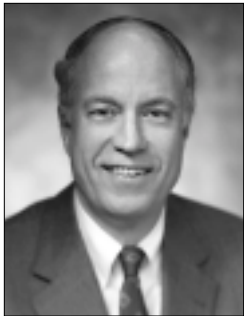


Facts and ideas from anywhere



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OUR MOST PERSISTENT AND DEADLY FOE

Spielman and D'Antonio recently published *Mosquito*, the story of the mosquito (1). They write: "No animal on earth has touched so directly and profoundly the lives of so many human beings. For all of history, and all over the globe, she has been a nuisance, a pain, and an angel of death. Mosquitoes have felled great leaders, decimated armies, and decided the fates of

nations. All this, and she is roughly the size and weight of a grape seed." Each year millions die from mosquito-borne malaria; cities in Europe and the USA battle outbreaks of West Nile virus. Dozens of countries fight yellow fever, dengue, filariasis, and a host of deadly encephalitis viruses.

As the authors state, the mosquito may be difficult to love, but anyone who comes to know her well develops a deep appreciation. A few species are beautiful. All mosquitoes manifest exquisite adaptation to their environment. As a larva, the mosquito feeds and navigates in water. As an adult, she walks on both water and land. She flies through the night air with the aid of the stars. She not only sees and smells but also senses heat from a distance. She thinks with her skin, changing direction and fleeing danger in response to myriad changes in her surroundings.

More than most other living things, the mosquito is self-serving. She doesn't aerate the soil, serve as an important pollinator of plants, or even serve as an essential food item for some other animal. She has no purpose other than to perpetuate her species! That the mosquito plagues human beings is to her incidental. She is simply surviving and reproducing.

Mosquitoes and the pathogens they carry have proven to be hardy, clever, and relentless. Despite all our technology and science, most mosquitoes may pose a risk to health virtually anywhere in the world. In fact, our troubles with mosquitoes are getting worse, making more people sick and claiming millions of lives every year. Drug-resistant malaria plagues the tropics. Many regions that were once considered fully cleansed of mosquito-borne pathogens have recently begun to suffer these plagues again.

Although there are >2500 different species of mosquitoes, the big 3 that transmit human disease worldwide include various *Anopheles* species, *Aedes aegypti*, and *Culex pipiens*. Although dozens of different mosquitoes may be present in a single site, these 3 common mosquitoes can usually be distinguished from each other. *Anopheles* mosquitoes, the vectors of human malaria, are brownish and have 3 long similar-looking projections on their

heads, a proboscis (bundle of feeding stylets), and 2 equally long palps (sensory appendages). *Aedes aegypti* mosquitoes, the vectors of dengue and yellow fever, have very short palps that are too small to see without a microscope. Their bodies are jet black and ornamented with silvery white lines and patches, and their wings are translucent. *Culex pipiens* mosquitoes, the most common mosquitoes and the vectors of West Nile virus and filariasis, have very short palps. Their bodies are brownish overall but have transverse white lines on the upper surface of their abdomens. The wings of the female adult *Culex* beat between 250 and 500 times per second. Mosquitoes fly at speeds of up to 3 miles per hour.

Several billion adult mosquitoes emerge each day worldwide. Mosquitoes can live 8000 feet up (as in the Himalayas) and below sea level (as in the California desert). The eggs of an extremely adaptable mosquito can survive decades of drought (in the Sahara) until a brief rainfall permits a hatch.

Most mosquitoes do not feast on human blood. Only the females practice vampirism. For the most part, mosquitoes, like butterflies, feed on nectar or other sources of sugar such as rotting food. Some species feed on the honeydew excreted by other insects and, amazingly, one species in Asia descends upon a certain kind of ant, inserts her proboscis in the remarkably cooperative ant's mouth, and sucks out regurgitated nutrients.

Nearly all female mosquitoes ingest blood mainly to fuel the production of eggs. But well before she exploits her blood to do her reproductive duty, *Culex pipiens* will have to be impregnated. *Culex* females emerge on their own accord, unmolested, and rest for a few hours to complete maturing after escaping the pupal case. In comparison, the newborn males' situation is quite different. As he emerges from the cuticle, his sex organs are on the wrong side of his body, and he must wait nearly a day for the terminal segments of his abdomen to rotate so that everything is aimed in the right direction. At that time he uses his antennae, which are more sensitive instruments than hers, to detect the whining sound of a female's wingbeat. The wing tone of immature males of <2 days of age is quite similar to a female's, which results in some rather unsuccessful encounters among sexually eager males. The males and females of the same species are profoundly responsive to the tones of their mates.

Once they are about 2 days old, *Culex* males and females are mature enough to mate. The process begins at dusk or dawn with scores or even hundreds of males forming a dancing swarm in the air near a landmark such as the chimney of a house or a church steeple. The *Culex* swarm can be so thick that it might be mistaken for smoke. In many species, generation after generation will swarm in the same location, year after year. Just as the males seek the swarm marker, females will be drawn to the swirling mass of

males and fly into it one by one. Often several males will be drawn to a female, but only one will take hold securely enough to remain with her once they've glided to the ground. Upon landing, the young male crawls beneath the female and the act can begin. The pair may be so tightly locked together that the male has some difficulty escaping. An unfortunate few males manage to get away only by leaving their sex organs behind. Females have only one sexual encounter, but males may mate 7 or 8 times. For the female, a single minute or so of mating allows her to produce all the fertile eggs she will ever lay. She stores sