effort. American physicians have completed and published only a few well-designed studies of some popular botanicals. Among them were studies showing that saw palmetto can shrink an enlarged prostate and ginkgo biloba can improve memory in patients with early Alzheimer's disease.

The Office of Dietary Supplements at the National Institutes of Health is helping to finance a three-year multicenter study of St. John's wort as a treatment for clinical depression and a study of plant-based estrogens as a preventive for post-menopausal health problems.

However, thousands of studies of botanicals have been completed abroad—mainly in Germany—that strongly suggest a health-promoting role for more than 200 plant products. Germany's Commission E evaluated 380 botanicals, approving 254 as safe and reasonably effective and disapproving 126 as ineffective, unsafe or both.

The Germans use a different criterion to assess an herb's benefits—a doctrine of "reasonable certainty" that the herb has the desired effect and is safe, Blumenthal said. Whereas standard testing of a drug for approval by the FDA can cost as much as $500 million per product—a prohibitive amount for companies to spend on botanicals that cannot be patented—tests to establish "reasonable certainty" would cost only $1 million to $2 million, Tyler estimated.

In June 1996, Dr. Robert Temple, director of medical policy for the FDA's Center for Drug Evaluation, suggested that, rather than subjecting botanicals to the extensive tests required for drugs, the agency might consider applying less stringent criteria to assess an herb's effects, at least when a product is to be used only for a short time. He said, "A long history of safe use might provide sufficient safety information for products that are intended for short-term use."

More than four dozen botanicals or botanical formulations have been submitted to the agency as investigational new drugs. If any meet the agency's criteria for safety and effectiveness and are eventually approved as drugs, they would be allowed to carry direct health claims—instead of just structure and function statements—on labels and in advertising.

Meanwhile, Dr. Joerg Gruenwald, medical director of a German phytomedicine company and primary editor of the new *Physicians' Desk Reference for Herbal Medicines*, said professionals can rely on that volume for current, documented information about botanicals. The volume, to be issued annually, updates the Commission E reports and adds several hundred other products sold in the United States, listing effects, side effects and conditions in which their use is inadvisable.

Focus Questions: "Americans Gamble on Herbs as Medicine"

Answer the following questions sentences by reading the first thirteen paragraphs of the article.

I. Language:

Read the title. What does it tell you about the topic of the article that follows? What does the use of the word "gamble" suggest about the use of herbs as medicine?

1. **Look** in the first paragraph for the term "near-quackery." Can you determine what it means by using context clues?
2. **Find** the definition for the literary term "metaphor." Can you find a metaphor in paragraph three? **Explain** the metaphor and **show how** it is effective in describing the testing of new products.
3. In paragraph three, the word "effective" has been changed by adding a prefix in one sentence and a suffix in another. **Explain** the purpose of using the prefix and suffix.
4. **Find** at least three examples of introductory words or phrases. How are they used? What punctuation mark always follows these words and phrases? Why?
5. **Find** two definition patterns that we have used in previous lessons.

II. Content:

1. **Explain** what the increasing use of herbal medicines over traditional ones states about society as a whole.
2. **Suggest why** a person might choose to use an herbal medicine over a conventional Western-type treatment.
3. **Explain** why herbal products are not as highly regulated as drugs and how this might affect consumers.
4. **Discuss** the significance of the report in the journal *Psychosomatics* that states that "unsuspecting consumers 'have used herbal remedies with good results only to discover that the benefit was actually derived from the presence of undisclosed medicines,' including steroids, anti-inflammatory agents, sedatives, and hormones."
5. **Explain** why Dr. Varro E. Tyler feels that "the lack of quality standards is the No. 1 problem in the whole [herbal supplement] industry."
6. **Describe** how Annette Dickinson supports the "good manufacturing practices" doctrine regarding the use of herbs for medicinal purposes.
7. Herbal products are not closely regulated, yet consumers are buying them at an increasing rate. **Speculate** why this is occurring.
8. The natural supplies of some herbs are becoming endangered due to the popularity of herbal supplements and herbal medicine. **Suggest how** this is happening and predict the impact it may have on the future of the industry and on the earth.
9. **Describe** what informational goods and services are available about herbs and their uses. **Explain** what they may do to forward the trend in herbal supplements. **(Students: Note the part of speech of "forward" in this question.)**

Adapted from website questions at <www.nytimes.com/learning/teachers/lessons/19990209 tuesday.html?searchpv=learning_lessons>.

Designing an Experiment: Research and Presentation of a Scientifically Valid Study to Test the Effectiveness of an Herbal Remedy

In doing your research:

1. Choose an herbal remedy.

2. **Observations and description:** Find reliable sources that will help you answer the following questions:
   - **Explain** the history behind the use of this herb.
   - **List** the ailments this remedy is supposed to prevent, relieve, or cure. If there is more than one, choose an ailment on which to focus your research.
   - **Describe** the symptoms commonly associated with this ailment.
   - **Describe** the suggested results of taking this remedy.
   - **Discuss** the anecdotal evidence that exists showing that this remedy is effective.
   - **Document** the warnings/problems that are associated with this herbal remedy.
   - **List** any conflicting claims about the success of using this herbal remedy.
   - **Find** a picture of the herb in plant form. Where is this herb found?

   (This information will be used as the "Background Information" section of your written experiment.)

3. **Hypothesis:** Think and note:
   - **Consider** the anecdotal information gathered. **Explain** some of the possible causes for it.
   - Of these possibilities, **choose** the one you think is most reasonable. **Decide** which possibility you would like to test.
   - Based on the research and observations made previously, formulate a **hypothesis** about the herbal remedy. **(This will be the "Hypothesis" section of your written experiment.)**
   - **Create** a clear, concise **title** for your experiment.
   - **Write out** a statement of purpose that describes what you intend to try and prove. **(This will be the "Purpose" section of your written experiment.)**

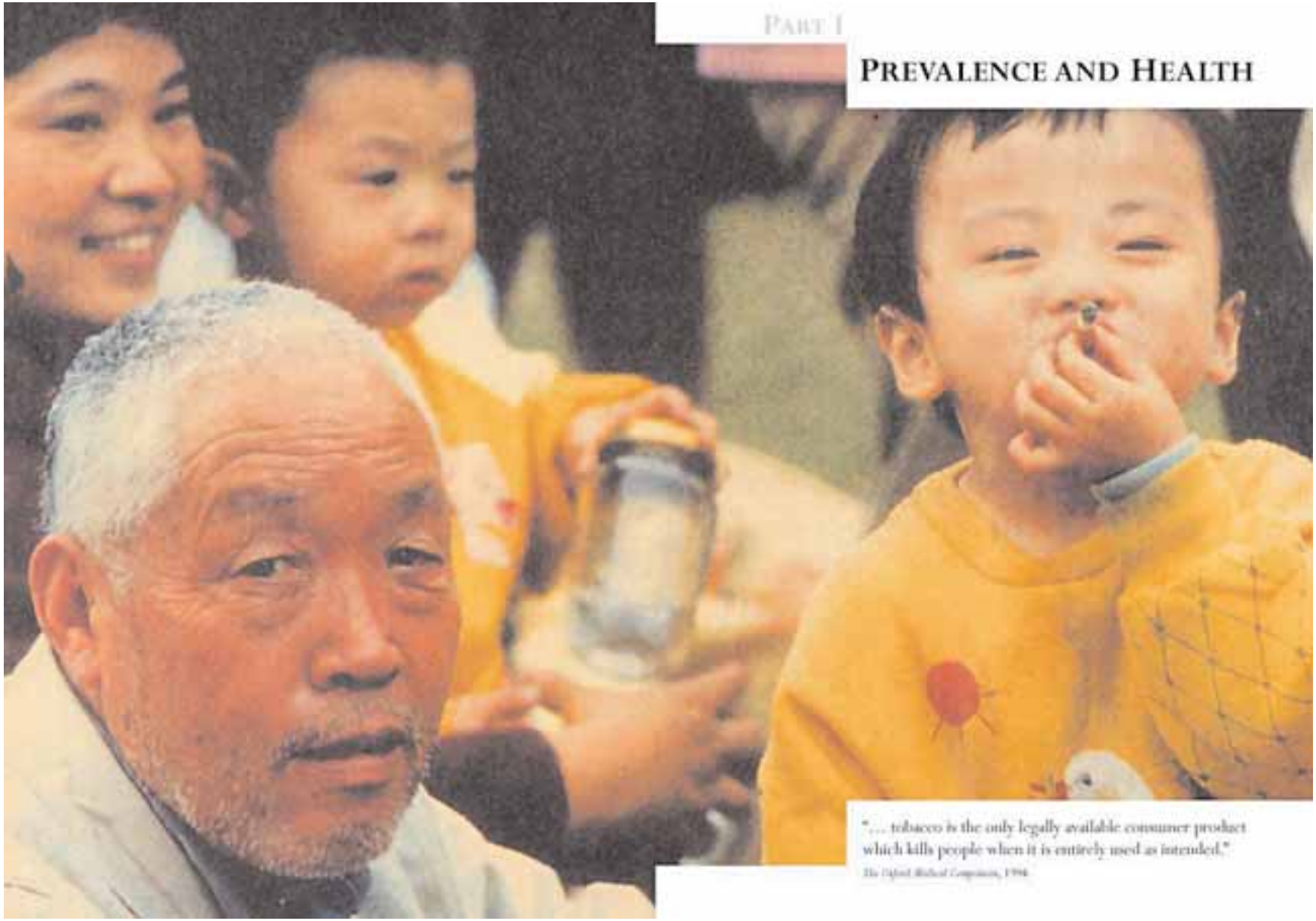
4. **Experiment:**
   - **Design** a double-blind experiment. This is an experiment in which neither the test subjects nor those dispensing the remedy know what materials they are dispensing or receiving.
   - **Write** the step-by-step directions, noting each step's purpose. **(This information will form the "Procedures" section of your written experiment.)**

(continued)

Adapted from "Medicine Show." <www.nytimes.com/learning/teachers/lessons/20021217tuesday.com>.

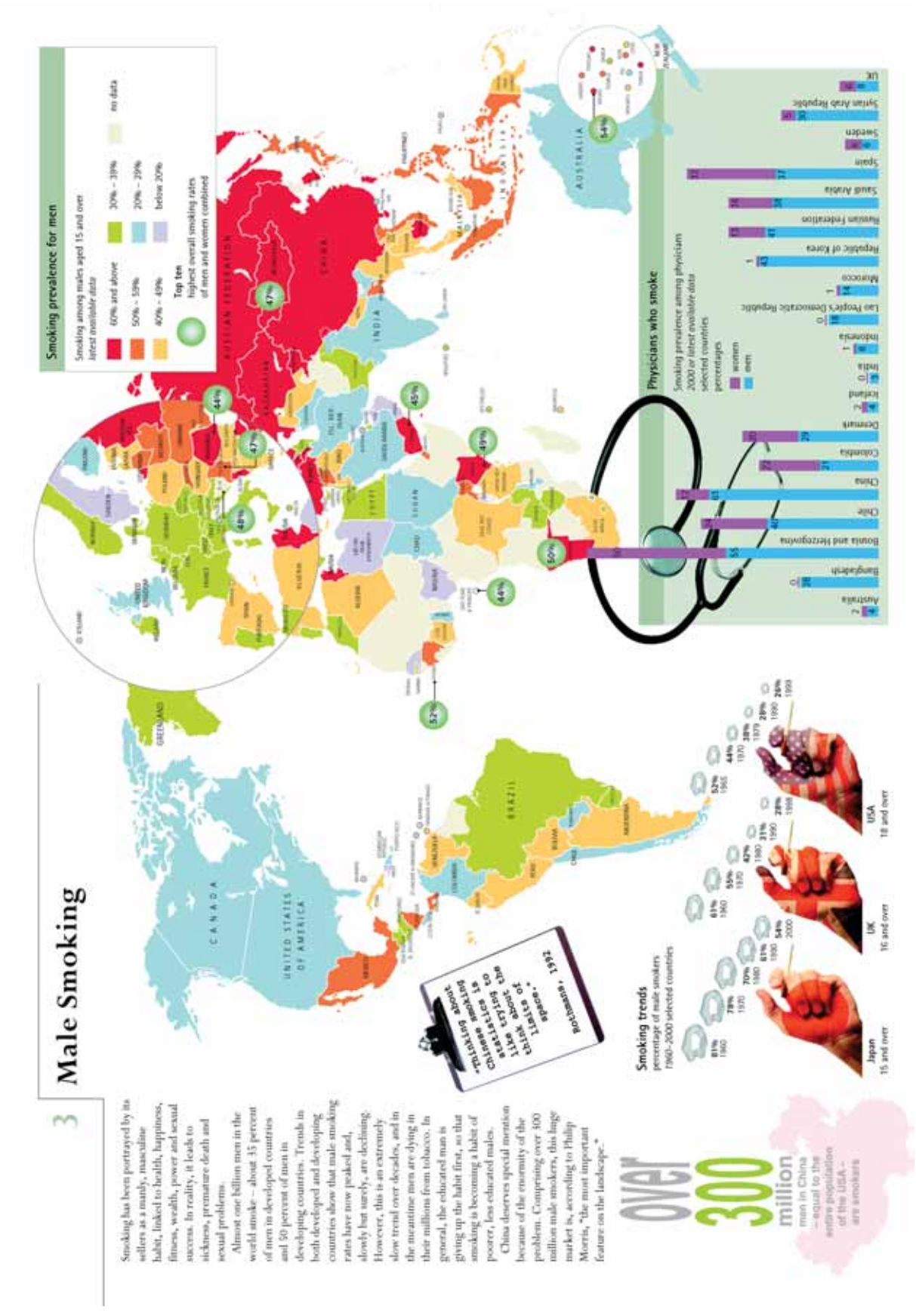
Designing an Experiment: Research and Presentation of a Scientifically Valid Study to Test the Effectiveness of an Herbal Remedy (continued)

- **Consider** the following:
  - Besides being affected by the remedy, how else might your subjects get well?
  - Based on these answers, what variables should be controlled?
  - How will you control these variables?
  - Can the people being tested affect the outcome?
  - How else might your observations of the test show a bias?
  - Whom will you test?
  - Will you have more than one group? Why or why not?
  - How will you control for bias on the part of those taking the remedy?
  - Who will perform the test?
  - How will you control for bias on the part of those dispensing the remedy?
  - In what form (salve, extracts, teas, tinctures, tablets, etc.) will the remedy be dispensed, and why?
  - When will you dispense the remedy, and why?
  - Where will the test be held?
  - What materials will you need? (This will form the "Materials" section of your written experiment.)



Copyright WHO Tobacco Atlas. <www.who.int/tobacco/en/atlas3.jpg>. Reproduced by permission.

Male Smoking



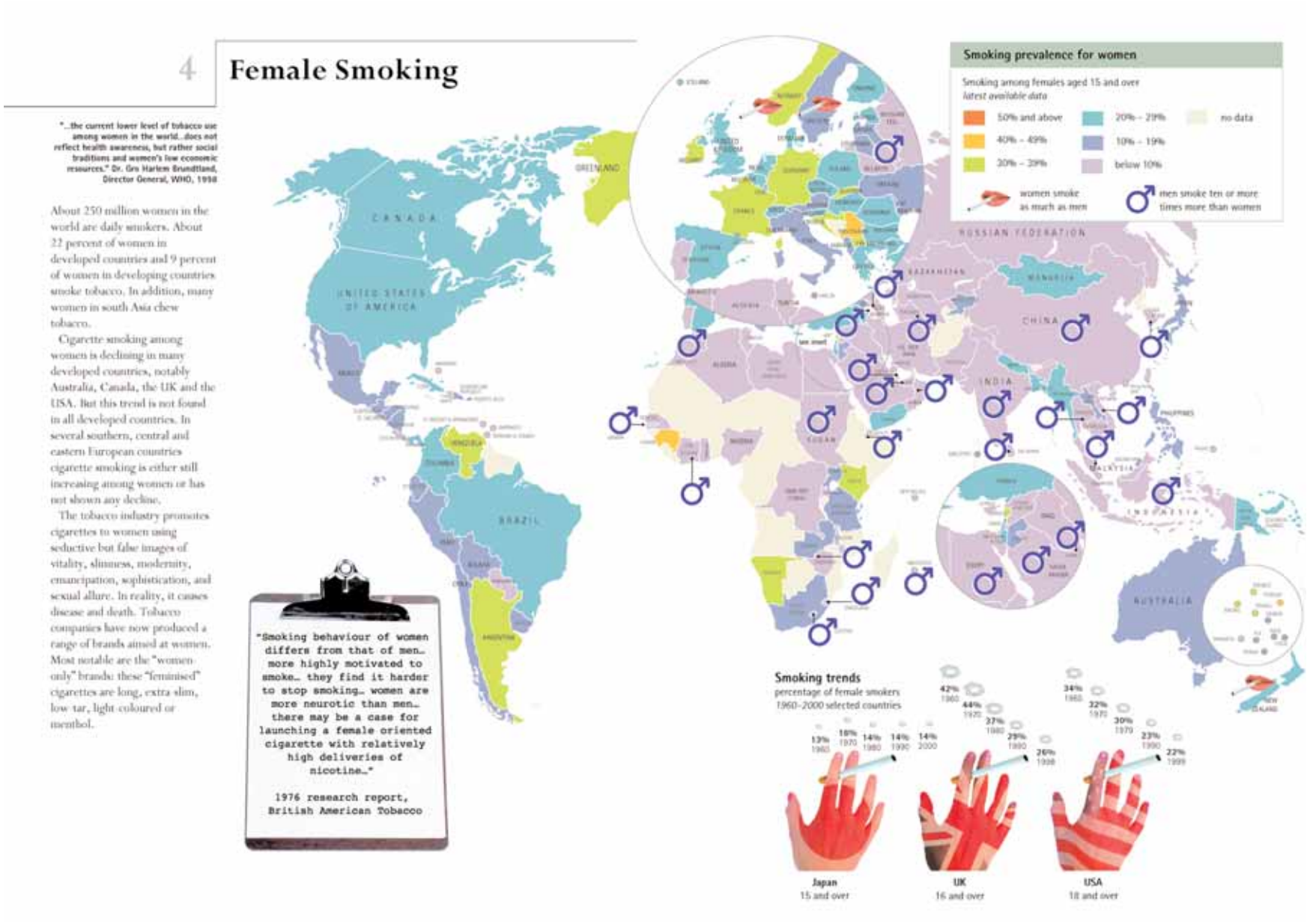
4 Female Smoking

"...the current lower level of tobacco use among women in the world...does not reflect health awareness, but rather social traditions and women's low economic resources." Dr. Gro Harlem Brundtland, Director General, WHO, 1998

About 250 million women in the world are daily smokers. About 22 percent of women in developed countries and 9 percent of women in developing countries smoke tobacco. In addition, many women in south Asia chew tobacco.

Cigarette smoking among women is declining in many developed countries, notably Australia, Canada, the UK and the USA. But this trend is not found in all developed countries. In several southern, central and eastern European countries cigarette smoking is either still increasing among women or has not shown any decline.

The tobacco industry promotes cigarettes to women using seductive but false images of vitality, slimness, modernity, emancipation, sophistication, and sexual allure. In reality, it causes disease and death. Tobacco companies have now produced a range of brands aimed at women. Most notable are the "women only" brands: these "feminised" cigarettes are long, extra slim, low tar, light coloured or menthol.



5 Youth

"If younger adults turn away from smoking, the industry will decline, just as a population which does not give birth will eventually dwindle."
RJ Reynolds researcher, 1984

The overwhelming majority of smokers begin tobacco use before they reach adulthood. Among those young people who smoke, nearly one-quarter smoked their first cigarette before they reached the age of ten.

Several factors increase the risk of youth smoking. These include tobacco industry advertising and promotion, easy access to tobacco products, and low prices. Peer pressure plays an important role through friends' and siblings' smoking. Other risk factors associated with youth smoking include having a lower self-image than peers, and perceiving that tobacco use is normal or "cool". Many studies show that parental smoking is associated with higher youth smoking.

While the most serious effects of tobacco use normally occur after decades of smoking, there are also immediate negative health effects for young smokers. Most teenage smokers are already addicted while in adolescence. The younger a person begins to smoke, the greater the risk of eventually contracting smoking-caused diseases such as cancer or heart disease.

The highest youth smoking rates can be found in Central and Eastern Europe, sections of India, and some of the Western Pacific islands.

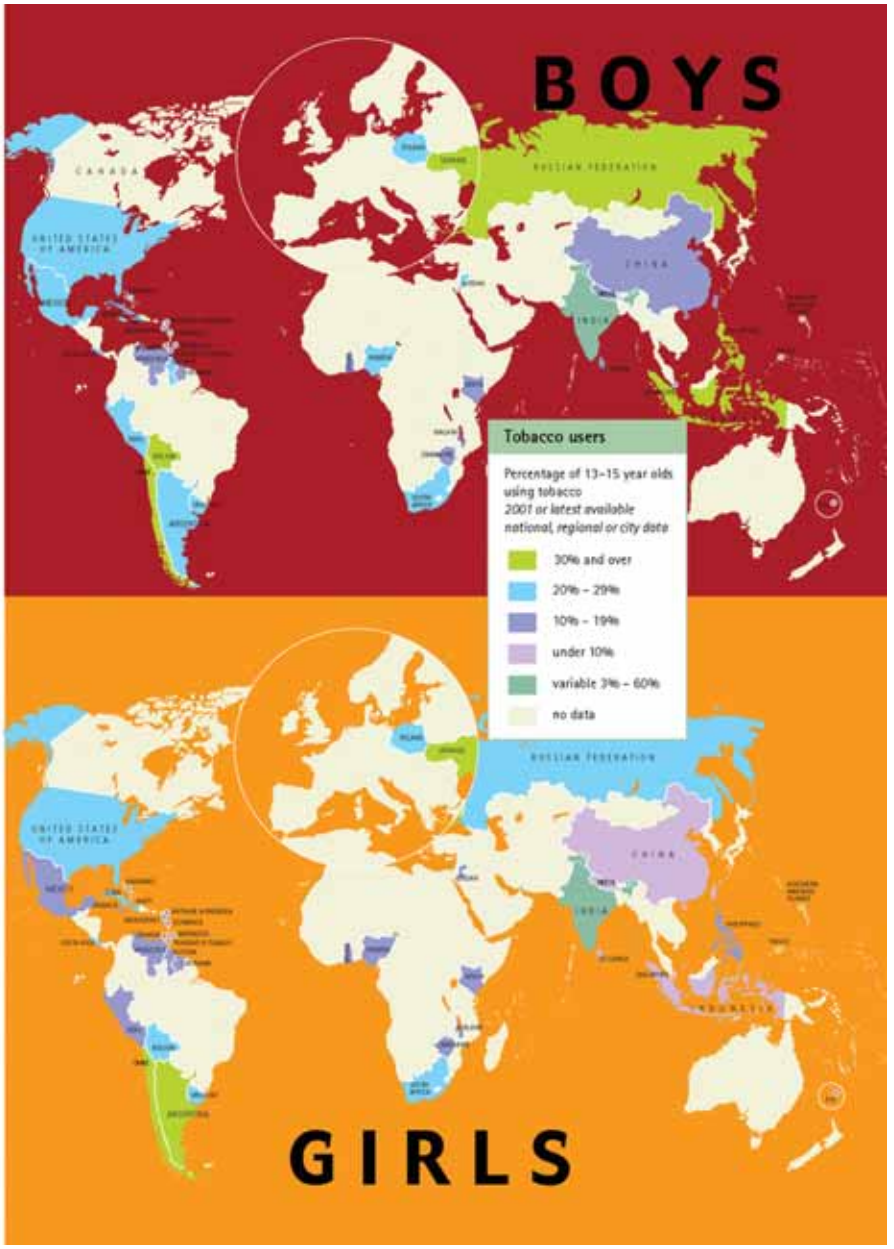
Fewer than 5% of young people in Bahamas, Barbados, Costa Rica, Indonesia, Malawi, Montserrat, Poland, Russia, Singapore, Ukraine and Venezuela think girls who smoke look more attractive.

Over 40% of young people in Fiji, Ghana, Malawi, Nigeria, South Africa, Sri Lanka and Zimbabwe think boys who smoke have more friends.

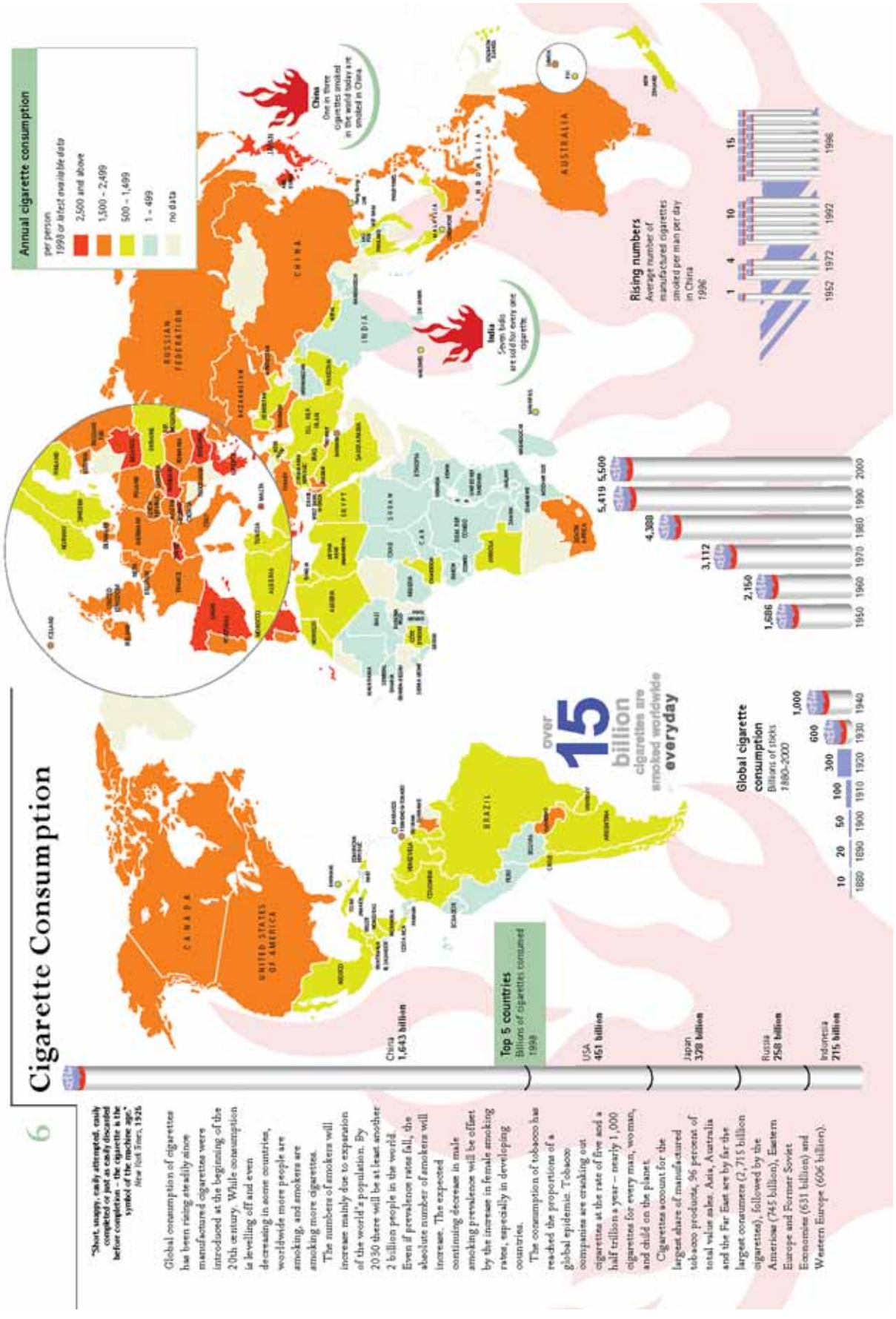
50%
of young people who continue to smoke will die from smoking

Early smokers
Over 30% of children smoked their first whole cigarette before age 10 in Ghana, Grenada, Guyana, India, Jamaica, Palau, Poland, N Mariana Islands and St Lucia.

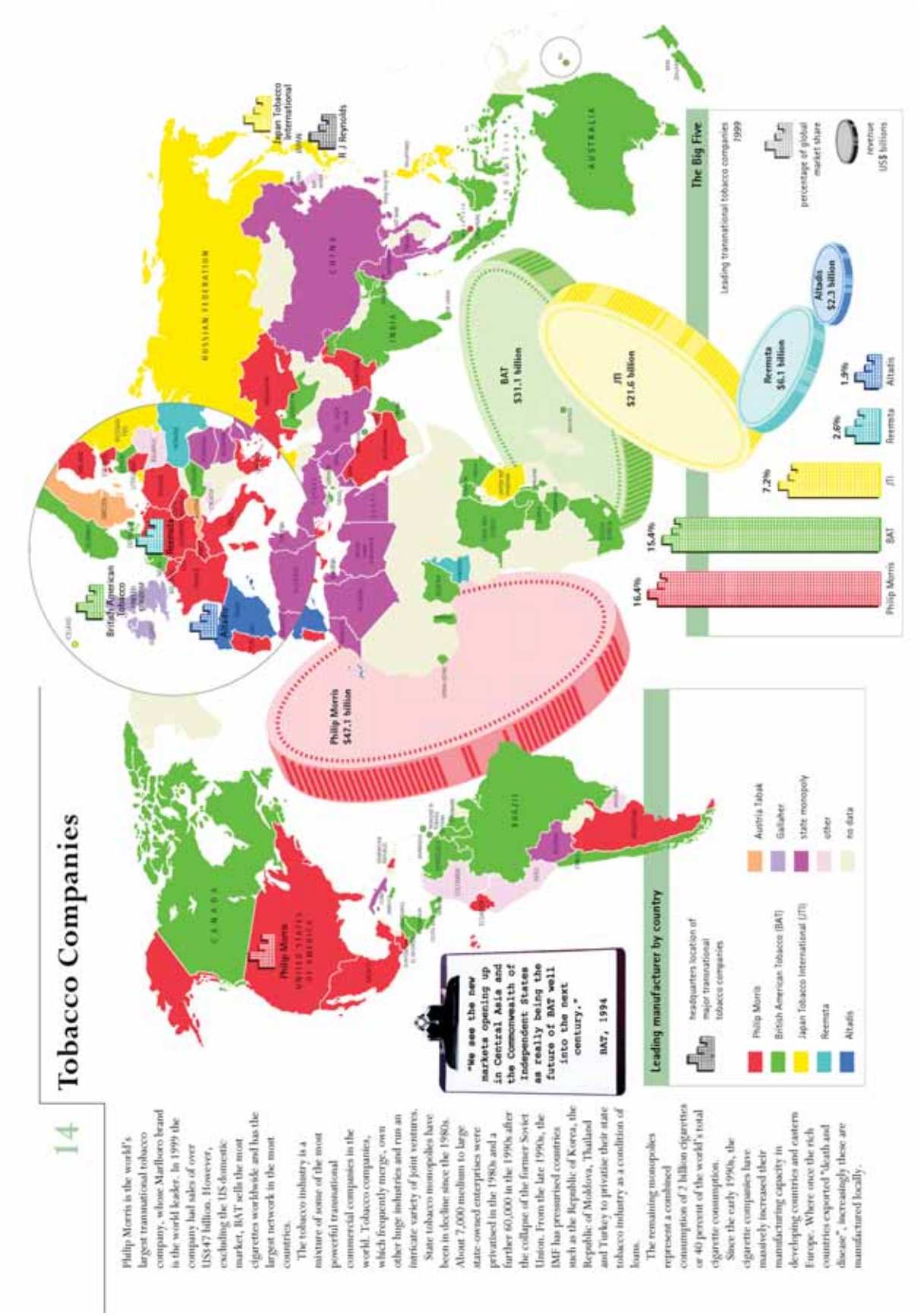
40%
of children worldwide are exposed to passive smoking at home

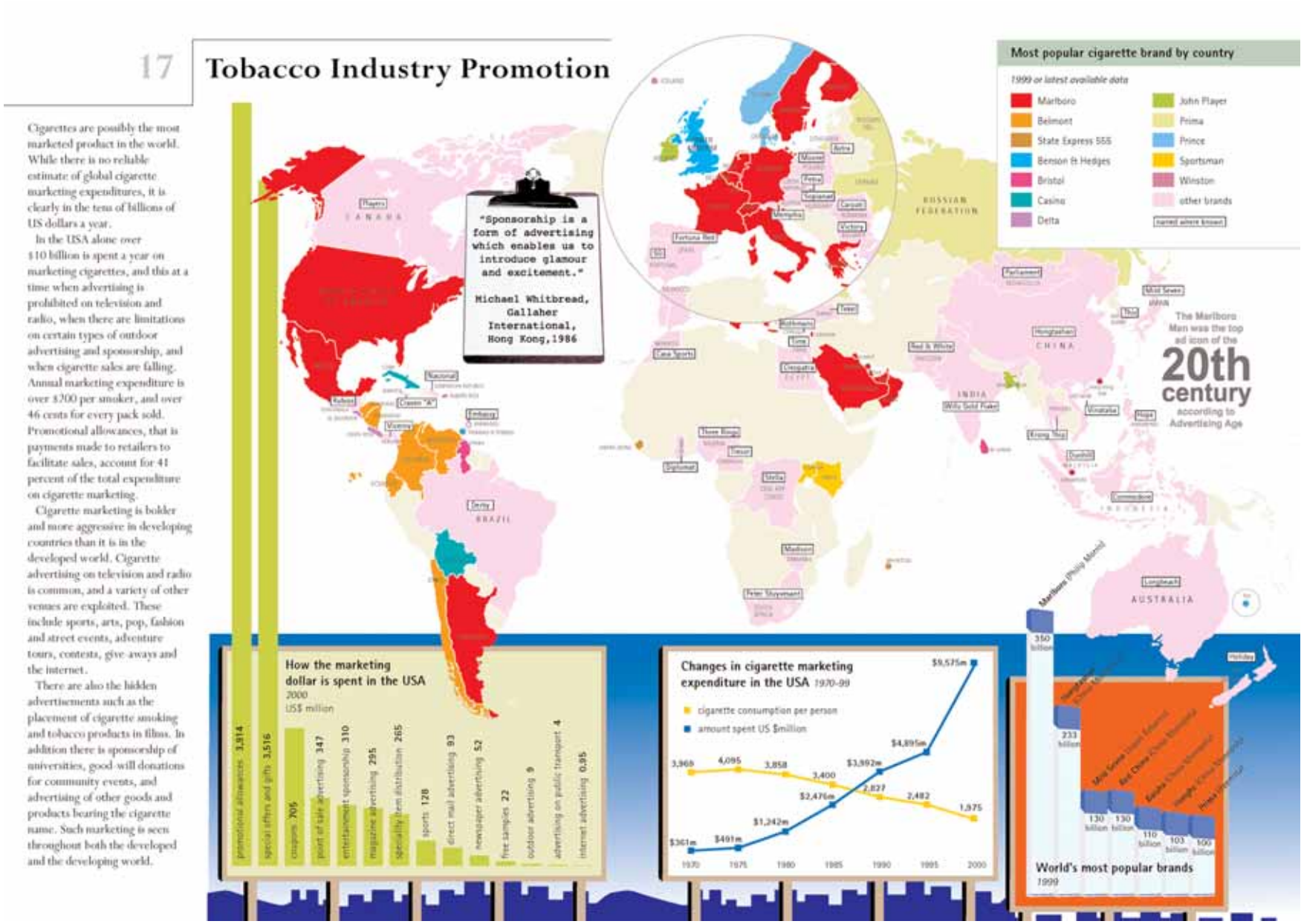


Cigarette Consumption



Tobacco Companies

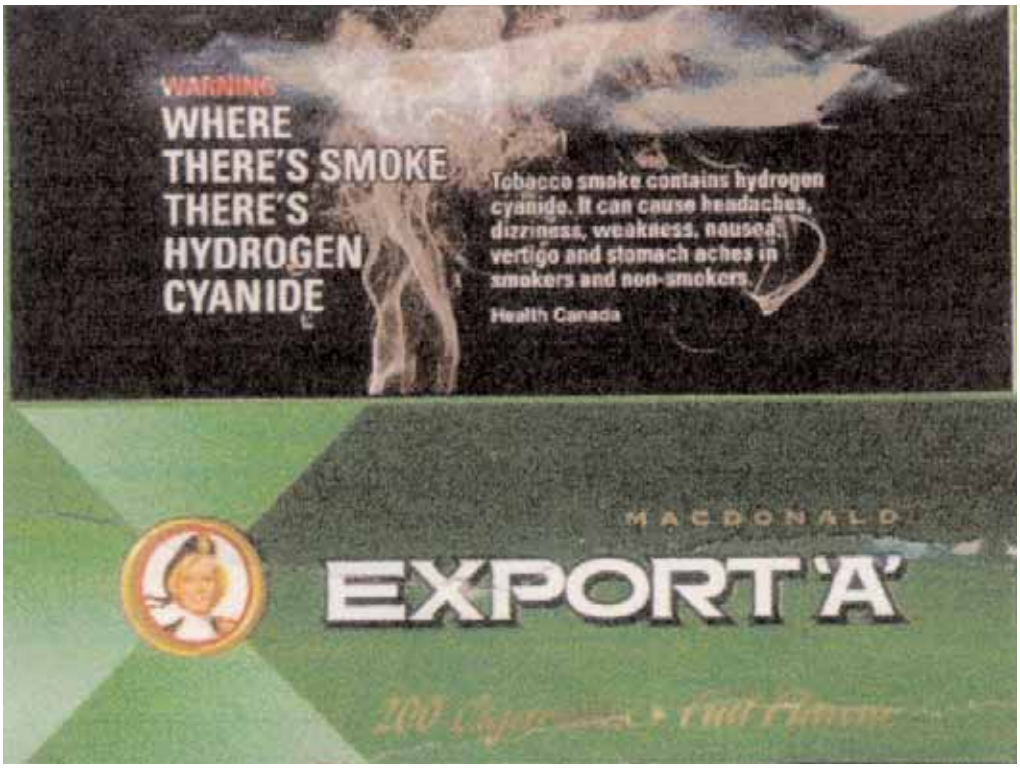




A Smoker's Hand

*Copyright Health Canada. <www.hc-sc.gc.ca/francais/media/photos/tabac/fi/00000008.jpg>.

Cigarette Package Warnings



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Cigarette Package Warnings (continued)

Manufacturers of cigarettes for sale in Canada are required to print one of the 16 new health warnings shown above on each pack of cigarettes. The requirement came into effect on December 23rd, 2000 for brands with a market share of 2% or more, and will be extended to smaller brands by mid-2001.

The above JPGs were scanned from cigarette packs purchased in Québec on January 2nd, 2001. The new warnings are trickling into retail outlets across the country as stocks of cigarettes are renewed. Warnings showed up first on the country's four biggest brands: du Maurier, Player's and Matinée (all manufactured by Imperial Tobacco of Canada, a subsidiary of British American Tobacco) and Export 'A' (manufactured by JTI-Macdonald, a subsidiary of Japan Tobacco International).

The new warning system extends to carton wrappers, which now include a warning on each of their six surfaces.

7 Health Risks

Tobacco is packed with harmful and addictive substances. Scientific evidence has shown conclusively that all forms of tobacco cause health problems throughout life, frequently resulting in death or disability.

Smokers have markedly increased risks of multiple cancers, particularly lung cancer, and are at far greater risk of heart disease, strokes, emphysema and many other fatal and non fatal diseases. If they chew tobacco, they risk cancer of the lip, tongue and mouth.

Women suffer additional health risks. Smoking in pregnancy is dangerous to the mother as well as to the foetus, especially in poor countries where health facilities are inadequate.

Maternal smoking is not only harmful during pregnancy, but has long-term effects on the baby after birth. This is often compounded by exposure to passive smoking from the mother, father or other adults smoking.

While tobacco kills millions more than it helps, research is underway examining any possible health benefits of nicotine and also trying to find a safe use for tobacco, particularly in the field of genetic modification. The aim is to produce vaccines or human proteins for medical use, or even to clean up soil that has been contaminated with explosives.

Deadly chemicals

Tobacco smoke contains over 4,000 chemicals, some of which have marked irritant properties and some 60 are known or suspected carcinogens.

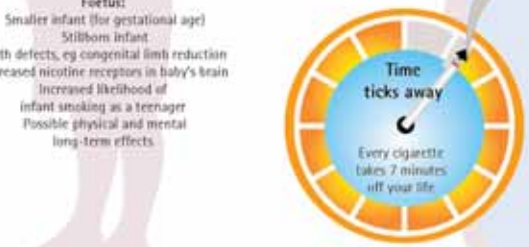
Tobacco smoke includes	as found in
Acetone	paint stripper
Ammonia	floor cleaner
Arsenic	ant poison
Butane	lighter fuel
Cadmium	car batteries
Carbon monoxide	car exhaust fumes
DDT	insecticide
Hydrogen cyanide	gas chambers
Methanol	rocket fuel
Napthalene	moth balls
Toluene	industrial solvent
Vinyl chloride	plastics

Babes in the womb

Smoking in pregnancy

Increased risks:
Spontaneous abortion / miscarriage
Ectopic pregnancy
Abruptio placentae
Placenta praevia
Premature rupture of the membranes
Premature birth

Foetus:
Smaller infant (for gestational age)
Stillborn infant
Birth defects, eg congenital limb reduction
Increased nicotine receptors in baby's brain
Increased likelihood of infant smoking as a teenager
Possible physical and mental long-term effects



How smoking harms you

Parts of the body especially affected by tobacco use

HAIR
• Smell and staining

BRAIN AND MENTAL EFFECTS
• Strokes (cerebrovascular accidents)
• Addiction / withdrawal
• Altered brain chemistry
• Anxiety about harm caused by smoking

EYES
• Eyes sting, water and blink more
• Blindness (macular degeneration)
• Cataracts

SKIN
• Wrinkles, premature ageing

NOSE
• Less sense of smell

HANDS
• Poor circulation (cold fingers): peripheral vascular disease
• Tar stained fingers

TEETH
• Discoloration and stains
• Plaque
• Loose teeth
• Gum disease (gingivitis)

MOUTH AND THROAT
• Cancers of lips, mouth, throat and larynx
• Sore throat
• Reduced sense of taste
• Breath smells of smoke

HEART
• Harms, blocks and weakens arteries of the heart
• Heart attack

RESPIRATION AND LUNGS
• Lung cancer
• Cough and sputum, shortness of breath
• Colds and flu, pneumonia, asthma
• Chronic obstructive pulmonary disease and emphysema
• Complicates tuberculosis

CHEST
• Cancer of oesophagus

ABDOMEN
• Stomach and duodenal ulcers
• Cancer of stomach, pancreas, colon
• Aortic aneurysm

LIVER
• Cancer

KIDNEYS and BLADDER
• Cancer

BONES
• Osteoporosis
• Spine and hip fractures

MALE REPRODUCTION
• Sperm: deformity, loss of motility, reduced number
• Infertility
• Impotence

FEMALE REPRODUCTION
• Period pains
• Earlier menopause
• Cancer of cervix
• Infertility and delay in conception

WOUNDS AND SURGERY
• Wounds take longer to heal
• Operation wounds take longer to heal
• Longer to recuperate from surgery

BLOOD
• Leukaemia

DIABETES
• Noninsulin dependent diabetes mellitus (Type 2, adult-onset)

BURNS
• From fires caused by tobacco

LEGS and FEET
• Increased leg pain and gangrene: peripheral vascular disease
• Buerger's Disease

IMMUNE SYSTEM
• Weakened

smoking is responsible for

90% of all lung cancer

75% of chronic bronchitis and emphysema

25% of cases of ischaemic heart disease

8 Passive Smoking

"An hour a day in a room with a smoker is nearly a hundred times more likely to cause lung cancer in a non-smoker than 20 years spent in a building containing asbestos." Sir Richard Doll, 1985

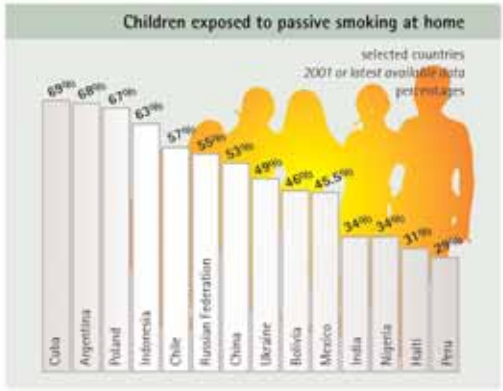
The first conclusive evidence on the danger of passive smoking came from Takeshi Hirayama's study in 1981 on lung cancer in non-smoking Japanese women married to men who smoked. Although the tobacco industry immediately launched a multi million dollar campaign to discredit the evidence, dozens of further studies have confirmed the link. Research then broadened into other areas and new scientific evidence continues to accumulate.

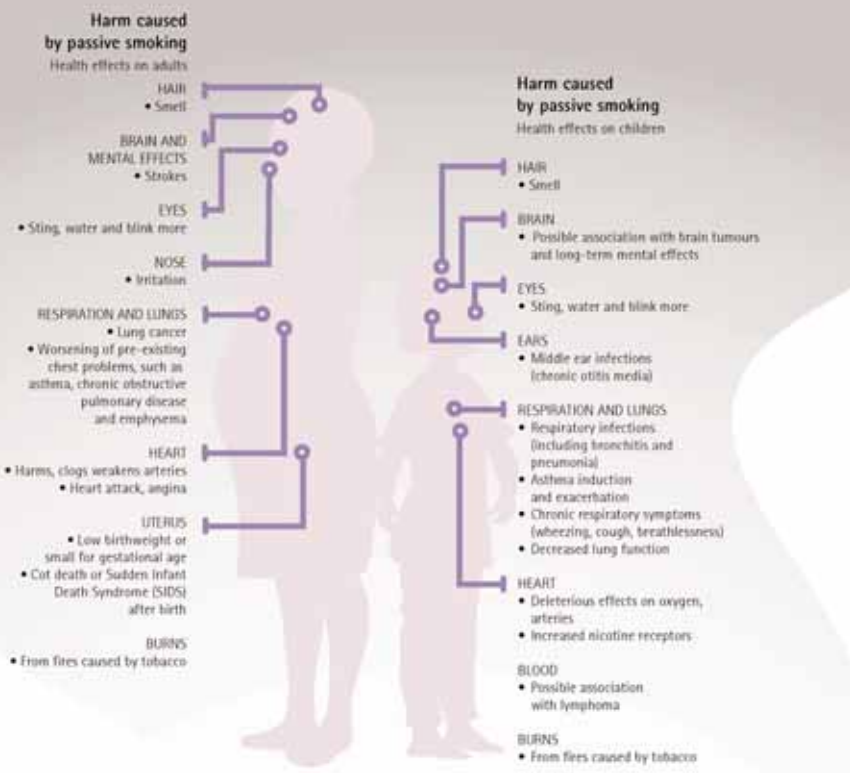
A complex mixture of chemicals is generated from the burning and smoking of tobacco. As a passive smoker, the non-smoker breathes "sidestream" smoke from the burning tip of the cigarette and "mainstream" smoke that has been inhaled and then exhaled by the smoker.

The risk of lung cancer in non smokers exposed to passive smoking is increased by between 20 and 30 percent, and the excess risk of heart disease is 23 percent.

Children are at particular risk from adults' smoking. Adverse health effects include pneumonia and bronchitis, coughing and wheezing, worsening of asthma, middle ear disease, and possibly neuro-behavioural impairment and cardiovascular disease in adulthood.

A pregnant woman's exposure to other people's smoking can harm her foetus. The effects are compounded when the child is exposed to passive smoking after birth.





Numbers affected by passive smoking in the USA
annual 1990s

Lung cancer 3,000
Ischaemic heart disease 35,000 to 62,000

Infants and children

Low birthweight 9,700 to 18,600
Cot death (SIDS) 1,900 to 2,700
Bronchitis or pneumonia in infants 150,000 to 300,000

Respiratory effects in children
Middle ear infection 700,000 to 1,600,000
Asthma induction (new cases) 8,000 to 26,000
Asthma exacerbation 400,000 to 1,000,000

9 Deaths

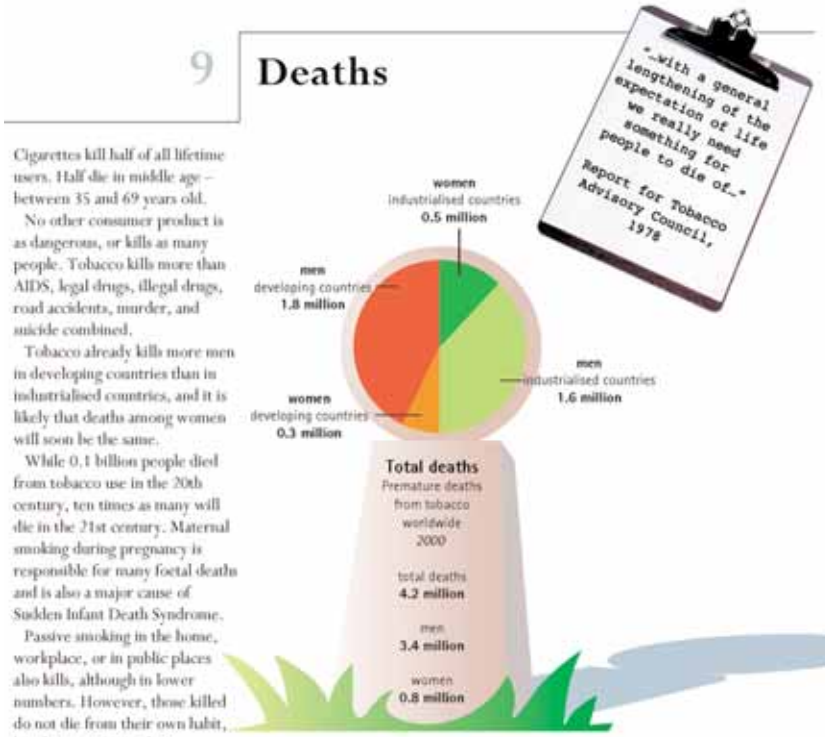
Cigarettes kill half of all lifetime users. Half die in middle age – between 35 and 69 years old.

No other consumer product is as dangerous, or kills as many people. Tobacco kills more than AIDS, legal drugs, illegal drugs, road accidents, murder, and suicide combined.

Tobacco already kills more men in developing countries than in industrialised countries, and it is likely that deaths among women will soon be the same.

While 0.1 billion people died from tobacco use in the 20th century, ten times as many will die in the 21st century. Maternal smoking during pregnancy is responsible for many foetal deaths and is also a major cause of Sudden Infant Death Syndrome.

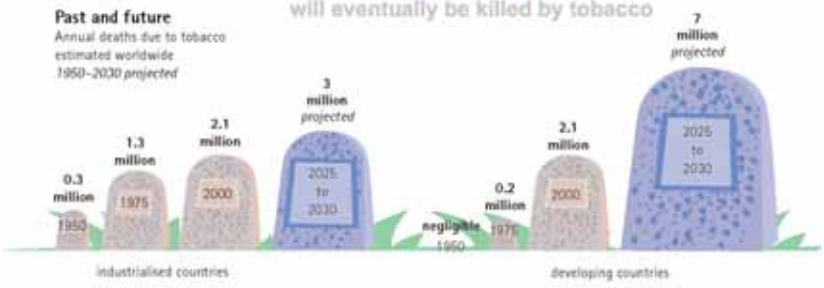
Passive smoking in the home, workplace, or in public places also kills, although in lower numbers. However, those killed do not die from their own habit, but from someone else's. Children are at particular risk from adults smoking, and even smoking by other adults around a pregnant woman has a harmful effect on a foetus.

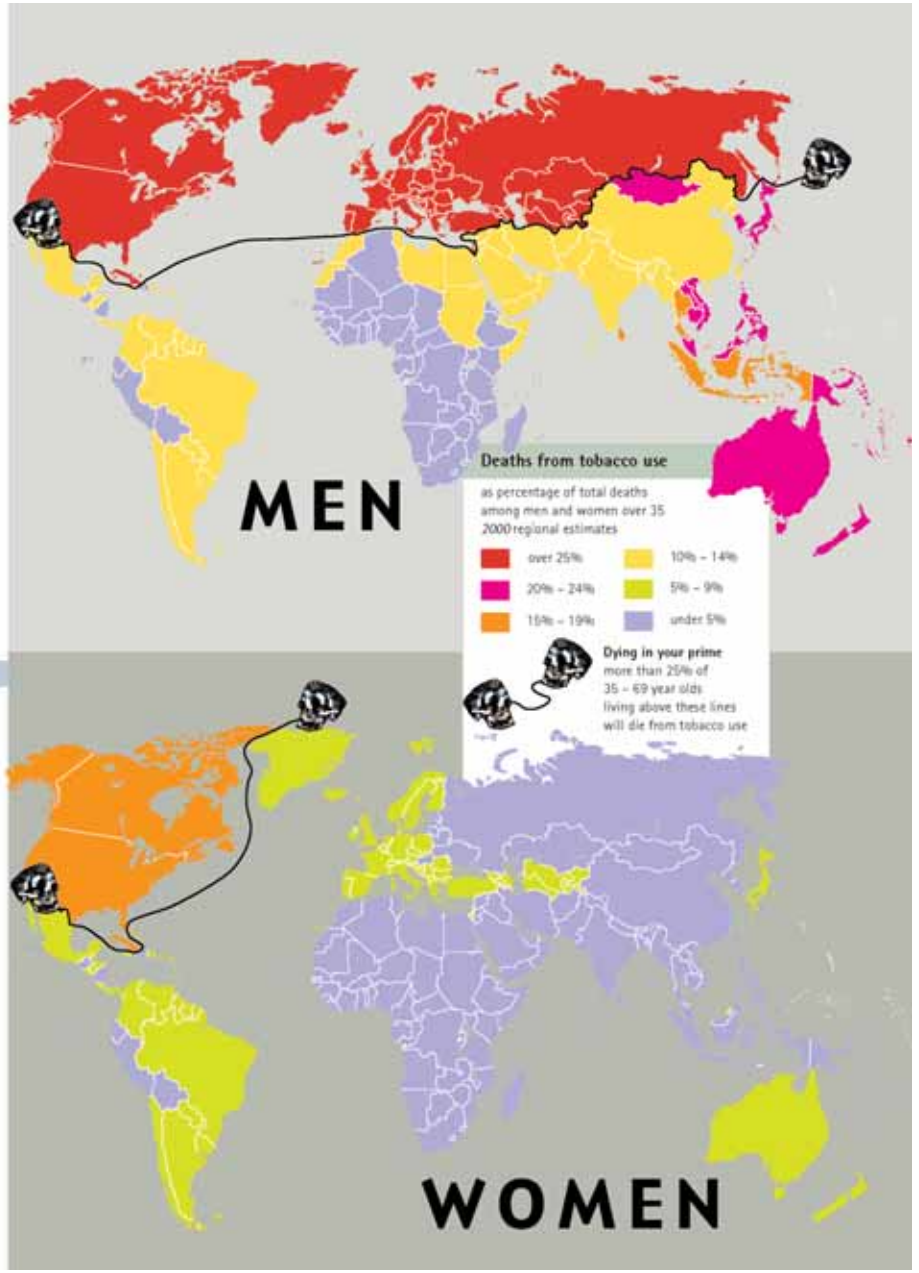


of everyone alive today

500,000,000

will eventually be killed by tobacco





26 Legislation: Health Warnings

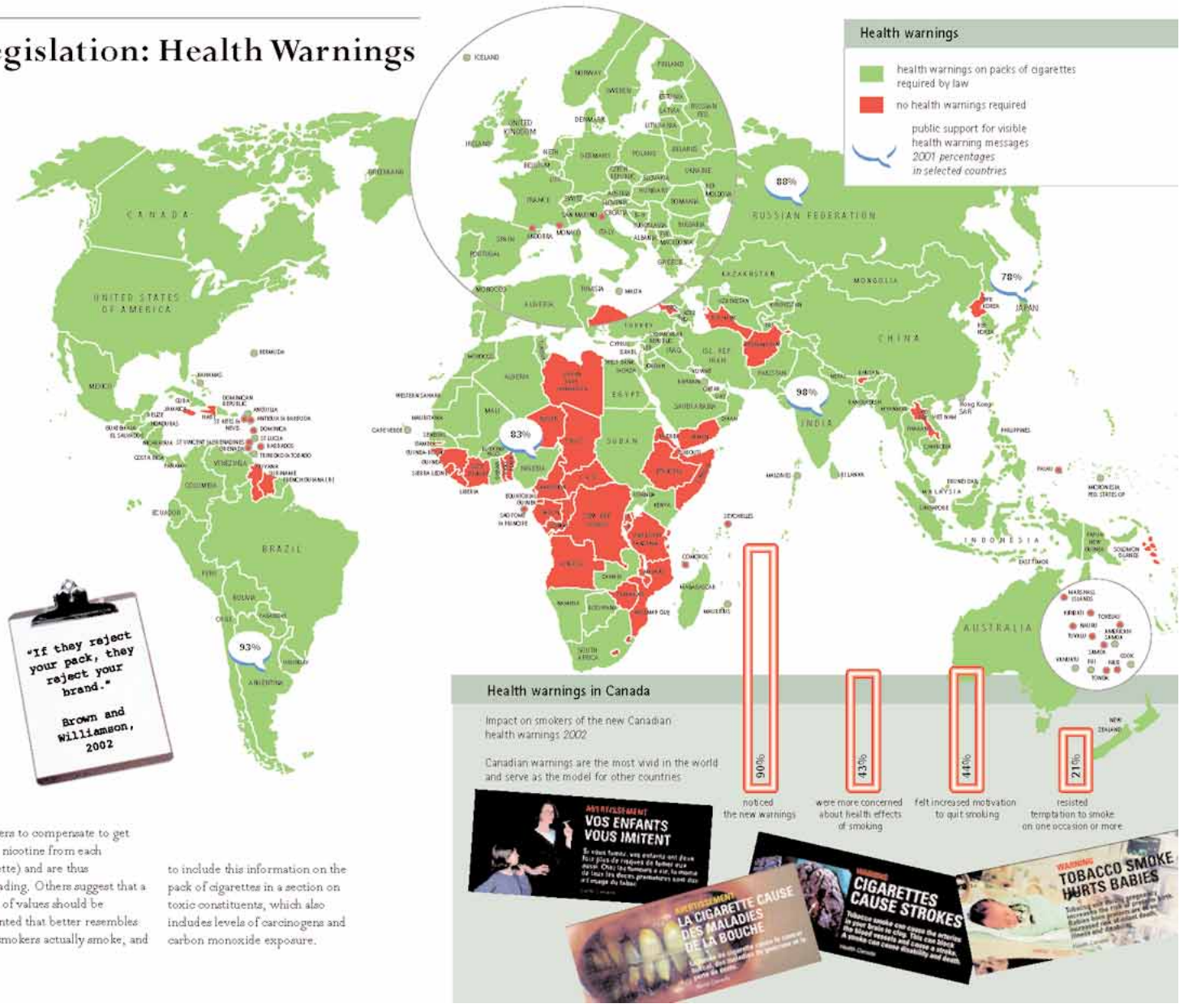
"Plain packaging is important because it eliminates the positive imagery associated with the brand and potentially disrupts the process of smoking initiation whereby child smokers become brand loyal."
Rob Cunningham and Ken Kyle, 1995

Health warnings about tobacco have been in existence for four hundred years, starting with King James I in England and Fang Yizhi in China, both in the 17th century (see map 1).

Cigarette packs first carried health warnings in the 1960's following scientific reports on the hazards of smoking in the USA and the UK. These early warnings were weak and inconspicuous. Contemporary Canadian warnings are the most vivid in the world and are serving as the model for other countries, such as Brazil. While many countries have some type of health warning on the pack, these are not universal and many that do exist are not as unequivocal, simple and stark as is necessary; some are not in the local language nor on all tobacco products.

Reports from Canada and Australia suggest that plain packaging may increase both prominence and believability of health warnings. That is, no use of colour, logo or graphic design, but simply a generic pack of cigarettes, with the brand name.

Health authorities now recommend that cigarette packages should not contain tar and nicotine levels as measured by smoking machines, as these do not reflect the actual inhalation of tar and nicotine due to cigarette design (primarily ventilation holes), and individual smoker behaviour (a tendency for smokers to compensate to get more nicotine from each cigarette) and are thus misleading. Others suggest that a range of values should be presented that better resembles how smokers actually smoke, and to include this information on the pack of cigarettes in a section on toxic constituents, which also includes levels of carcinogens and carbon monoxide exposure.



28 Quitting

"Every nicotine patch sold means 200 cigarettes not sold." Clive Bates, ASH UK, 2002

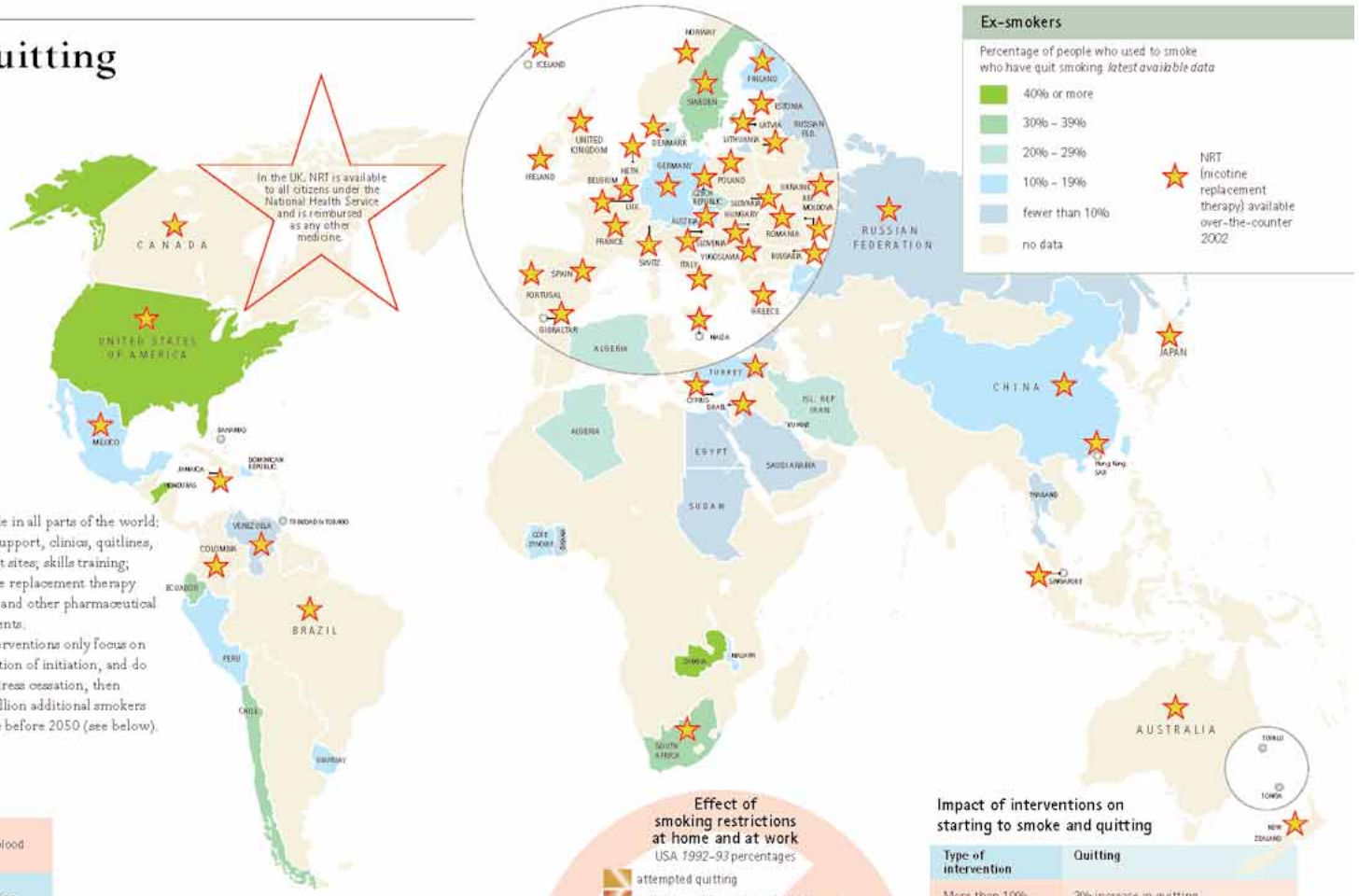
The main dangers of smoking decrease when smokers quit, even in those who have smoked for 30 or more years.

Smokers move through stages in relation to quitting: of pre-contemplation, contemplation, readiness then action, followed by maintenance or relapse. Many move through this cycle several times before they finally quit, while others report they found it easier to quit than they expected. These stages are influenced by increased costs from tax increases or reduction of smuggling, illness in the smoker, family or friends dying from tobacco, the media, health profession, bans on promotion, creation of smoke-free areas and, while most smokers still quit on their own, availability of support and treatment.

There are now techniques to assist those who want to quit smoking, although these are not available in all parts of the world: social support, clinics, quitlines, internet sites; skills training; nicotine replacement therapy (NRT) and other pharmaceutical treatments.

If interventions only focus on prevention of initiation, and do not address cessation, then 160 million additional smokers will die before 2050 (see below).

In the UK, NRT is available to all citizens under the National Health Service and is reimbursed as any other medicine.



Quitting Calendar

The benefits of stopping smoking

1 day later	Heart, blood pressure, and the blood show improvements
1 year later	Excess risk of coronary heart disease is half that of a continuing smoker
5 to 15 years later	Risk of a stroke is reduced to that of never-smokers
10 years later	Risk of lung cancer is reduced to less than half that of continuing smokers; risks of many other cancers decrease
15 years later	Risk of coronary heart disease is similar to that of never-smokers, and the overall risk of death almost the same, especially if the smoker quits before illness develops

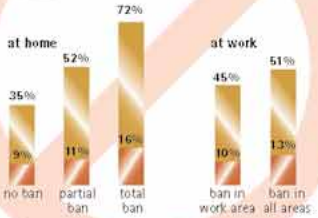
Effects of starting and quitting smoking on deaths

Total accumulated tobacco deaths
2000, 2025 and 2050 projected
millions

Effect of smoking restrictions at home and at work

USA 1992–93 percentages

attempted quitting
still not smoking six months later



Impact of interventions on starting to smoke and quitting

Type of intervention	Quitting
More than 10% price increase	3% increase in quitting
Anti-smoking media	Increased number of attempts and success
Bans on promotion	Complete ban reduces consumption by 6%
Restrictions on youth access	*no evidence*
Smoking restrictions	Work and household restrictions most effective
NRT	Higher number of attempts to quit

Winnipeg Free Press: Smoker's Helpline and Statistics

WHAT'S IN A CALL?

All callers are immediately connected to a trained quit specialist. The one touch rule applies here as the only prompt is: 1 for English or 2 for French. During the call, guidance will be provided that is tailored, based on the caller's individual needs and goals. For example, some callers have not yet thought about making a quit attempt and are just looking for information. Other callers may be thinking about quitting but aren't sure of the appropriate steps to take, while other callers are ready to make a quit attempt and need support and guidance. In fact, callers who have already quit smoking but need some counseling to stay smoke-free are also welcome to utilize the line. In addition, an important feature of the Smokers' Helpline is that key influencers making calls to the line are welcomed, as individuals can acces the line to seek advice to help a friend or loved one to quit smoking. Optional follow-up calls can be made to the caller by a trained quit specialist to keep track of the caller's progress and, more importantly, to provide support and encouragement.

The following statistics were taken from MANTRA'S (Manitoba Tobacco Reduction Alliance) Comprehensive Strategy Document.

TOBACCO USE

On a global level, the impacts of tobacco use are staggering. The World Health Organization (WHO) estimates smoking kills one person every 10 seconds, which is around 4 million deaths a year. Health Canada predicts that more than 45,000 Canadians will die due to smoking this year. Of these, more than 300 nonsmokers will die of lung cancer and at least 700 non-smokers will die of coronary heart disease caused by exposure to second-hand smoke.

The World Health Organization indicated that in the mid 1990's, Canadian women had the 7th highest smoking rate in the world whereas Canadian men had the 73rd highest.

Kyle: I really hadn't thought about quitting until I heard about the Smokers' Helpline. So I called, just to see what it was all about. I was amazed at how supportive the quit specialist was. I'm still not ready to quit yet, but when I do quit, I know I'll call the Smokers' Helpline for help."

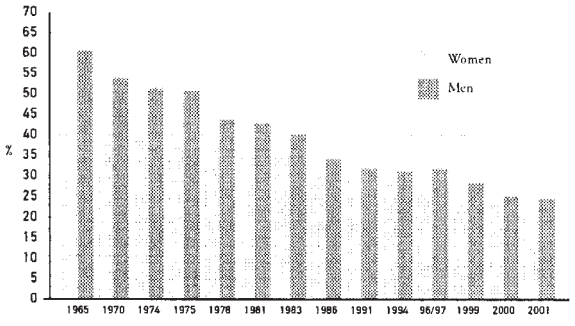
Dorothy: I had no intentions of ever quitting until last week when I was diagnosed with lung cancer. I realized I had to quit immediately. I called the Smokers' Helpline and now I'm on the road to recovery."

(continued)

Winnipeg Free Press: Smoker's Helpline and Statistics (continued)

PREVALENCE & CONSUMPTION

Looking at the prevalence of smoking and rates of consumption in Canada quickly reveals that there is both good and bad news. As the chart below illustrates, there has been a steady decline in the overall prevalence of smoking in the last 35 years.



It is important that we recognize the gains that have been made and not allow ourselves to give credence to the idea that smoking is a "norm" amongst a majority of the population. Youth in particular appear vulnerable to overestimating the number of peers who actually smoke. What is, however, readily observable is the decline of smoking among women has not kept pace with the rate of decline among men.

Jacob: **I would never call the line myself, but my buddy called and got all the support he needed to help me quit. Without me knowing, the Smokers' Helpline helped me quit."**

HEALTH IMPACT

Tobacco is the leading cause of disease and preventable death in Manitoba.

The U.S. Department of Health indicates that there is no safe level of consumption. Tobacco smoke contains more than 4,000 substances, 50 of which are associated with, or known to cause cancer. In 1993, the U.S. Environmental Protection Agency classified cigarette smoke as a Class A carcinogen; a substance which has been shown to cause cancer in humans through studies on human population. There is strong scientific evidence that smoking is related to more than two dozen diseases and conditions.

Health Canada has reported that the risk of premature death is extremely high among smokers; half of all long-term smokers will eventually be killed by tobacco, and of these, half will die during middle age, losing 20 to 25 years of life.

FACTS TO CONSIDER

Physicians For a Smoke-free Canada

- Coronary heart disease and stroke are 2 to 4 times more common in smokers than in non-smokers.
- Tobacco use results in 80 – 90% of all chronic, obstructive pulmonary disease (COPD).
- Tobacco is responsible for 30% of all cancer deaths.
- Every 35 minutes a Canadian woman dies as a result of smoking.
- Tobacco is responsible for one in five deaths in Canada – almost five times the number of deaths caused by car accidents, suicides, drug abuse, murder and AIDS combined.

Cynthia: **I had been thinking about quitting for quite some time now, but I really didn't know where to go for help. When I heard about the Smokers' Helpline, I gave it a try. Now I'm ready to make a quit attempt. And they're even going to call me the day before to see if I'm ready to go and to encourage me."**

ECONOMIC BURDEN

Smoking is an expensive habit. Health Canada indicates that Canadian teenagers smoke more than 1.6 billion cigarettes each year—resulting in retail sales worth more than $330 million. With Manitoba teenagers accounting for approximately 4% of the Canadian teenage population, this would mean that Manitoba teens are spending over $13 million annually on cigarettes. Smoking rates tend to be higher amongst those who are socially and economically disadvantaged. This adds to the economic burden which they often face.

Benefits of Quitting Smoking

Ever wonder what happens to your body the moment you stop smoking? Within 20 minutes of smoking that last cigarette, the body begins a series of changes that continues for years.

20 MINUTES

- Blood pressure drops to normal.
- Pulse rate drops to normal.
- Body temperature of hands and feet increases to normal.

8 HOURS

- Carbon monoxide level in blood drops to normal.
- Oxygen level in blood increases to normal.

24 HOURS

- Chance of heart attack decreases.

48 HOURS

- Nerve endings start regrowing.
- Ability to smell and taste is enhanced.

2 WEEKS TO 3 MONTHS

- Circulation improves.
- Walking becomes easier.
- Lung function increases up to 30%.

1 TO 9 MONTHS

- Coughing, sinus congestion, fatigue, and shortness of breath decrease. Cilia regrow in lungs, increasing ability to handle mucus, clean the lungs, and reduce infection.
- Body's overall energy increases.

1 YEAR

- Excess risk of coronary heart disease is half that of a smoker.

5 YEARS

- Lung cancer death rate for average smoker (one pack a day) decreases by almost half.
- Stroke risk is reduced to that of a nonsmoker 5-15 years after quitting.
- Risk of cancer of the mouth, throat and esophagus is half that of a smoker's.

Reproduced from <www.geocities.com/angelescresthighway/smoking.html>. Author unknown.

(continued)

Benefits of Quitting Smoking (continued)

10 YEARS

- Lung cancer death rate similar to that of nonsmokers.
- Precancerous cells are replaced.
- Risk of cancer of the mouth, throat, esophagus, bladder, kidney and pancreas decreases.

15 YEARS

- Risk of coronary heart disease is that of a nonsmoker.

What Are Some Rewards of Quitting Smoking?

Immediate Rewards
Within 12 hours after you have your last cigarette, your body will begin to heal itself. The levels of carbon monoxide and nicotine in your system will decline rapidly, and your heart and lungs will begin to repair the damage caused by cigarette smoke.

Within a few days you will probably begin to notice some remarkable changes in your body. Your sense of smell and taste may improve. You will breathe easier, and your smoker's hack will begin to disappear, although you may notice that you will continue to cough for a while. And you will be free from the mess, smell, inconvenience, expense, and dependence of cigarette smoking.

Immediate Effects
As your body begins to repair itself, instead of feeling better right away, you may feel worse for a while. It's important to understand that healing is a process; it begins immediately, but it continues over time. These "withdrawal pangs" are really symptoms of the recovery process.

Immediately after quitting, many ex-smokers experience "symptoms of recovery" such as temporary weight gain caused by fluid retention, irregularity, and dry, sore gums or tongue. You may feel edgy, hungry, more tired, and more short-tempered than usual and have trouble sleeping and notice that you are coughing a lot. These symptoms are the result of your body clearing itself of nicotine, a powerful addictive chemical. Most nicotine is gone from the body in 2-3 days.

Long-range Benefits
It is important to understand that the long range after-effects of quitting are only temporary and signal the beginning of a healthier life. Now that you've quit, you've added a number of healthy productive days to each year of your life. Most important, you've greatly improved your chances for a longer life. You have significantly reduced your risk of death from heart disease, stroke, chronic bronchitis, emphysema, and several kinds of cancers; not just lung cancer. (Cigarette smoking is responsible every year for approximately 130,000 deaths from cancer, 170,000 deaths from heart disease, and 50,000 deaths from lung disease.)

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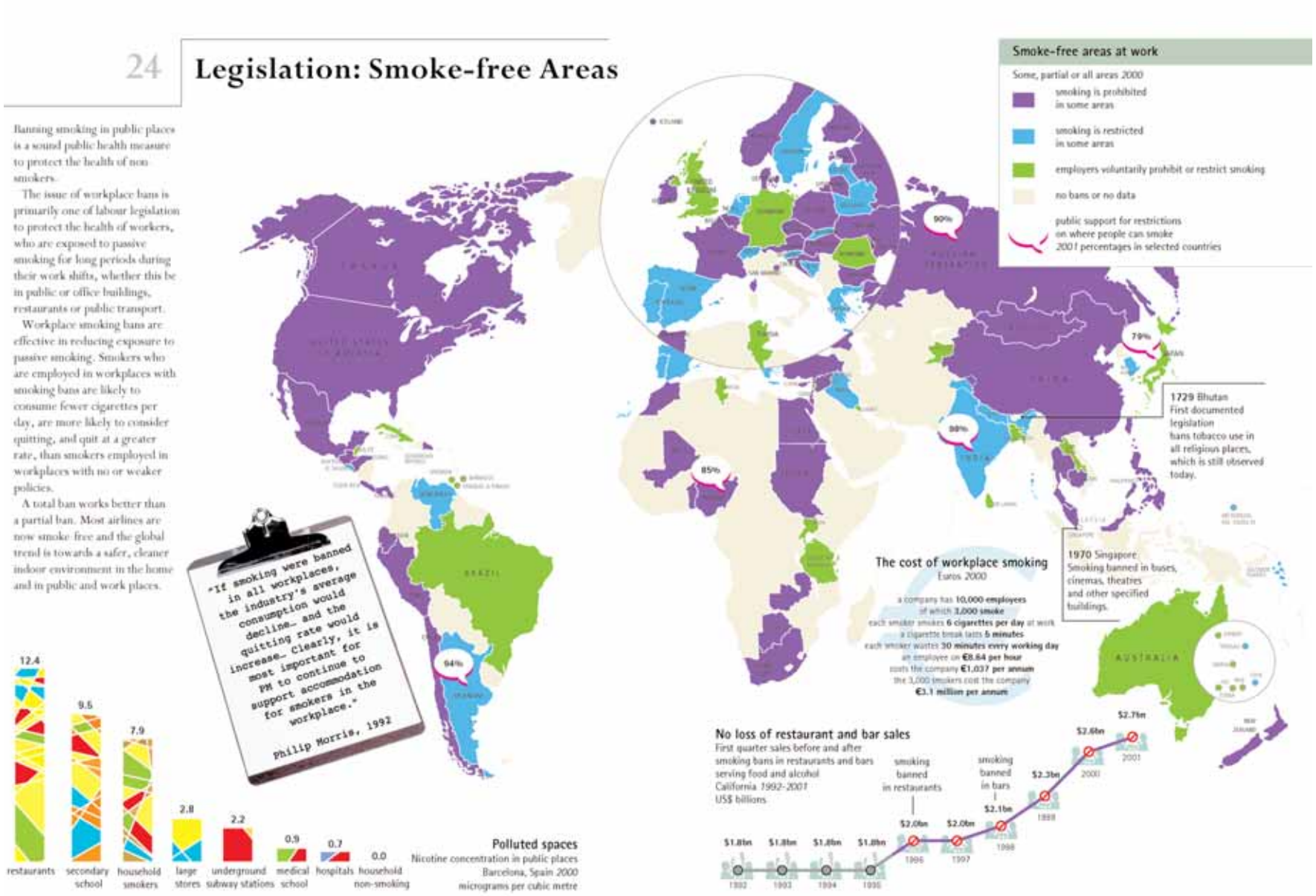
24 Legislation: Smoke-free Areas

Banning smoking in public places is a sound public health measure to protect the health of non smokers.

The issue of workplace bans is primarily one of labour legislation to protect the health of workers, who are exposed to passive smoking for long periods during their work shifts, whether this be in public or office buildings, restaurants or public transport.

Workplace smoking bans are effective in reducing exposure to passive smoking. Smokers who are employed in workplaces with smoking bans are likely to consume fewer cigarettes per day, are more likely to consider quitting, and quit at a greater rate, than smokers employed in workplaces with no or weaker policies.

A total ban works better than a partial ban. Most airlines are now smoke free and the global trend is towards a safer, cleaner indoor environment in the home and in public and work places.



Smoking Bylaw Rolls Out across Winnipeg, September 2, 2003

WINNIPEG - Smokers looking to light up in Winnipeg's restaurants, bars, or any other enclosed public space can now look forward to a hefty fine, thanks to a city bylaw which took effect Monday.

The bylaw covers all enclosed public places; it threatens a minimum $100 fine on individuals who attempt to smoke and a $500 fine for the owners of the establishment that allows them to do so.

Inspectors fanned out across the city on the holiday Monday with an eye on cracking down on the illegal smokers.

Serge Scrafield with Manitoba Conservation said the 10 provincial inspectors would be out in force Monday, but would likely put off issuing tickets until Tuesday.

"We can legally issue the ticket to either [the individual or owner]," he said. "However we would do that only if we felt the proprietor had taken all the steps that reasonably he or she could take, and if the problem still persisted then we would consider ticketing the individuals."

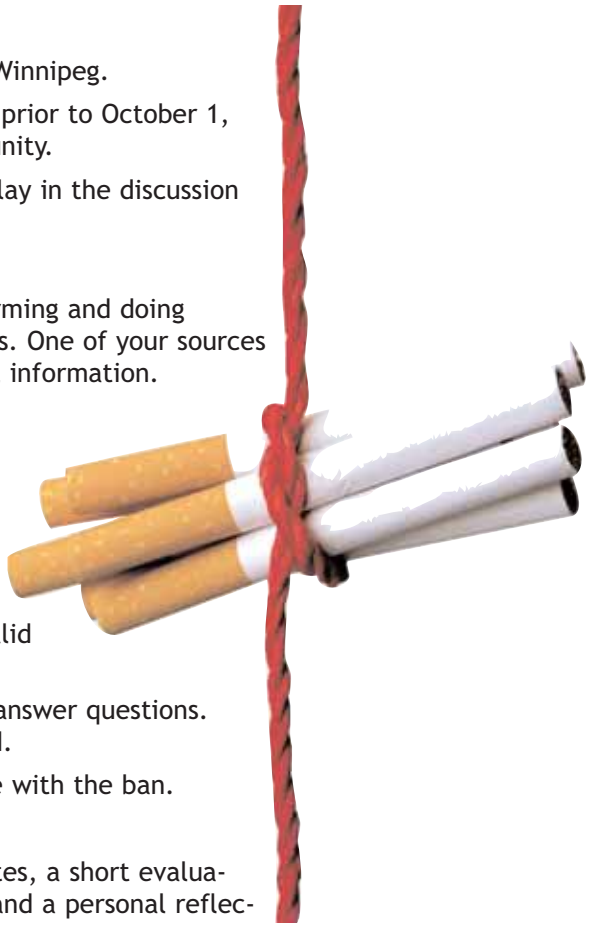
The province is responsible for enforcing the bylaw in 70 per cent of the city, mostly the suburbs.

The bylaw actually went into effect July 1, but the province delayed its enforcement for two months so it could hire more inspectors.

Scrafield hopes the delay may have allowed people extra time to get accustomed to the bylaw, meaning his inspectors will not have to issue too many tickets.

Town Hall Forum: Smoking Ban

The class will be divided into two groups: prospective citizens with a vested interest in a proposed smoking ban, and a town council. The citizens will receive position cards. The town council may be elected or chosen. The teacher will act as the moderator.



Directions for students with position cards:

1. Read the news article about the imposed smoking ban in Winnipeg.
2. You will perform a role-play of a historical discussion, set prior to October 1, 2004, discussing the proposed smoking ban in your community.
3. You will receive a position card stating the role you will play in the discussion about the ban.
4. Decide what your position would be on this issue.
5. Prepare an argument to support your position by brainstorming and doing research. Collect relevant notes, references, and statistics. One of your sources must be a primary source. You may also include anecdotal information.

   Some ideas you might want to consider are

   - the economic benefits and liabilities
   - the related health issues and costs
   - the Charter of Rights and Freedoms issues

6. Prepare your point-form notes on index cards.
   - Use statistics and direct references to current and valid information in your argument.
   - Try to speak naturally rather than read. Be ready to answer questions. Prepare for this by predicting what you may be asked.
7. You may try to present a workable solution if you disagree with the ban.
8. Each person should be treated respectfully.

When the forum is over, hand in your research and speaking notes, a short evaluation of the points made by the other speakers, a bibliography, and a personal reflection about the process when the forum is over.

Directions for the town council:

1. You will listen to and evaluate the arguments presented.
2. You must do research and take notes on the issues involved in this debate so that you are prepared to listen actively.
3. During the debate, make notes about each speaker.
4. You may ask relevant questions.
5. After the forum is over, you will vote to decide who presented the most convincing argument. Evaluate each speaker; give one positive point and suggest one goal for future presentations like this. Discuss your choices as a group. Then, vote for the most convincing speaker.

When the forum is over, hand in your preparation notes, a bibliography, your notes on each speaker, your reasons for choosing the speaker you did, and a personal reflection about the process.

As a class, form groups of four made up of two people supporting the ban and two people against the ban. Discuss

- the process
- the pros and cons of each argument
- how the values of each interest group differ
- whether there could be ever be a viable solution that would satisfy both groups

Senior 4 ELA:
ESL for Academic Success

Module Handouts

Module 5

Statistics for Index Card Activity

Statistics are written on one side of the card and the statistical percentage on the other.

1. What percentage of the world's people live in each world region:

Africa	12%
Asia (including the Pacific Islands)	55%
North America	5%
Latin America (including Mexico)	8%
Europe	10%
Middle East	4%
Former USSR	5%

2. What percentage of the world's people has drinking water at home? 30%

3. What percentage of the world's people knows how to read? 35%

4. What percentage of the world's people goes to bed hungry? 20%

5. What percentage of the world's people uses 80% of the world's energy? 7%

6. What percentage of the world's people uses 80% of the world's farmland? 4%

7. What percentage of the world's people is under 15 years of age? 33%

8. What percentage of the world's people is over 64 years of age? 6%

9. What percentage of the world's people has a college education? 1%

10. What percentage of the world's people speaks English? 8%

Adapted from <http://www.abc-oghs.org/group_activities.htm>.

Anticipation Guide: Learning and Using English

Directions: Rate each statement according to the strongly agree/strongly disagree continuum and explain your choices. (You may be asked to write about them on a separate piece of paper.) Then, in your group, discuss each statement; you must reach consensus on your ratings. (Optional: Ask two people outside your high school and over 19 to rate these statements. How do their answers compare with yours?)

1. It is crucial to have one common language for business.

   ❑ strongly disagree
   ❑ disagree
   ❑ depends
   ❑ agree
   ❑ strongly agree

2. One can become fluent in a second language without compromising the first.

   ❑ strongly disagree
   ❑ disagree
   ❑ depends
   ❑ agree
   ❑ strongly agree

3. In the future, if there is one universal language for business, it will be English.

   ❑ strongly disagree
   ❑ disagree
   ❑ depends
   ❑ agree
   ❑ strongly agree

4. If English becomes the global language of the future, other languages will die out.

   ❑ strongly disagree
   ❑ disagree
   ❑ depends
   ❑ agree
   ❑ strongly agree

5. When I study in Canada, I will adopt English and not use my first language as much.

   ❑ strongly disagree
   ❑ disagree
   ❑ depends
   ❑ agree
   ❑ strongly agree

6. I am studying English because I need it in order to be successful in my chosen profession.

   ❑ strongly disagree
   ❑ disagree
   ❑ depends
   ❑ agree
   ❑ strongly agree

How Many People in the World Speak English?

Q. How many people in the world speak English?

A. About one and a half billion (1,500,000,000) people spoke English at the start of the 21st century. That is one quarter (¼) of all people on earth. More than 400 million (400,000,000) speak English as their first language. The rest speak English as a second or third language for their professional and personal lives. But English is not the world's top first language, as you can see from the following chart:

	Language	**Spoken as a first language by**
1st	Mandarin Chinese	726,000,000
2nd	English	427,000,000
3rd	Spanish	266,000,000
4th	Hindi	182,000,000
5th	Arabic	181,000,000
6th	Portuguese	165,000,000
7th	Bengali	162,000,000
8th	Russian	158,000,000
9th	Japanese	124,000,000
10th	German	121,000,000

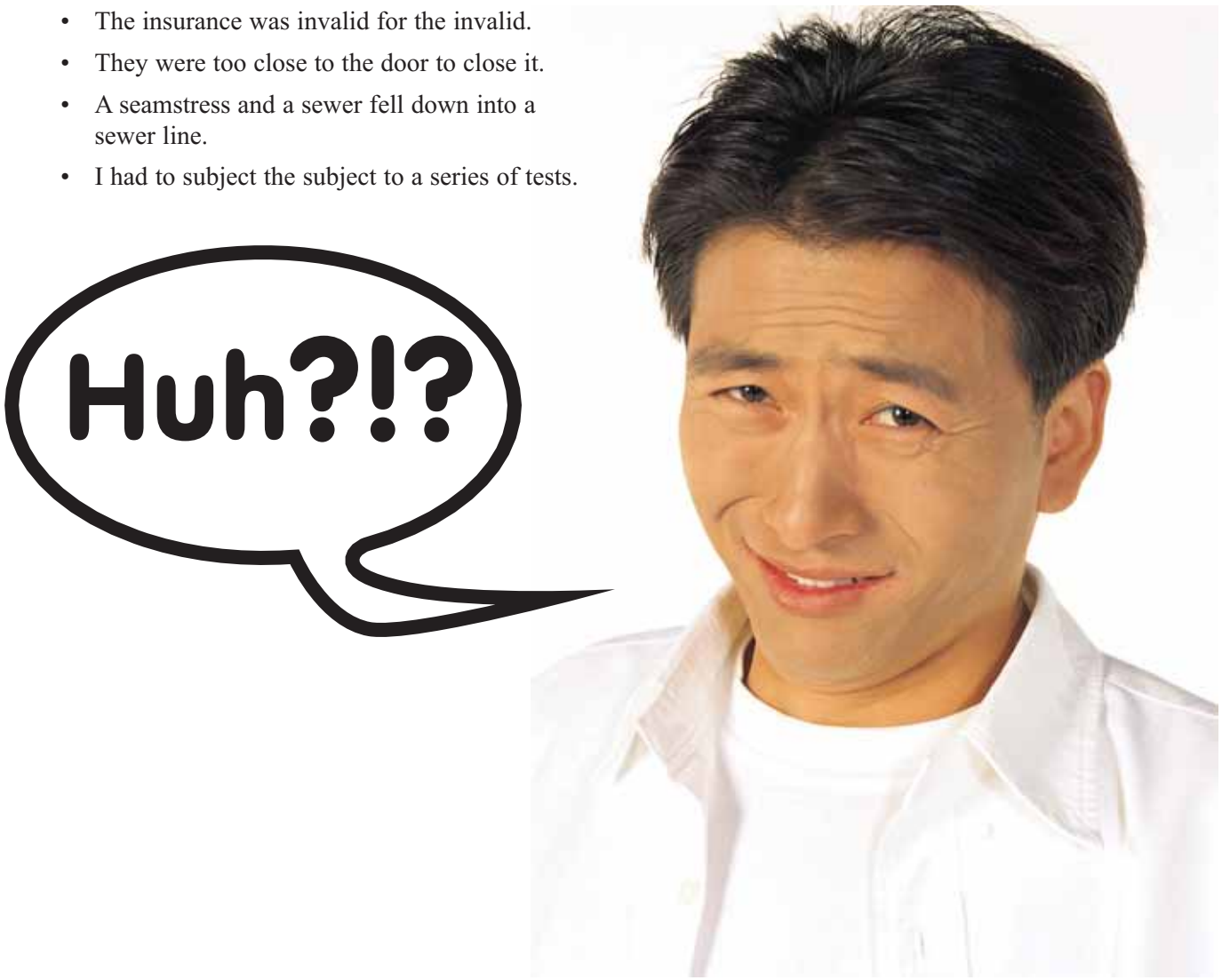
Source: The Cambridge Encyclopedia of Language, 1997.

English, The Universal Language?

The English language may be universal but it can definitely be hard to learn. Ponder these lines...

- The bandage was wound around the wound.
- The farm used to produce produce.
- We must polish the Polish furniture.
- He could lead if he would get the lead out.
- The soldier decided to desert his dessert in the desert.
- A bass was painted on the head of the bass drum.
- When shot at, the dove dove into the bushes.
- I did not object to the object.
- The insurance was invalid for the invalid.
- They were too close to the door to close it.
- A seamstress and a sewer fell down into a sewer line.
- I had to subject the subject to a series of tests.

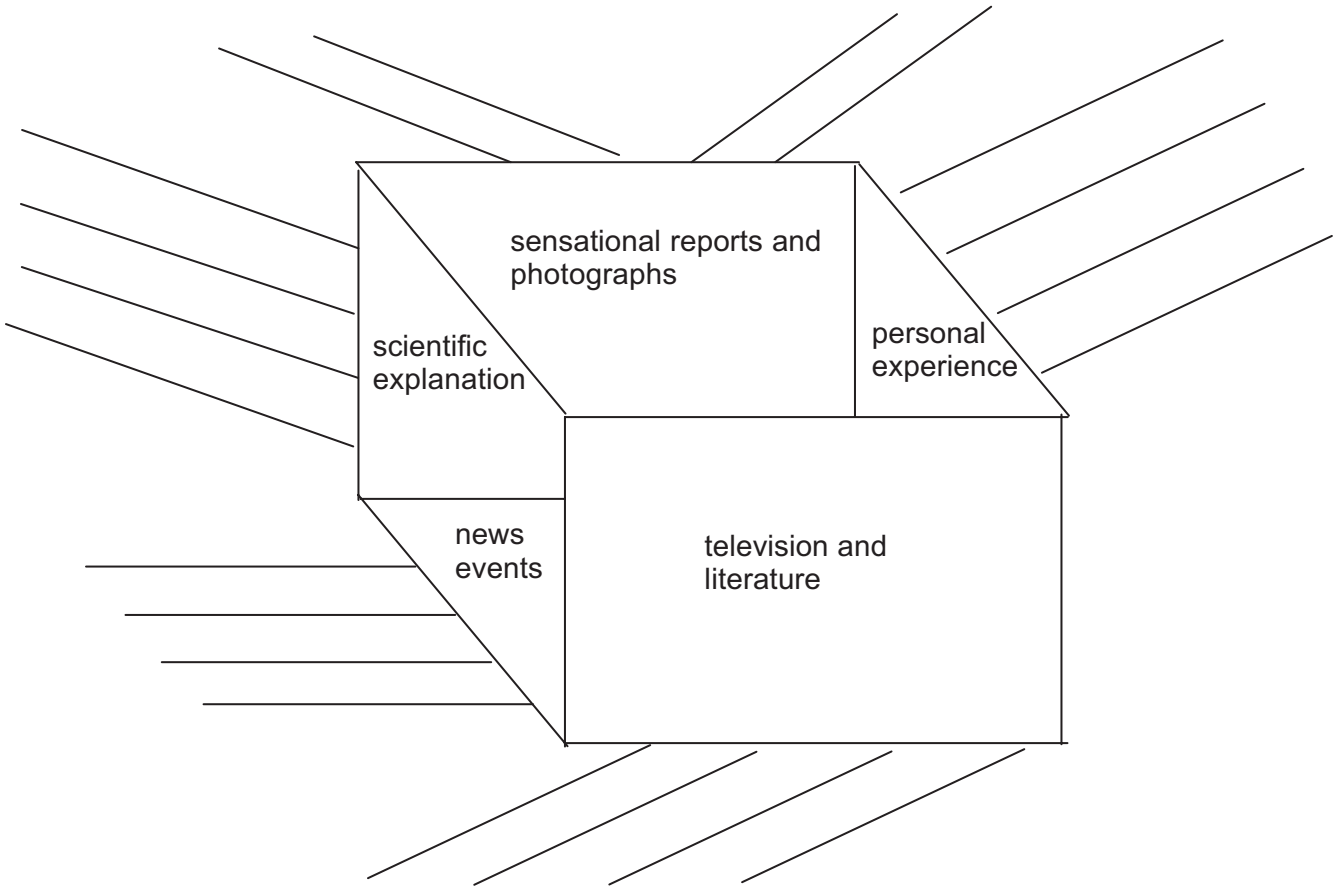
Lets face it, the English language is crazy. There is no egg in eggplant, nor ham in hamburger, neither apple nor pine in pineapple. English muffins weren't invented in England or french fries in France. Sweetmeats are candies while sweetbreads, which aren't sweet, are meat. We also wonder why quicksand works slowly, boxing rings are square and a guinea pig is neither from guinea nor is it a pig. And why is it that writers write but fingers don't fing, grocers don't groce and hammers don't ham? One goose, two geese—why not one moose, two meese? If we say teachers have taught, why don't we say preachers have praught? If a vegetarian eats vegetables, what does a humanitarian eat?



Source: <www.titus2menandwomen.org/Humor/EnglishLanguage.shtml>. Author unknown.

Canada's Worst Nightmare

Graphic Organizer:
Exploring through Background Knowledge



The Return of the Plagues?

by Gwynne Dyer

21 February 2003

On 28 January an eight-year-old girl from Hong Kong visiting relatives in southern China fell ill with influenza and was admitted to hospital. A week later she died, and since then her father has died of the same flu, while her nine-year-old brother lies gravely ill in an isolation ward in Hong Kong. The virus is outwardly similar to the A (H5N1) strain, also known as "bird flu," that killed six of the eighteen people who were infected in the last outbreak in Hong Kong in 1997.

New strains of viral diseases that can kill human beings generally emerge by mutation as they hop back and forth between people and their domesticated animals. This exchange of viruses goes on all the time in farming areas—but it's only when a lethal new virus crosses the species barrier AND THEN STARTS TO PASS FROM ONE PERSON TO ANOTHER that the alarm bells start to ring. They are ringing now.

"If this virus is transmissible from human to human then it is far more serious," said a spokesperson for the World Health Organization in Geneva on 19 February. The 1997 flu virus was stopped by slaughtering the 1.4 million chickens, ducks and geese in Hong Kong, but if the new one is already loose all over southern China that solution will not really work. Even the normal wave of flu that circles the world every year, slightly changed genetically each time, exacts a serious toll in lives, but once in a while something really lethal comes along. This could be one of those times.

The "Spanish flu" pandemic of 1918 infected between 20 and 40 percent of the world's population and killed 20 million people in four months, twice as many as died in the First World War—and the majority of the victims were young, healthy people who died of complications like bronchitis and pneumonia. If a flu virus like that appeared now, could it do as much damage?

Certainly the two subsequent flu pandemics, occurring after the development of anti-viral medicines, did not cause the same carnage. The impact of the 1957 "Asian flu" pandemic was greatly reduced by mass vaccination: only one human being in six caught it, and it killed an estimated two million people worldwide. The 1968 "Hong Kong flu" pandemic killed only a million people, and as in 1957 most of the victims were elderly. But viruses are not impressed by medical technology.

Despite the far higher standards of sanitation and medical care in the developed world, influenza death rates there have not been significantly lower than in poorer countries. Viral diseases mutate fast, antibiotics are no use against them, and good hygiene is no protection either. Bacterial diseases like cholera, anthrax and malaria have complex life cycles and mutate only slowly, so they are easy to contain—but if the latest version of "bird flu" is transmissible between people, we could be looking at millions of deaths over the next year. Nor is that the worst that could happen.

The true nature of the "Black Death" was long a mystery, but early in the 20th century, after doctors had found and described bubonic plague in India, experts jumped to the conclusion that a more virulent form of that disease, endemic in rats and transmitted to humans by their fleas, was the real culprit. This was a comforting conclusion, because it meant that it was a bacterial disease with a complicated life cycle, easily contained by hygiene and antibiotics, that would never come back to trouble modern human beings.

But it never actually made sense, because the standard treatment for the Black Death, tried and tested over three hundred years, was to quarantine affected families and villages for forty days. That could not have worked if it were carried by rats, which do not respect quarantines. So two years ago professors Christopher Duncan and Susan Scott of Liverpool University suggested in their book, "Biology of Plagues," that the Black Death was really an Ebola-like virus, a haemorrhagic fever transmitted directly from person to person. It is frighteningly plausible.

(continued)

The Return of the Plagues? (continued)

There were actually two Great Pandemics, and the first hit Europe and the Middle East in 541 AD. The Roman empire had been relatively unharmed by great plagues, apart from bouts of smallpox in 170 and measles in 250, which killed mostly children and left survivors immune, but the new plague was different. It returned about every 10 years for the next two centuries, and reduced the population of the Mediterranean area by between 30 and 50 percent. Large parts of the Middle East and North Africa did not recover their pre-540 populations until about 100 years ago.

The plague called the Black Death appeared in Mongolia in the 1320s, and killed two-thirds of China's population between 1330-50. It reached Europe in 1347, and killed between 30 and 40 percent of the population in the first onslaught. It returned at intervals of about a decade, with gradually diminishing lethality, until it disappeared at the end of the 17th century. The aching, the bleeding from internal organs, the red blotches on the skin caused by the effusion of blood under the skin, were all typical of Ebola-style fevers. Besides, bubonic plague, unlike the Black Death, did not disappear. There was an outbreak of bubonic plague in Glasgow as recently as the 1890s.

If Duncan and Scott are right, therefore, there is a virus out there somewhere, dormant for the moment while it tries out mutations that might break through the genetic defenses that human beings evolved to defeat it last time, which could kill a significant portion of the human race in a year. The Black Death is not dead, it's only sleeping. And in the meantime, the "bird flu" may be coming.

What Is a Virus?

Viruses may be defined as acellular organisms whose genomes consist of nucleic acid, and which obligately replicate inside host cells using host metabolic machinery and ribosomes to form a pool of components which assemble into particles called VIRIONS, which serve to protect the genome and to transfer it to other cells.

They are distinct from other so-called *virus-like agents* such as *viroids* and *plasmids* and *prions*.

The concept of a virus as an organism challenges the way we define life:

- viruses do not respire
- nor do they display irritability
- they do not move
- nor do they grow
- however, they do most certainly reproduce, and may adapt to new hosts

By older, more zoologically and botanically biased criteria, then, viruses are not living. However, this sort of argument results from a "top-down" sort of definition, which has been modified over years to take account of smaller and smaller things (with fewer and fewer legs, or leaves), until it has met the ultimate "molechisms" or "organules"—that is to say, viruses—and has proved inadequate.

If one defines life from the bottom up—that is, from the simplest forms capable of displaying the most essential attributes of a living thing—one very quickly realizes that the only real criterion for life is *the ability to replicate* and that only systems that contain nucleic acids—in the natural world, at least— are capable of this phenomenon. This sort of reasoning has led to a new definition of organisms:

"An organism is the unit element of a continuous lineage with an individual evolutionary history."

The key words here are *unit element*, and *individual*: the thing that you see, now, as an organism, is merely the current slice in a continuous lineage; the individual evolutionary history denotes the independence of the organism over time. Thus, mitochondria and chloroplasts and nuclei and chromosomes are not organisms, in that together they constitute a continuous lineage, but separately have no possibility of survival, despite their independence before they entered initially symbiotic, and then dependent, associations.

The concept of replication is contained within the concepts of individual viruses constituting continuous lineages, and having an evolutionary history.

Thus, given this sort of lateral thinking, viruses become quite respectable as organisms:

- they most definitely replicate
- their evolution can (within limits) be traced quite effectively
- they are independent in terms of not being limited to a single organism as host, or even necessarily to a single species, genus, or phylum of host

Winnipeg's Fortress of Deadly Disease

A Congolese woman lands at the airport in Toronto after a 21-hour flight that took her from Africa, via Rome and Newark, N.J., to Toronto. She couldn't eat on the flight and was weak and flushed with high fever. Doctors thought she may have had malaria, which is scary. Then they considered she may be suffering from the dreaded Ebola virus.

Turns out she probably hasn't been infected with Ebola; it's likely some other exotic disease. The results came from the new Canadian Science Centre for Human and Animal Health in Winnipeg, which contains one of the world's most secure laboratories for the testing of deadly diseases.

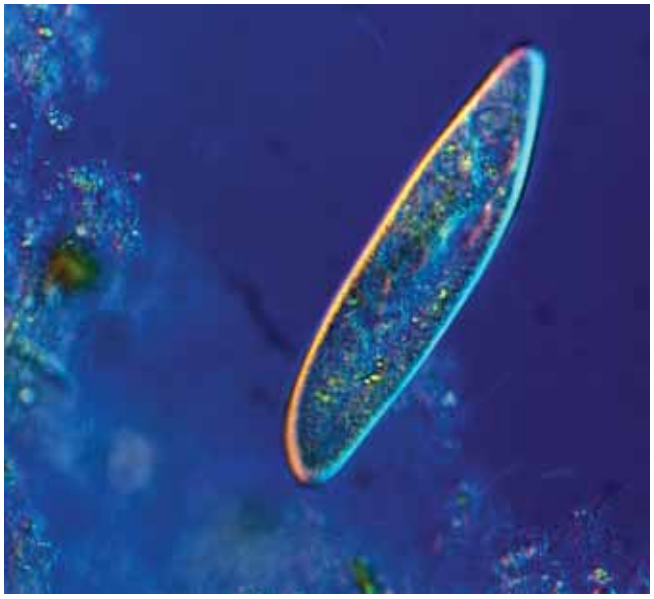
It is a Level 4 lab, one of 15 in the world, and the only one in Canada. The Congolese woman's blood and fluids were sent to Winnipeg for testing, also to Atlanta's Centers for Disease Control and Prevention.

Winnipeg's new virology lab—administered by Health Canada—cost $172 million and took 10 years to design and build. It took two years to build the concrete box that encloses the Level 4 lab. They waited a year for the massive, monolithic concrete to dry, then covered it with 30 coats of special paint, then covered the walls and floor with a layer of epoxy 7.5 centimetres thick.

What distinguishes the Winnipeg lab is that it is set up for both human and animal diseases, which is of vital importance as scientists uncover more evidence of human diseases transmitted from animals. An example in the news recently is mad cow disease and its association with the human disease called Creutzfeldt-Jakob disease (CJD).

The first strains of lethal diseases arrived at the Winnipeg lab in the summer of 2000, a cargo of six of the most deadly viruses in the world. Small vials contained samples of Lassa, Marburg and Junin, with three strains of Ebola viruses, all flown in from the Centers for Disease Control in Atlanta.

But, if security requirements are so stringent, and the stuff so deadly, how is it so easily transported over great distances to the lab in Winnipeg? Dr. Ron St. John, Health Canada's executive director of the Centre for Emergency Preparedness and Response, says the vials are transported in safety packs, then secured in a triple-container and sealed.



"I would stress that these packages are designed to withstand tremendous impact," Dr. St. John explained. "In the famous Lockerbie crash the only package—the only thing to survive intact in that terrible airplane tragedy—was a safety pack that had an organism in it."

The Canadian Science Centre for Human and Animal Health in Winnipeg is located in the city's west end, on Arlington Street. Its laboratories are in four levels of containment, Level 1 being at about the safety requirements of a high school lab, Level 4 considered secure enough to test the world's deadliest viruses.

Much of the impetus for the Winnipeg lab—known locally as "the virology lab"—comes from a surge of new diseases in the 1980s, when two new strains of Ebola were discovered, and when the medical community took serious notice of the HIV-AIDS epidemic.

It is no cinch to build a Level 4 lab, and not just for design and construction challenges. A major problem is to get someone finally to sign off on the labs, which means to authorize them and guarantee that they are safe enough for the deadliest diseases in the world.

In 1976, a woman took sick at the Toronto airport and was taken to Etobicoke General Hospital where it was determined that she had contracted Lassa fever. This was enough of a scare to have the hospital shut down for a week.

(continued)

Source: <www.cbc.ca/news/indepth/background/bioweapons/winnipeglab.html>. Reproduced by permission.

Winnipeg's Fortress of Deadly Disease (continued)

The Ontario government responded by spending $5.8 million to build a Level 4 lab in Etobicoke. But neighbours complained, the new facility was never opened, and the Ontario government decided these types of facilities are a federal responsibility.

Another high-security lab was built at Toronto General Hospital, on the 11th floor of the Norman Urquhart Wing. It was sealed off from the rest of the hospital, with its own air supply and electrical system, and a special state-of-the-art particulate filtering system. A special team was trained to work in the isolation unit, intended to handle diseases as lethal as Lassa and Ebola fevers. It was completed in 1984, at a cost of $2 million.

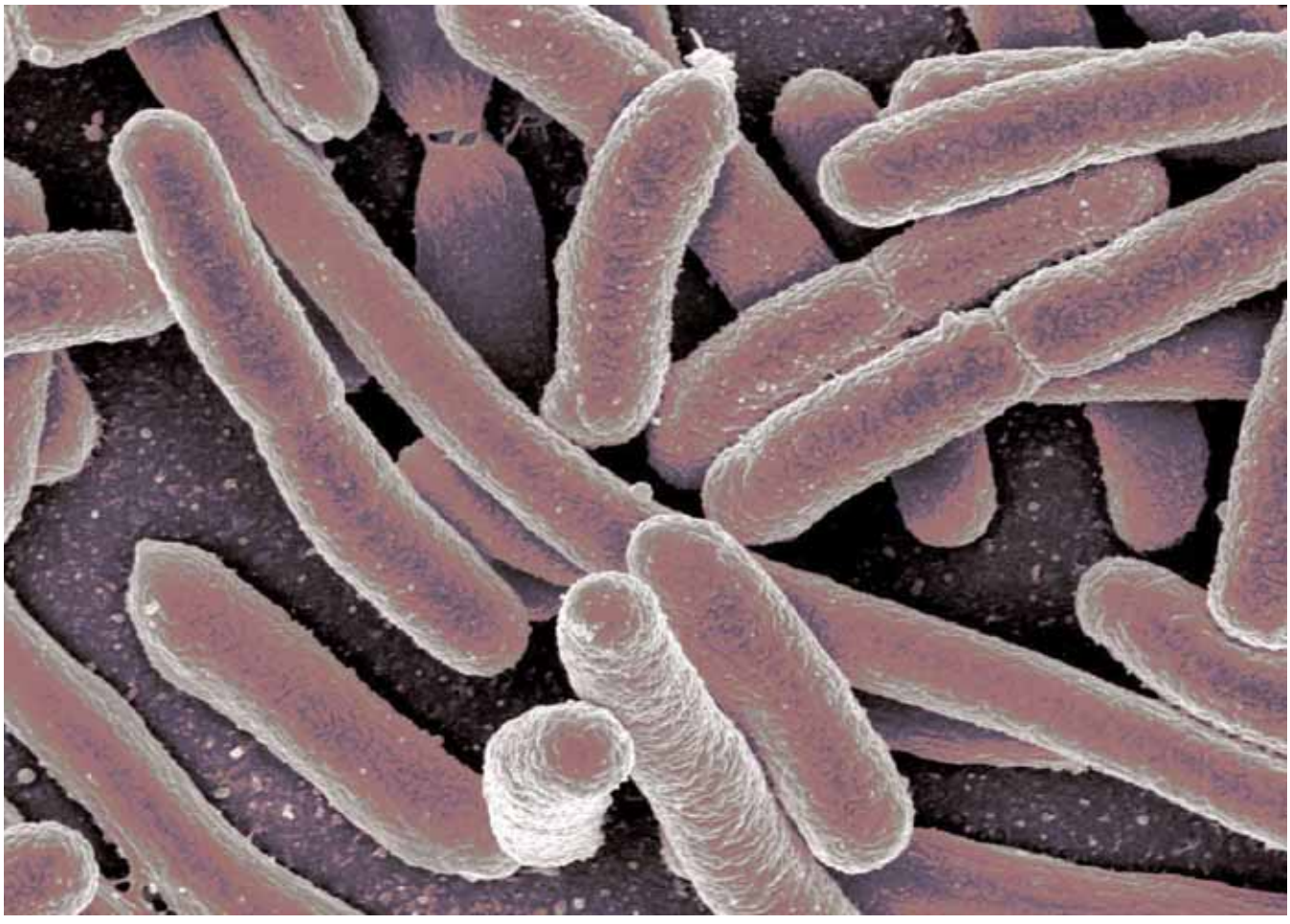
But it never opened.

Vickery Stoughton, then president of Toronto General Hospital blamed it on what he called "bureaucratic ass-covering." Stoughton said government inspectors often arrived to check the new facility, but not one was willing to sign off on the guaranteed safety of a lab dealing with the deadliest diseases in the world.

"Instead, they'd recommend that another $100,000 or $200,000 be spent to make absolutely sure it's safe," Stoughton said.

One afternoon in his office, Stoughton seemed particularly upset at the sophisticated new lab lying idle for two years, at a time when the hot topics were health cutbacks and cost-cutting. I was with him that day.

"Sooner or later," Stoughton told me, looking down at his telephone as if it would start ringing as he spoke, "someone's going to ask, 'Why'd you spend all that money and just let it sit there?' I mean, *The Toronto Sun* would have a field day."



Scientists Match Wits with Killers

Some fierce warfare is taking place in Winnipeg. The enemy: killer viruses, stubborn super-bugs and bacteria.

The battlefield is the Canadian Science Centre for Human and Animal Health, a complex on Arlington Street under 24-hour guard.

Commonly called "the virology lab" by most Winnipeggers, it will also become the hub of the new nationwide laboratory network for detecting and treating bioterrorist attacks.

The federal facility is a powerhouse of impressive technology, which includes more than the microscopes and sophisticated equipment used to sequence DNA. Technology is an integral part of the science, of course, but it's also part of the safety and security processes of the building.

"It's technology, partly, and it's technique," Dr. Frank Plummer, scientific director general of the National Microbiology Laboratories within the centre, said in an interview.

"People are trained in a certain way that allows them to do their job safely."

Plummer, a leading HIV-AIDS researcher, has been at the helm of the microbiology labs since September 2000. He still works with graduate students at the University of Manitoba and delivers the occasional lecture.

"The main technology that's important here is the safety," Plummer said. "It'll allow you to work on things you otherwise wouldn't be able to."

Every employee is vetted by the Canadian Security Intelligence Service. Drills with the city's emergency services are routine. Security at the complex has always been tight, but since the terrorist attacks in the United States on September 11, 2001, it has become more visible. A security guard greets visitors at the front door.

The facility houses Health Canada and Canadian Food Inspection Agency labs. It's the only one of its kind designed to house research for both human and animal health.

It costs about $11 million a year to operate the centre, an expense split between Health Canada and Agriculture Canada.

The lobby is the only area of the guarded facility—approved by the Treasury Board in 1987 and designed and built more than 10 years later—that is open to the public. The total building area covers the size of five football fields.

The High Efficient Particulate Air (HEPA) filtration system is used in Level 4 labs and is capable of removing particles 85 times smaller than the smallest known disease-causing agent.

The foundation of concrete pillars, embedded 30 metres into the second level of bedrock, cost $5 million and won't shift. The building is backed by two power supplies.

It cost $35 million to equip the labs and about $2 million is spent annually in upgrades and additions. That amount will likely grow as programs grow, Plummer says.

"I think it's the bells and whistles, the state of the art equipment that's attracting people," said centre spokesman Brian Koshul. "Everyone wants to be on the cutting edge."

Plummer agrees: "It's the fact that it's big, it's brand new. It's got everything. People know about it."

The labs are organized in an easily reconfigurable way, to suit changing needs of different programs and the preferences of the people who work in them. For instance, a big lab can be divided into four smaller labs overnight.

More than 90 per cent of utilities maintenance can be conducted from the hallways or above the labs where panels are located, so as not to disturb the integrity or routine of lab work. This also avoids any mishaps.

Coils, condensers and electric motors are not located in the containment area where scientists work, but in outside labs, leaving more workspace for scientists and technicians.

"Something as simple as changing light bulbs can stay relatively simple," said Les Wittmeier, electrical technologist at the federal laboratories.

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Source: <http://winnipegfreepress2.com/specialsections/technologyupdate/articles/1.html>.
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Scientists Match Wits with Killers (continued)

This is a progressive bit of planning, because most high-end labs are not designed this efficiently.

The most sophisticated scientific work taking place in the building is connected to DNA testing. The centre has a DNA arrayer, a high-tech piece of equipment capable of placing 20,000 spots of DNA on a glass slide and reading it.

The slides are scanned for fluorescence, revealing the kind of DNA for which the scientists are looking. By studying DNA chips, researchers can test for the presence of certain genes, determine anti-microbial resistance, consider agents of bioterrorism and understand which genes are activated in particular conditions.

An experiment with a single DNA chip can provide researchers with information on thousands of genes simultaneously.

"It's the sharp end of biotechnology," Plummer said.

The "DNA court"—located within the Level 2 area—also has a robotic workstation for liquid handling. Up to 1,000 vials can be easily handled in the stacking system.

Scientists can actually make DNA here. Machines in this area of the building are capable of determining a DNA sequence automatically.

"These things are fairly common," Plummer said. "We just have more of them than anyone else."

Although the Level 4 labs, a series of pressure chambers, perform just one per cent of the centre's area, they are the marquee attraction.

Most of the centre's work takes place in the Level 2 and Level 3 labs where researchers study viruses and bacteria that make animals and humans sick. In those labs, scientists work with such things as sexually transmitted diseases, mad cow disease, salmonella, tuberculosis, flesh-eating bacteria and antibiotic-resistant organisms.

The Level 4 area is a box-within-a-box containment, sandwiched in the N-block of the complex, between the air filtering on the floor above and the bio-waste treatment system on the floor below.

In the Level 4 lab, the most sophisticated science taking place is the manipulation of deadly viruses, like Ebola. Plummer said scientists are able to change the genes around to see which ones are important in causing disease.

Bank-vault doors have key-punch locks and freezers keep specimens at -147°C, about 127 degrees colder than a home freezer. Samples are small, and kept frozen in liquid nitrogen.

When working in the Level 4 labs, scientists zip themselves into pale blue rubberized suits with sealed hoods, gloves and boots and press-lock folds. They communicate via an internal two-way radio system.

Just seven people are authorized to work in these labs and only four are permitted to work alone. Eight separate physical security checkpoints are required to gain entry. Cameras and motion detectors monitor the area.

Air coming in to the lab has already been filtered using High Efficiency Particulate Air (HEPA) filtration, removing particles 85 times smaller than the smallest known disease-causing agent. Air is HEPA filtered again, and then filtered a third time before it leaves. The breathing air that is piped into their suits is HEPA-filtered, too. A complete air change takes place every three minutes.

The HEPA air filters, which cost between $10,000 and $36,000 each, are not re-used. They are sanitized and destroyed after use. A crew of four people is dedicated solely to the HEPA filtration. Every air filter is backed up by at least one other filter.

"The advances in genomics and proteomics require expensive equipment that needs a lot of expertise to run and also sophisticated information handling," Plummer said.

Primary treatment of any waste takes place first in the labs, before it even leaves for the bio-waste rendering system, where all liquid and solid waste is disinfected and sterilized before it enters the city's sewer system.

Waste enters one of three 5,000-litre vessels, the kind seen in the meat-packing industry, although modified to suit the lab's needs. Waste is heated to 121°C for a minimum of 30 minutes to sterilize it.

Nothing is incinerated. All liquid and solid waste is sanitized before it leaves the building. And even if a mishap occurs—in 1999, a step was missed, and disinfected shower and slide rinse water was released into the city sewer system before it had been re-sterilized—redundancy measures are in place.

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Scientists Match Wits with Killers (continued)

The "redundant system," which includes safety measures that go beyond international standards, in effect, doubles the safety process. People who work in the complex say they have no qualms about bio-safety.

Because waste is treated first at the lab and then rendered before finally going into sewage blending when it is cooled and released into the city sewers, it is considered cleaner than any waste from residences or even hospitals.

"Personally, I feel safer working here than sitting in any ER or doctor's office," Wittmeier said. "I have no problems working here at all. It's a basic understanding of what goes on here and what needs to be done that gives me that comfort."

The bio-waste treatment area is alarmed, and monitored 24 hours a day.

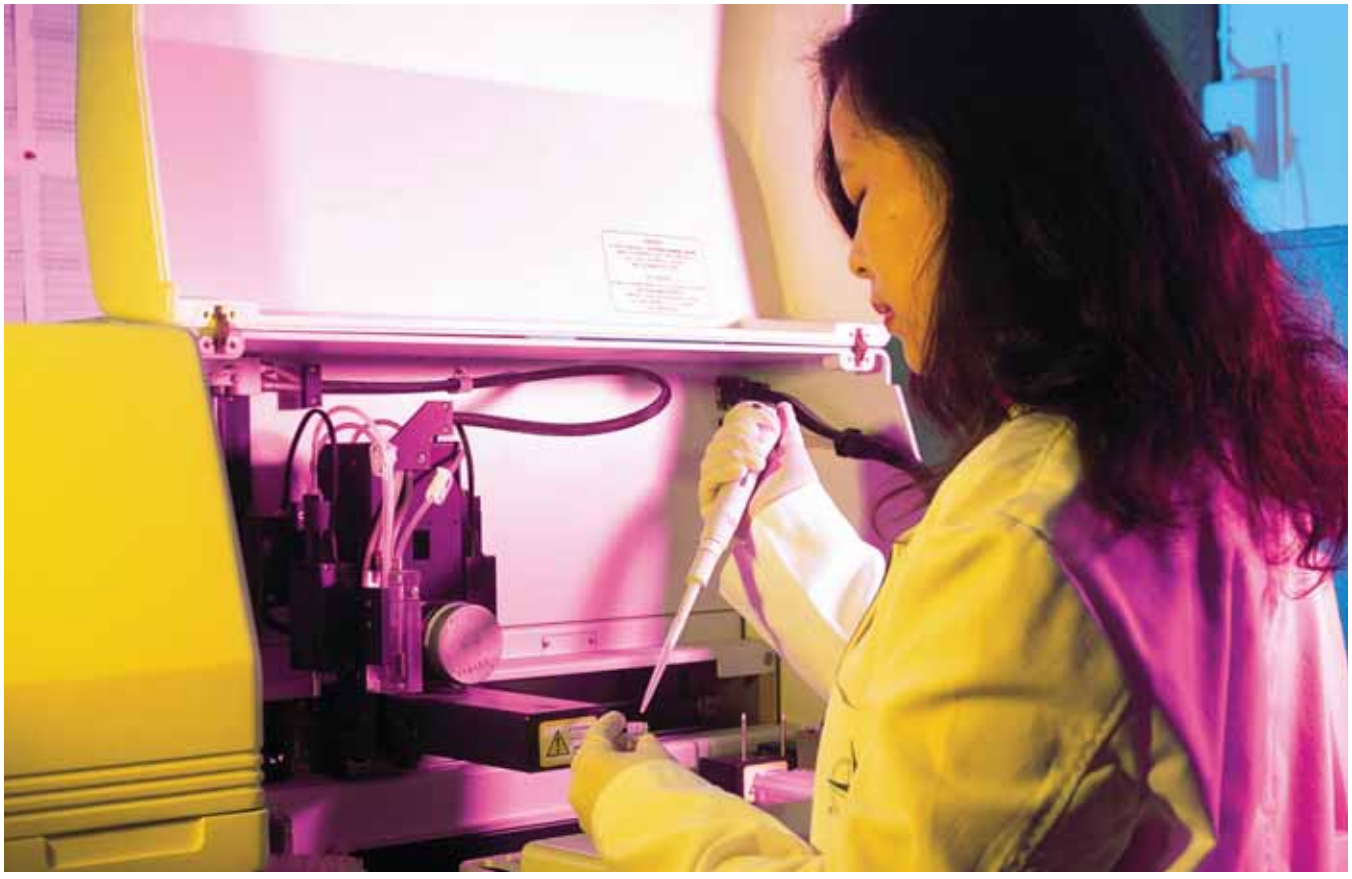
"It's a critical part of the building," Wittmeier said. "It's a high maintenance system, but when you consider the alternative of incineration, it's preferable."

Wittmeier says the centre is now providing information on bio-safety systems and procedures to other organizations, such as NASA, Texas Tech University and the Center for Disease Control in Atlanta. The world is also looking to the centre for its research capabilities, Plummer says.

On the horizon, Plummer would like for the lab to build a proteomics technology platform, develop genome libraries to explore things like the susceptibility to infection, and build a program in molecular imaging.

One of the most high-tech aspects of the centre isn't the gear, but the people who work there. At least 10 of the scientists have been recruited from around the world.

"It's really the scientists that do the work," Plummer said. "You can have all the machines you want, but you need the scientists."



Quiz: What Do You Know About AIDS?

PARADE classroom® TEACHER'S GUIDE **Skills Sheet**

NOVEMBER 30-DECEMBER 6, 2003 • PAGE 5

What Do You Know About AIDS?

A recent United Nations report found that young people are dangerously uninformed about AIDS. Are you? Take this test to see just how much you know. Afterward, your teacher will share the answers with you.

1. AIDS is:
a) an illness.
b) a type of bacteria.

2. AIDS is caused by:
a) malnutrition.
b) a virus.
c) unsanitary living conditions.

3. AIDS attacks the immune system. The immune system:
a) builds muscle.
b) builds bone.
c) protects the body from disease.

4. AIDS affects only gay people.
a) true
b) false
c) only gay men
d) only gay women

5. You can get AIDS by:
a) kissing someone with AIDS.
b) having sex with someone with AIDS without properly using a latex condom.
c) sharing needles to inject drugs with someone who has AIDS.
d) both b and c.
e) all of the above.

6. You also can get AIDS:
a) by sharing food with someone who has AIDS.
b) by being bitten by an infected mosquito.
c) by hugging someone with AIDS.
d) from a toilet seat.
e) in none of these ways.

7. A person who looks healthy:
a) has the HIV virus.
b) couldn't possibly have the HIV virus.
c) might or might not have the HIV virus.

8. The only way to know for sure if someone has the HIV virus:
a) is through medical tests.
b) is by looking at them.

9. You can't get AIDS from having sex just once.
a) true
b) false

10. Using a latex condom:
a) provides 100% protection against AIDS.
b) provides a lot of protection against AIDS but not 100%.

11. Can an HIV-positive mother transmit the virus to her unborn child?
a) yes
b) no

12. Sometimes a person's decision-making in sexual situations is influenced by:
a) drugs.
b) alcohol.
c) either a or b.

13. A person infected with HIV might show signs of it:
a) within several weeks.
b) within a year or two.
c) in 10 years.
d) any of the above.

14. Right now:
a) there is a cure for AIDS.
b) there is no cure for AIDS.
c) there are drugs that help many, but not all, infected people control their symptoms.
d) both b and c.

15. How many people around the world get infected with HIV each day?
a) less than 1000
b) more than 5000
c) more than 10,000
d) more than 15,000

16. HIV infection rates are growing fastest among:
a) gay men.
b) women and teenagers.
c) middle-aged men.

Source: <www.paradeclassroom.com>.

HIV: Basic Facts

What is HIV?

"HIV" stands for Human Immunodeficiency Virus:

- Human: means it affects humans only.
- Immunodeficiency: means that something is deficient, or there is not enough of it, in the immune system.
- Virus: is a very small germ that infects someone and can be spread from one person to another.
  HIV is the virus that causes AIDS.

How does your immune system work?

Normally, your immune system helps protect you from germs and infections—like cancer, bacteria, parasites, fungi, and viruses—that can make you sick. It also keeps you from getting some diseases more than once, like chicken pox or the measles.

Your immune system works throughout your whole body. Some examples of your immune system at work include:

- Skin: keeps all kinds of germs and bacteria out of your body.
- Saliva: contains things called enzymes that can kill some germs.
- Nostrils: have hair and mucous that filter the air you breath. They keep germs from getting in your body.
- Vagina, penis, anus, and bowels: contain mucous to protect the body from infection.

What is a virus?

A virus is a germ that makes copies of itself within the cells of a person it infects. It usually makes you sick in some way. A virus is different from other kinds of germs. Bacteria, for example, can grow on their own. A virus can't. Viruses need to get inside a living cell and take it over. Once a virus is inside a living cell, the virus can make copies of itself.

Your immune system kills most viruses before they can make you sick, or before they can do a lot of damage to your cells.

How does the virus called HIV work?

HIV is different from other viruses because it gets inside some of the cells in your immune system. Those cells are called CD4 cells, which are also known as T4 cells or T cells.

The job of CD4 cells is to watch out for viruses as they enter your body. CD4 cells send a message to the rest of your immune system to help fight the virus. But HIV uses CD4 cells to grow, which means those cells can't do their job. And that means your body doesn't have part of its immune system.

When HIV gets into a CD4 cell, it goes right into the cell's DNA. HIV takes control of that cell, so the cell starts making new copies of HIV. This process is called replication.

First, the HIV in the CD4 cell produces new HIV proteins. Next, these proteins leave the CD4 cell to go and infect other CD4 cells. HIV uses an enzyme called protease to help spread it to other cells.

Once HIV has infected CD4 cells, it usually kills the cells. If you have HIV, this process happens billions of times a day. At the same time, your immune system tries to kill the infected CD4 cells and makes new CD4 cells to replace the ones that are infected. But as you can imagine, HIV soon infects these new cells, too.

If you have HIV, your CD4 cells can't do their normal job of protecting you from viruses, so you are at a much higher risk of getting infections and other diseases.

A doctor can use a blood test to count the number of CD4 cells per cubic millimetre (mm3) in your blood. In HIV-negative adult men, the normal CD4 cell count is 400-1200 cells/mm3. In HIV-negative adult women, the normal CD4 cell count is 500-1600 cells/mm3. The CD4 count is important in HIV positive people because it shows how much damage has been done to their immune system. It's important to note that test results can vary from one lab to another.

How do you get HIV?

HIV likes wet things, so it lives in body fluids. HIV can be passed from an infected person to someone else through body fluids such as:

- semen/sperm
- vaginal fluids
- blood
- breast milk

(continued)

HIV: Basic Facts (continued)

If HIV-infected body fluids get into your body, you might get HIV. That's why doctors and nurses wear rubber gloves when they give needles or perform operations. It's also why you should never share needles with someone else and why you need to use a condom when you're having sex.

These are the ways you can get HIV:

- Having **unprotected sex** with an HIV positive person (that means not using a condom during vaginal, anal or oral sex).
- **Sharing needles**, whether you're injecting drugs or getting a tattoo or piercing.
- Having **open cuts and sores** on your body come into contact with an infected person's blood or semen.
- Being **born to an HIV positive mother**—infection can occur in the womb, during birth or through breast milk.
- Playing blood games, such as "chicken" or "blood brothers."

Can I get HIV from kissing someone?

Even though HIV likes wet things, you can't get HIV by simply kissing someone who is infected with HIV. You also can't get HIV from:

- saliva
- sweat
- tears
- shaking hands
- sharing towels
- swimming pools
- telephones
- toilet seats
- biting insects, like mosquitoes

How do you know if you have HIV?

It's hard to tell. Most people don't know that they have been infected with HIV for some time after getting it. It can take up to three months before it shows up on a blood test.

Sometimes HIV infected people feel sick, like they have the flu, with a fever, headache and sore throat, before they actually test positive for HIV.

But so many people who have HIV don't know it. Sometimes it can take years before a person finds out. Some people only find out if they start getting sick a lot more often and go to a doctor to find out why.

You can't tell by just looking at someone that they are infected with HIV.

What does it mean if you are "HIV positive"?

When you are tested for HIV, and the test results are positive, you are "HIV positive." Once you are infected with HIV, it's just a matter of time before you become "HIV positive."

When you are HIV positive, your immune system has gone through a process called seroconversion. Seroconversion means that your immune system has created antibodies to HIV.

An HIV test looks for these antibodies. It might take a few months after being exposed to HIV for your body to start making these antibodies. But once you do, you will get a positive result on an HIV test.

How do you find out if you are HIV positive?

Only a doctor or other health care professional (like a nurse) can tell you for sure if you are HIV positive.

The doctor will do a blood test to see if your body is making antibodies. If your body is making antibodies to HIV, it means you are infected with the virus. Once you test positive for HIV, you will always test positive for the virus.

What happens to your body when you're HIV positive?

If you are HIV positive, the virus creates billions of new HIV viruses in your body every day. Your body's reaction to infection is to produce billions of cells to fight HIV.

HIV, however, takes every chance it can to reproduce faster than the body can attack it. Your immune system may get weaker or become overactive. Either way, your immune system is out of balance. HIV starts a process that can be very hard to stop once it starts.

With a weak immune system, you can get infections and cancers more easily. Most people with HIV end up with AIDS.

How do you know if your HIV disease is changing or getting worse?

Your doctor will keep track of your HIV disease with blood tests. That way, the doctor can tell if your HIV

(continued)

HIV: Basic Facts (continued)

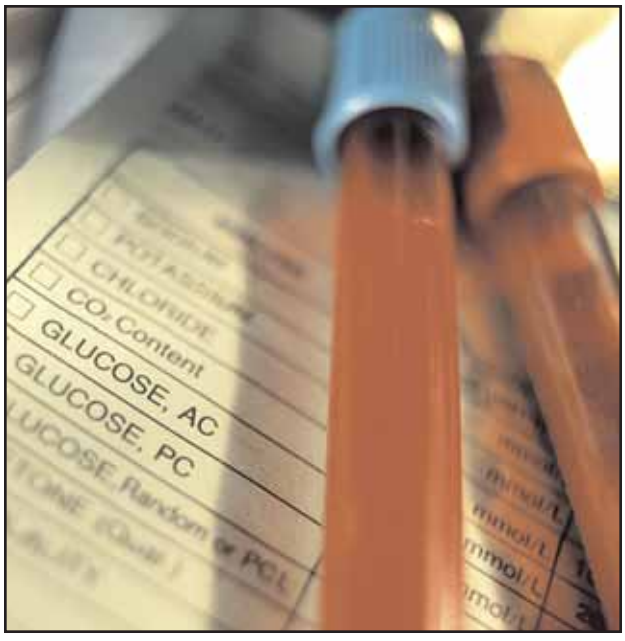
is getting worse and your immune system is getting weaker. These tests also can tell your doctor if you have Opportunistic Infections or AIDS-Related Complications.

To measure the progression of your HIV disease, your doctor will probably do:

- **CD4 Count Test:** this test tracks how much damage has been done to your immune system. It should be done every three to six months, or if you have a low CD4 count, it probably will have to be done more often. It's better to have a high CD4 count than a low CD4 count.
- **Viral Load Test:** this test measures the number of copies HIV has made in your blood and shows how much damage HIV could do to your body in the future. Your viral load tells you how far your HIV disease has progressed. It's better to have a low viral load than a high viral load.

Your doctor will probably also do tests to check your general health and to see if you have any opportunistic infections or co-infections.

- **Biopsy:** a small sample of skin, muscle, lymph node, or even organ is removed from your body and examined under a microscope for disease.
- **Complete Blood Count (CBC):** this shows how well your blood cells are working. Blood cells help your body run properly.



- **Culture:** a sample of body fluids or tissues are tested to find out if they contain any germs that might make you sick.
- **Imaging tests:** these tests include X-rays, computerized tomography (CT or CAT scans) and magnetic resonance imaging (MRI scans). All create pictures of the inside of your body. They let doctors see infections, tumours and broken bones.
- **Liver Function Test:** this test shows how well your liver is working and whether it has been damaged.
- **Scope:** a really thin, flexible tube that goes inside your body. Doctors can look through it to see if there's anything wrong with an organ or some tissues. They can also take samples with it.
- **Stain:** this is just like a culture. Your doctor might take a sample of blood, stool, mucus, urine, sputum (fluid coughed up from your lungs), phlegm, spinal fluid or tissue from you, stain it with some dye and look at it under a microscope for germs.
- **Tuberculosis (TB) Test:** this test may be done once a year because you are at a higher risk of getting TB if you have HIV. Tuberculosis is a really serious lung disease that makes you cough and have trouble breathing.

HIV and Pregnancy

Right now, four out of every 10,000 pregnant women in Canada are HIV positive. Many of these women find out about their HIV when they are pregnant because many doctors now test for the virus.

In the past, many babies born to HIV positive women also got the disease. Now, very few women who are getting the right care pass the virus on to the baby. The baby can get HIV during the pregnancy, during delivery and from breast milk. If a mother knows she has HIV, she can take anti-HIV drugs, have a Caesarean Section (an operation to take the baby out) and not breastfeed. All of these steps greatly reduce the risk of passing the virus onto the baby.

When someone is pregnant, they should get an HIV test. While it might be scary to get the test, it's really important for both a woman's health and the health of the baby.

(continued)

HIV: Basic Facts (continued)

Is there a cure for HIV?

There is no cure for HIV. Right now, once you get HIV, you have it for the rest of your life. Scientists are working really hard to cure HIV and AIDS. They're also working on a vaccine to keep people from getting HIV.

People who have HIV can live a long time and stay healthy for many years. There are several treatments that can slow down HIV. Some people on these treatments feel very healthy and can fight off the virus for a long time. That's why it's really important that anyone who has HIV—or even thinks they might have it—should see a doctor and consider getting treatment.

Understanding HIV/AIDS Trends

The most common measure of the HIV/AIDS epidemic is the prevalence of HIV infections among a country's adult population—in other words, the percentage of the adult population living with HIV. Prevalence of HIV provides a good picture of the overall state of the epidemic. Think of it as a still photograph of HIV/AIDS. In countries with generalized epidemics, this image is based largely on HIV tests done on anonymous blood samples taken from women attending antenatal clinics.

But prevalence offers a less clear picture of recent trends in the epidemic, because it does not distinguish between people who acquired the virus very recently and those who were infected a decade or more ago. (Without antiretroviral treatment, a person might survive, on average, up to nine to 11 years after acquiring HIV; with treatment, survival is substantially longer.)

Countries A and B, for example, could have the same HIV prevalence, but be experiencing very different epidemics. In country A, the vast majority of people living with HIV/AIDS (the prevalent cases) might have been infected five to 10 years ago, with few recent infections occurring. In country B, the majority of people living with HIV/AIDS might have been infected in the past two years. These differences would obviously have a huge impact on the kind of prevention and care efforts that countries A and B need to mount.

Similarly, HIV prevalence rates might be stable in country C, suggesting that new infections are occurring at a stable rate. That may not be the case, however. Country C could be experiencing higher rates of AIDS mortality (as people infected a decade or so ago die in large numbers), and an increase in new infections. Overall HIV prevalence rates would not illuminate those details of the country's epidemic.

So a measure of HIV incidence (i.e., the number of new infections observed over a year among previously uninfected people) would help complete the picture of current trends. Think of it as an animated image of the epidemic.

The problem is that measuring HIV incidence is expensive and complicated—to the point of it being unfeasible at a national level and on a regular basis in most countries.

None of this means, however, that recent trends are a mystery. Regular measurement of HIV prevalence among groups of young people can serve as a proxy, albeit imperfect, for HIV incidence among them. Because of their age, young people will have become infected relatively recently. Significant changes in HIV prevalence among 15- to 19-year-olds or 15- to 24-year-olds can therefore reflect important new trends in the epidemic.

The steadily dropping HIV prevalence levels in 15- to 19-year-olds in Uganda, for example, indicate a reduction in recent infections among young people, and provide a more accurate picture of current trends in the epidemic (and, in this instance, of the effectiveness of prevention efforts among young people).

<www.Unaids.org/Unaids/EN/Resources/Epidemiology/Understanding_HIV_Trends.asp>.

World AIDS Summit Warns of Challenges Ahead

The Fourteenth International Conference on AIDS, held in Barcelona, Spain from July 7-12, 2002, warned that the HIV/AIDS epidemic is the greatest threat to global health today. According to figures released at the summit, 60 million people have been infected and 22 million people have died from AIDS since its identification in the 1980s, with a further 68 million people projected to die from the disease by 2020.

Summit participants, including government representatives, non-governmental organizations, youth activists, business groups, and statesmen such as Kofi Annan, Nelson Mandela, and Bill Clinton, called for more funding, with the United Nations Joint Program on HIV/AIDS (UNAIDS) and the United Nations Development Program (UNDP), declaring $10 billion annually a desirable and achievable figure.

Nevertheless, the summit's funding recommendation was criticized by various interest groups. Developing countries and non-governmental organizations, such as the Catholic Aid Agency (CAFOD), argued for increasing funding levels higher than the $10 billion proposed. They also pointed out that the problem of lack of funding to tackle AIDS is compounded by the UN Global Fund's failure to distribute any money since its creation in January 2002 in the fight against AIDS, TB, and malaria despite announcing $1.6 billion in grants to 40 developing countries.

Critics also linked fighting HIV/AIDS to other issues. For example, Oxfam argued that developing countries would be able to fund their own prevention, education, and healthcare projects if they were not burdened with huge debt repayments to the developed world. The World Food Program (WFP) and the Food and Agriculture Organization (FAO), meanwhile, noted that well-nourished people are better able to survive the disease and that treating people for HIV/AIDS and then having them die of starvation would be a tragedy. Others said that developing countries would be better served by the elimination of tariff barriers by Western countries and freedom to use WTO provisions on national health emergencies and compulsory licensing of patents to produce cheaper drugs to treat the epidemic.

Indeed, the disease's links to other issues such as development, productivity, education, and social cohesion were highlighted at the summit. For example, the International Labor Organization (ILO) says that the epidemic undermines both economic and social development by reducing productivity and competitiveness through increased absenteeism, organizational disruption, and loss of skills, resulting in added costs for training new staff as productive workers die. Productivity and development have also suffered as the disease has affected education, with children removed from school, to nurse family members, work the land or because schools have closed as teachers have died. These problems are particularly acute in Africa, where 28,500,000 people are living with HIV/AIDS, prompting warnings from the UN Envoy on HIV/AIDS in Africa that the effects of the epidemic "stand to undermine all efforts to promote development" and have created a skills shortage that years of aid and billions of dollars of development work had attempted to overcome.

The disease also disrupts society because of the widespread death it brings. The United Nations Children's Fund (UNICEF), for example, estimates more than 20 million children have been orphaned by the AIDS epidemic, with this figure expected to rise to 25 million by 2010, with many facing poverty and starvation as a result. Furthermore, an increasing number of children are born HIV-positive as more women are infected and drugs available to reduce transmission to the children are prohibitively expensive.

Similarly, the United Nations Security Council has highlighted the epidemic's potential threat to both national and international security, especially in conflict and peacekeeping situations, where the disease can lead to the complete breakdown of society and its regulatory systems. In response, the UN has adopted the UN Initiative on HIV/AIDS and Security, and implemented a two-year plan aimed at protecting vulnerable communities and supporting their regulatory systems, such as the army and police force, to tackle the disease and maintain social stability.

(continued)

World AIDS Summit Warns of Challenges Ahead (continued)

Furthermore, HIV/AIDS not only kills millions of people itself, it also increases the prevalence of other communicable and potentially fatal diseases such as tuberculosis (TB) and malaria. All these diseases are straining healthcare systems in developing countries, leaving impoverished patients to try to pay for their own treatment and stretching the system so far that there is little funding to treat other healthcare problems, resulting in a drop in healthcare standards and a rise in fatalities. This appears to have affected migration as well, with developed countries noting more people seeking to move abroad to gain medical care and some developed nations tightening their immigration rules in response.

The HIV/AIDS epidemic thus has profound implications for globalization, threatening global health, retarding development, damaging productivity, creating new threats to global security, and raising questions over how best to help developing nations deal with the challenge of disease epidemics. The success or failure of multi-agency strategies proposed to deal with the threat of HIV/AIDS will profoundly affect the future for all nations and the global scope of the threat may affect the way health and development issues are viewed in the future.

Diseases Go Global

According to one estimate, by the time of the European colonization of the Americas, plagues such as smallpox and measles could travel around the world within the span of a year. Today, of course, with international air travel, an infected person can carry a disease from almost any point of the globe to any other point in less than 36 hours.

One of the particularly threatening aspects of this compression of time is that people can now cross continents in periods of time shorter than the incubation periods of most diseases. This means that, in some cases, travelers can depart from their point of origin, arrive at their destination and begin infecting people without even knowing that they are sick.

The new ease with which infectious diseases can be transmitted globally is having a direct and dramatic effect on morbidity and mortality around the world. In the United States, for example, the incidence of infectious disease-related deaths has been increasing by roughly 4.8 percent per year since 1980, bringing the number of deaths up to 59 per 100,000 by 1996. This translates into 170,000 U.S. deaths annually. This increase follows nearly a century of long-term, steady decline in the number of deaths from infectious diseases in the United States.

Similarly, in the United Kingdom, which had almost completely eradicated tuberculosis from the British Isles by 1953, 7000 new cases of the disease occurred in 1990.

The dangers posed by these diseases go beyond simply medical concerns. In January of 2000, the U.S. Intelligence Community issued a declassified report concerning the spread of global infectious diseases. This National Intelligence Estimate found that:

"New and re-emerging infectious diseases will pose a rising global health threat and will complicate U.S. and global security over the next twenty years. These diseases will endanger U.S. citizens at home and abroad, threaten U.S. armed forces deployed overseas, and exacerbate social and political instability in key countries and regions in which the United States has significant interests."

The threat of political instability—which can be defined as wars, ethnic conflict, and violent regime transitions—is most likely to endanger developing countries. In these nations the burden of disease can strain already meager national budgets, set off competition for resources, and result in the death or disability of important government officials.

In many African countries in particular, the most skilled and wealthiest segments of the population are often the most severely affected by the HIV virus. This tends to be the case because the wealthier segments of the population tend to be more mobile and have more opportunities for sexual partners.

"...The concept of domestic as distinct from "international health" is outdated. Such a dichotomous concept is no longer germane to infectious diseases in an era in which commerce, travel, ecologic change, and population shifts are intertwined on a truly global scale." (U.S. CDC, Addressing Emerging Infectious Disease Threats: A Prevention Strategy for the United States).

Similarly, the armed forces of some African countries are estimated to harbor infection rates of between 10 and 60 percent. Losses of key military leaders and senior officers can lead to breakdowns in the chain of command, and make it more tempting for younger officers to launch coup attempts.

Of course, the problems of health and instability are

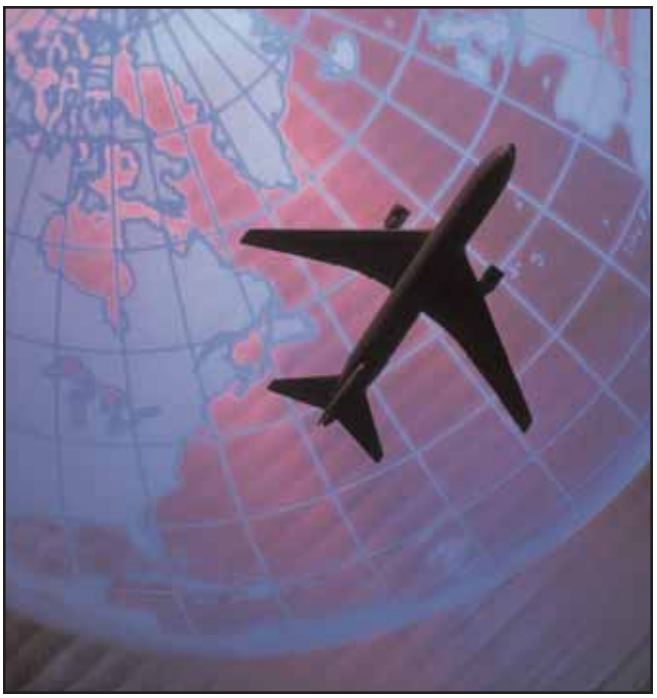
(continued)

Diseases Go Global (continued)

not limited to Africa or to the HIV virus alone. Political instability is most likely to arise in the presence of broad social upheaval. A recent major study by political scientists looked into the causes of 127 cases of state instability around the world over a forty-year period, evaluating each of these cases according to the presence of certain variables or indicators of social and political turmoil. Out of 75 factors they analyzed, 3 emerged which proved to correlate the most strongly as predictors of political instability. These three most powerful determinants were:

- incomplete democratization,
- low openness to international trade, and
- infant mortality.

In particular, they found that high infant mortality within a state that is only partially democratic is most likely to produce instability.



Questions for Discussion:

The study on political instability found that incomplete democratization, low openness to international trade, and infant mortality are the three strongest predictors of political instability. Do you think these three predictors are related to each other? How?

Why does the spread of infectious disease lead to political instability?

If the spread of infectious diseases have been around for centuries, why does it seem like this is a relatively new phenomenon? What do you think has drawn increased attention to global diseases?

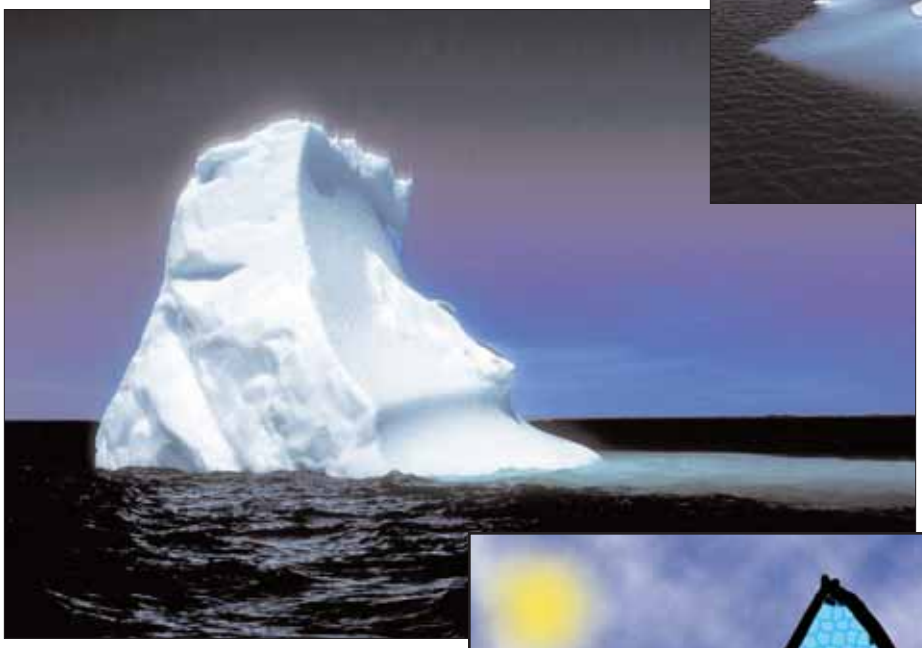
Do you think there is a connection between infectious diseases and economic development?

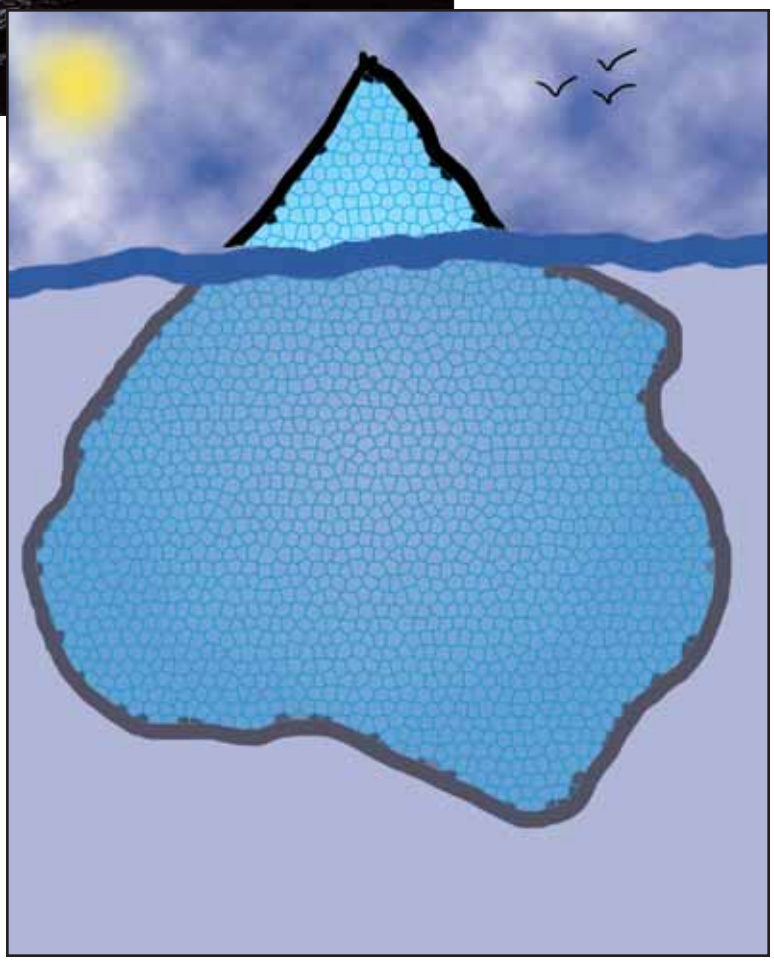
Features of Culture

1. Facial expressions
2. Religious beliefs
3. Religious rituals
4. Importance of time
5. Paintings
6. Values
7. Literature
8. Child raising beliefs
9. Concept of leadership
10. Gestures
11. Holiday customs
12. Concept of fairness
13. Nature of friendship
14. Notions of modesty
15. Foods
16. Eating habits
17. Understanding of the natural world
18. Concept of self
19. Work ethic
20. Concept of beauty
21. Music
22. Styles of dress
23. General world view
24. Concept of personal space
25. Rules of social etiquette

The Iceberg

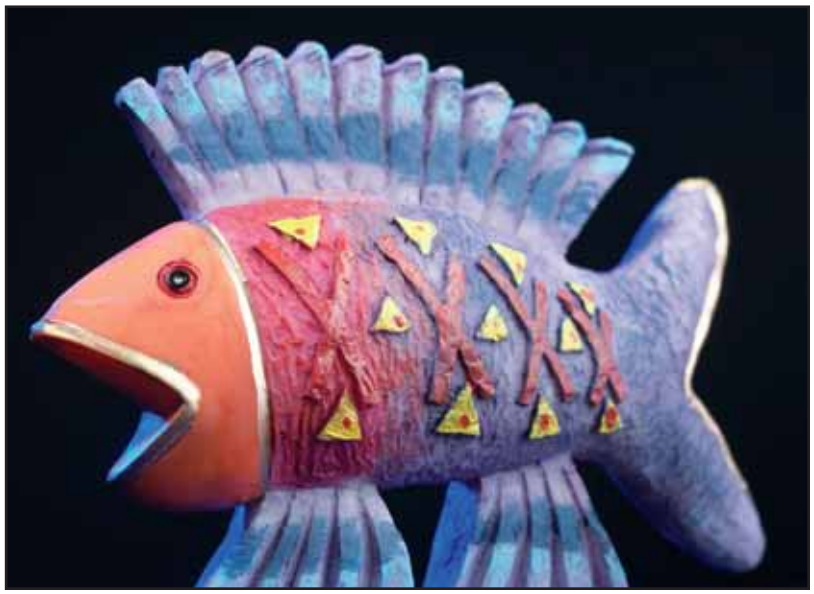
Culture has been aptly compared to an iceberg. Just as an iceberg has a visible section above the waterline, and a larger, invisible section below the water line, so culture has some aspects that are observable and others that can only be suspected, imagined, or intuited. Also like an iceberg, that part of culture that is visible (observable behaviour) is only a small part of a much bigger whole.





Culture Shock: A Fish Out of Water

by *Duncan Mason*



Introduction:

1. Kalvero Oberg was one of the first writers to identify five distinct stages of culture shock. He found that all human beings experience the same feelings when they travel to or live in a different country or culture. He found that culture shock is almost like a disease: it has a cause, symptoms, and a cure.

Body:

2. Whenever someone travels overseas they are like "a fish out of water." Like the fish, they have been swimming in their own culture all their lives. A fish doesn't know what water is. Likewise, we often do not think too much about the culture we are raised in. Our culture helps to shape our identity. Many of the cues of interpersonal communication (body language, words, facial expressions, tone of voice, idioms, slang) are different in different cultures. One of the reasons that we feel like a fish out of water when we enter a new culture is that we do not know all of the cues that are used in the new culture.
3. Psychologists tell us that there are five distinct phases (or stages) of culture shock. It is important to understand that culture shock happens to all people who travel abroad, but some people have much stronger reactions than others.
4. During the first few days of your stay in a new country, everything usually goes fairly smoothly. You are excited about being in a new place where there are new sights and sounds, new smells and tastes. You may have some problems, but accept them as just part of the newness. You may find yourself staying in hotels or with a homestay family that is excited to meet you. You may find that "the red carpet" has been rolled out and you may be taken to restaurants, movies, and tours of the sights. Your new acquaintances may want to take you out to many places and "show them off." This first stage of culture shock is called the "honeymoon phase."
5. Unfortunately, this honeymoon phase often comes to an end fairly soon. You have to deal with transportation problems (buses that don't come on time), shopping problems (can't buy favourite foods), or communication problems (just what does "Chill out, dude" mean?). It may start to seem like people no longer care about your problems. They may help, but they don't seem to understand your concern over what they see as small problems. You might even start to think that the people in the host country don't like foreigners.
6. This may lead to the second stage of culture shock, known as the "rejection phase." You may begin to feel aggressive and start to complain about the host culture/country. However, it is important to recognize that these feelings are real and can become serious. This phase is a kind of crisis in the "disease" of culture shock. It is called the "rejection" phase because it is at this point that you start to reject the host country, complaining about and noticing only the bad things that bother you. At this stage you either get stronger and stay, or weaker and go home (physically or only mentally).

(continued)

Source: <http://international.ouc.bc.ca/cultureshock/printext.htm>.

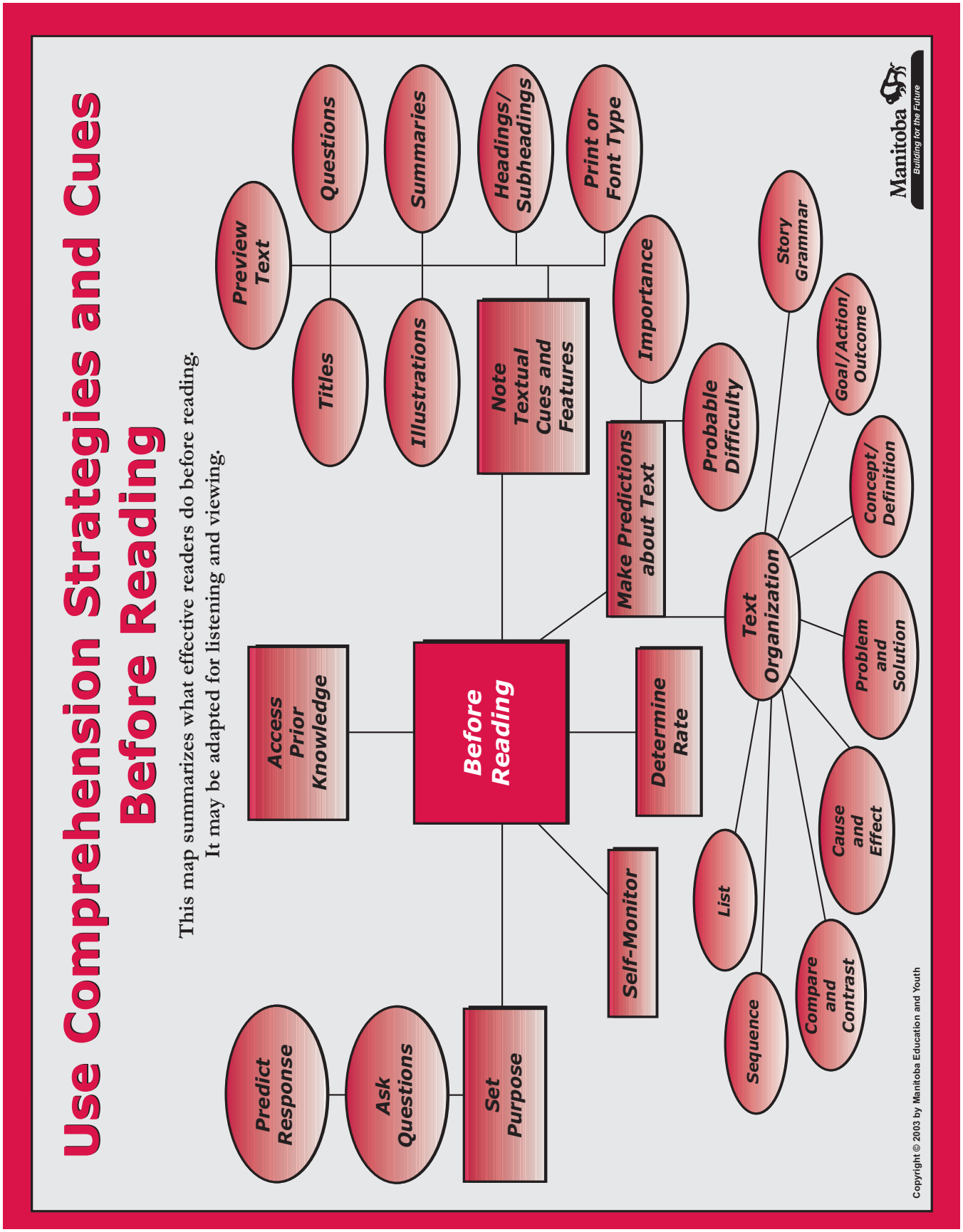
Culture Shock : A Fish Out of Water (continued)

7. If you don't survive stage two successfully, you may find yourself moving into stage three: the "regression phase." The word "regression" means moving backward, and in this phase of culture shock, you spend much of your time speaking your own language, watching videos from your home country, eating food from home. You may also notice that you are moving around campus or around town with a group of students who speak your own language. You may spend most of this time complaining about the host country/culture.
8. Also in the regression phase, you may only remember the good things about your home country. Your homeland may suddenly seem marvellously wonderful; all the difficulties that you had there are forgotten and you may find yourself wondering why you ever left (hint: you left to learn English!). You may now only remember your home country as a wonderful place in which nothing ever went wrong for you. Of course, this is not true, but an illusion created by your culture shock "disease."
9. If you survive the third stage successfully (or miss it completely) you will move into the fourth stage of culture shock called the "recovery phase" or the "at-ease-at-last phase." In this stage you become more comfortable with the language and you also feel more comfortable with the customs of the host country. You can now move around without a feeling of anxiety. You still have problems with some of the social cues and you may still not understand everything people say (especially idioms). However, you are now 90% adjusted to the new culture and you start to realize that no country is that much better than another—there are just different lifestyles and different ways to deal with the problems of life.
10. With this complete adjustment, you accept the food, drinks, habits and customs of the host country, and you may even find yourself preferring some things in the host country to things at home. You have now understood that there are different ways to live your life and that no way is really better than another, just different. Finally you have become comfortable in the new place.
11. It is important to remember that not everyone experiences all the phases of culture shock. It is also important to know that you can experience all of them at different times: you might experience the regression phase before the rejection phase, etc. You might even experience the regression phase on Monday, the at-ease phase on Tuesday, the honeymoon phase on Wednesday, and the rejection phase again on Thursday. "What will Friday be like?"
12. Much later, you may find yourself returning to your homeland and—guess what?—you may find yourself entering the fifth phase of culture shock. This is called "reverse culture shock" or "return culture shock" and occurs when you return home. You have been away for a long time, becoming comfortable with the habits and customs of a new lifestyle and you may find that you are no longer completely comfortable in your home country. Many things may have changed while you were away and—surprise! surprise!—it may take a little while to become at ease with the cues and signs and symbols of your home culture.

Conclusion

13. Reverse culture shock can be very difficult. There is a risk of sickness or emotional problems in many of the phases of culture shock. Remember to be kind to yourself all the time that you are overseas, and when you get home, give yourself time to adjust. Be your own best friend. If you do these things you will be a much stronger person. If you do these things, congratulations—you will be a citizen of the world!

Comprehension Strategies



(continued)

Comprehension Strategies (continued)

Use Comprehension Strategies and Cues During Reading

This map summarizes what effective readers do during reading.
It may be adapted for listening and viewing.

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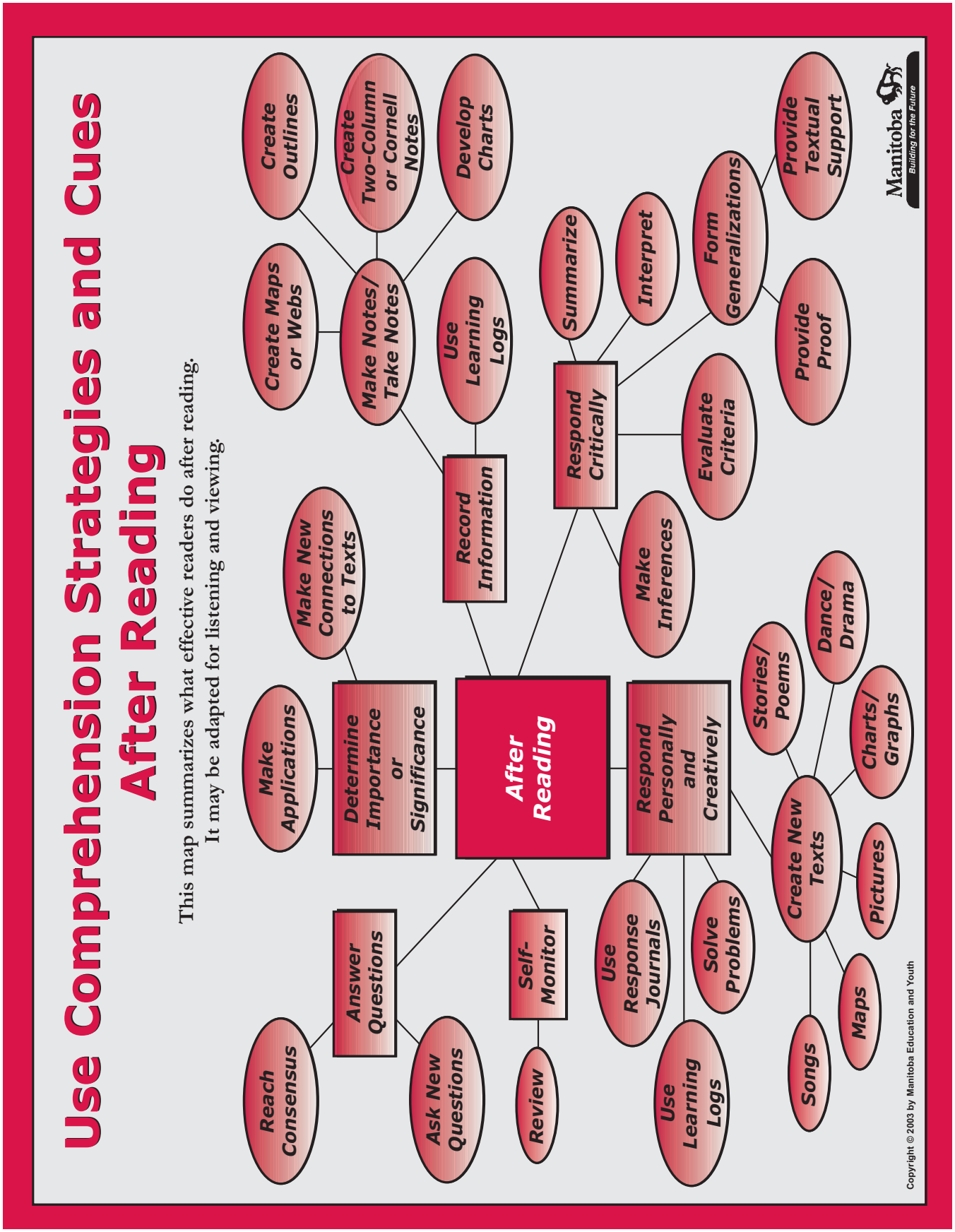
Comprehension Strategies (continued)



Culture Quotes

All good people agree.
And all good people say,
All nice people, like us, are We
And everyone else is They.
But if you cross over the sea,
Instead of over the way,
You may end by (think of it!) looking on We
As only a sort of They!
--Rudyard Kipling
"We and They"

Understanding Other Cultures

Keep in mind the "seven lessons" writer Craig Storti derived from his book of cross-cultural dialogues:

1. Don't assume sameness.
2. What you think of as normal or human behaviour may only be cultural.
3. Familiar behaviours may have different meanings.
4. Don't assume that what you meant is what was understood.
5. Don't assume that what you understood is what was meant.
6. You don't have to like or accept "different" behaviour, but you should try to understand where it comes from.
7. Most people do behave rationally; you just have to discover the rationale.

"Despite popular beliefs to the contrary, the single greatest barrier to business success is the one erected by culture."

—Edward T. Hall and
Mildred Reed Hall
Hidden Differences: Doing Business with the Japanese

Practical Steps to Relieve Culture Shock

In *The Whole World Guide to Culture Learning*, J. Daniel Hess explains that "one of the problems with culture shock is that frequently people don't realize (or deny) they are experiencing it. The feelings are ascribed to other causes. It is difficult to counteract something you don't believe is affecting you, but once you do recognize what is happening, there are a number of things to do."

Here are some suggestions for people who are experiencing the loneliness or other distress of culture shock.

1. People are important. Don't isolate yourself. Interact with everyone you can. You may need to take the first step because they may not realize that you are lonely. Give small gifts, help with something, smile, and ask questions.
2. Keep your environment comfortable. Decorate it with little reminders of home: a favourite cup or photo. Play your music or watch a video. But try the new ones too.
3. Slow down until your body and emotions have had time to catch up. You've gone through a major change in your life and you need time. Simplify and relax.
4. Do the same thing every day until you feel that it is part of your routine.
5. Express your feelings. This may be privately, through prayer, writing, journaling, art, etc., or publicly to a friend.
6. When you feel disappointed or frustrated in your slow progress, remember that this is just a detour—and detours often have beauties of their own.
7. Work on the language. Being able to use even small bits will increase your confidence and enjoyment. And it's a great way to make friends.
8. Keep moving—find ways and time to get exercise. What do the locals do for fun?
9. Friends and host families want you to succeed. Let them know when you are sad so that they can support you.
10. Make a few small plans and complete them. Every little achievement will help you gain the confidence to tackle the next one.

Remember that culture shock is a normal process of adjustment, and if you allow yourself time and kindness, it will pass. Some people fear that if they adjust too well to the new environment, they will forget their old one, but a better view is enrichment—you will now have two cultures to draw on.

Script for the Slides of "Houston's Little Giant"

Slide 1: Nothing

Slide 2: Yao Ming, the NBA's most **anticipated** new player, **battles with guard** Steve Francis and **centre** Kelvin Cato during Yao's first practice with his Houston Rockets teammates last Tuesday. Yao surprised Rockets' head coach Rudy Tomjanovitch by practising the morning after arriving from China.

Slide 3: Yao Ming **goes up against** Kelvin Cato and Oscar Torres during practice. Yao, 22, **stands** 7', 5" and weighs 296 pounds. The practice was Houston's first look at their **number one draft pick**.

Slide 4 Teammate Steve Francis drives Yao Ming through rain during a charity golf luncheon. Yao, who studied English for five years, is slowly **getting used to** talking with his new teammates. The universal NBA greeting—**"What's up?"** has been difficult for Yao to get used to; it sounds like a common Mandarin **profanity**.

Slide 5: Yao Ming **dwarfs** Rockets cheerleader, Tina Hill, as they arrive at the charity golf luncheon. Steve Francis, walking behind Yao, says that "Even my **Hummer** is too small for him."

Slide 6: The media is following every move of the rookie Yao Ming. After his **debut** in a **pre-season** game where he **drew three fouls** in his first five minutes of action, ESPN strung together all of his worst moments for a Sportscenter segment. In his second preseason game, Yao **rebounded** by **scoring** 13 points and **blocking** 2 shots.

Slide 7: Yao Ming stands in line with translator Colin Pine during the charity luncheon. Although Yao speaks some English, Pine will be there to help Yao deal with the media and the **adjustment** to a new country.

Slide 8: Yao Ming won't get too homesick during his first full season in the NBA. Houston has a small downtown Chinatown and a daily newspaper that prints in Chinese. To help out with the adjustment to the new life, Yao's mother will stay with him at his Houston house during the whole season.

Slide 9: Yao Ming is photographed with admirers by translator Colin Pine. Rockets owner Les Alexander believes Yao will become a worldwide **superstar**: "In two years, he'll be bigger than Michael [Jordan] ever was, worldwide, and bigger than Tiger [Woods]. I think he's going to be the **number one icon** in the world."

Script is available online: <www.usatoday.com/sports/basketball/nba/rockets/2002-10-28-yao-usat-cover_x.htm>.

Cloze Passage: "Houston's Little Giant"

1. Audio:

There is something _____engaging about the guy. You see _____ and you_____ him to do well. Uh, I think you _____ that from ___ fans.

There's just something very _____ likeable _____him.

2. Audio:

He's looked _____ every day. I think the big thing he's _____ is that uh, _____ learning curve is going up. Um, his first day (in) _____ _____ played a game, he was _____ lost quite _____. And then, the next night, 24 hours later, he comes back, and he was _____, much more um, in _____.

3. Audio:

He's 296 pounds. He's virtually 300, and _____ _____ how you stack it, 300 pounds is _____ good. He has really strong, um, _____ body strength, so he's probably gonna be able to leverage _____ he gets, uh, a _____ more time in and learns the NBA game.

4. Audio:

All of them _____ been very surprised at, uh, the _____ he has with the English language. He did take five years in Middle School, and when he's having _____ conversations with them, he speaks _____ English, um, _____ they say quite _____. _____ I talked to two guys _____ went _____to him to the _____ Rock Café in San Antonio, and they said they _____ in English _____ the whole night.

5. Audio:

You never cease to be _____ by his height. That _____ _____ he's going out to a tent at a "Meet _____ _____" at a, uh, country club. And the cheerleaders _____ _____ escorting us 'cause it was _____ very heavily. But even on tippytoes, fully extended, uh, they _____ get the umbrella over Yao Ming's head. Guys just look _____ _____ every day and _____ _____, "Man, that guy's just bigger _____ anything _____ we've ever seen!"

6. Audio:

He's a little _____, and I think it's mainly _____ a little concerned about _____ _____ use _____ interpreter all the time. He _____ like to be doing it on his own. Doesn't always understand or _____ _____ some of the… the more _____ questions. Like "_____ talk" was a new term _____ _____.

7. Audio:

The big thing he's _____ _____ for him when he's at home is that his _____ here and will be here for the whole _____. So she cooks for him, and he's real _____ _____ that. He says he likes _____ a lot. Uh… he ate at the Hard Rock and the guys who ate with him said, you know, _____ _____ no _____. I _____ him about that, and _____ _____ pestering him and he wanted to give me an _____, and he finally said, "Well, you know, _____, I _____ like cold sandwiches that much," but it _____ a major complaint.

(continued)

Source: Audio from <www.usatoday.com/sports/gallery/2002-10-28-yaoming/flash.htm>.

"Houston's Little Giant" (continued)

8. Audio:

I think he _____ read a fair _____ of English and he is reading that _____ paper…um… It's the *Southwest Asia News*. Uh…so _____ _____ his news from there, and they make _____ that he gets a paper every day. He's getting _____ _____ to the Internet, too. He's got a laptop, and I think they were _____ wire _____ all _____ for him this week so that he can, _____ _____, have email _____ to friends and, and get on some of the Chinese Internet _____.

9. Audio:

(Unintelligible) interesting _____ with the fans. Uh… he's been stopping and _____ with people. In San Antonio, he was walking down the streets and the San Antonians were um…saying "Hey, _____ _____!" He got a big _____ out of that. _____ he _____ also that he, he's really felt that, _____ getting to Houston, fans that he's _____ _____ haven't just _____ him like a basketball player, but he _____ they were treating him like a Texan and, uh, he seemed genuinely _____ by that.

Cloze Passage Transcript: "Houston's Little Giant" (Teacher Version)

1. Audio:

There is something terribly engaging about the guy. You see him and you want him to do well. Uh, I think you sense that from the fans.

There's just something very immediately likeable about him.

2. Audio:

He's looked better every day. I think the big thing he's shown is that uh, his learning curve is going up. Um, his first day (in) that he played a game, he was really lost quite often. And then, the next night, 24 hours later, he comes back, and he was much, much more um, in control.

3. Audio:

He's 296 pounds. He's virtually 300, and no matter how you stack it, 300 pounds is pretty good. He has really strong, um, lower body strength, so he's probably gonna be able to leverage as he gets, uh, a gets more time in and learns the NBA game.

4. Audio:

All of them have been very surprised at, uh, the ability he has with the English language. He did take five years in Middle School, and when he's having casual conversations with them, he speaks in English, um, and they say quite well. That I talked to two guys that went out to him to the Hard Rock Café in San Antonio, and they said they spoke in English almost the whole night.

5. Audio:

You never cease to be surprised by his height. That picture is he's going out to a tent at a "Meet and Greet" at a, uh, country club. And the cheerleaders were all escorting us 'cause it was raining very heavily. But even on tippy-toes, fully extended, uh, they couldn't get the umbrella over Yao Ming's head. Guys just look at him every day and you go, "Man, that guy's just bigger than anything else we've ever seen!"

6. Audio:

He's a little timid, and I think it's mainly he's a little concerned about having to use an interpreter all the time. He would like to be doing it on his own. Doesn't always understand or fully absorb some of the… the more cultural questions. Like "trash talk" was a new term to him.

7. Audio:

The big thing he's got going for him when he's at home is that his mother's here and will be here for the whole year. So she cooks for him, and he's real comfortable with that. He says he likes steak a lot. Uh… he ate at the Hard Rock and the guys who ate with him said, you know, he had no problem. I asked him about that, and I kept pestering him and he wanted to give me an answer, and he finally said, "Well, you know, okay, I don't like cold sandwiches that much," but it wasn't a major complaint.

8. Audio:

I think he can read a fair amount of English and he is reading that local paper…um… It's the *Southwest Asia News*. Uh…so he's getting his news from there, and they make sure that he gets a paper every day. He's getting hooked up to the Internet, too. He's got a laptop, and I think they were gonna wire it all up for him this week so that he can, you know, have email access to friends and, and get on some of the Chinese Internet availability.

(continued)

"Houston's Little Giant" (Teacher Version) (continued)

9. Audio:

(Unintelligible) interesting interaction with the fans. Uh… he's been stopping and posing with people. In San Antonio, he was walking down the streets and the San Antonians were um…saying "Hey, Mr. Houston!" He got a big kick out of that. And he said also that he, he's really felt that, since getting to Houston, fans that he's run into haven't just treated him like a basketball player, but he felt they were treating him like a Texan and, uh, he seemed genuinely touched by that.

Connecting the Dots

Often during this course you have been asked to work in groups. What is the role of social interaction in developing stronger writing? A common image of the writer is a solitary soul holed up in a room, feverishly pounding away at a computer, forgetting to eat or drink until the perfect line flows out onto the screen. Another misconception is of an extraordinarily gifted individual who can perfectly capture an idea in words at the first try.

However, professionals who write as part of their academic, scientific, or business careers increasingly depend on a writing community of colleagues for the majority of their work. They generate and test ideas as they sit around a table or share an email discussion; they may focus and organize these ideas using wall charts or whiteboards; they may split the writing and editing in different ways; circulate and critique their shared work electronically or in print; and finally come to a consensus on the final document. Much of the writing in the professional world today, including technical articles, proposals, advertising, reports, and web pages, is ultimately produced by a team.

The team approach to writing has been driven by several recent developments. First, the complexity of contemporary research, technology, and business demands more breadth or depth of expertise than one person likely has. Second, organizational patterns in the working world have been evolving from hierarchical systems to more self-directed teams who must produce their own documents. Finally, and perhaps most significantly, is the development of networked computers, so that team members can conveniently circulate and revise work within the same office or from thousands of kilometres apart. As a result of this shift in working style, group interaction skills and the ability to team-write have become critical determinants of career success.

Beyond the efficiency of group writing, a writing community allows individuals the social interaction that helps construct knowledge. We see a topic through the perspective of our own experience, but as we are presented with multiple angles of vision, we are able to examine, focus, and expand our own knowledge. This process promotes the creation of new understandings. Oral discussion does this and so can team writing.

However, as in team sports, team writing is a learned skill. Most students are familiar with the dilemma presented by some group efforts, when one person completed the majority of the work, with others more than ready to accept equal credit for less than equal effort. Others recall wasted hours as the team members tried to organize themselves and focus on the task.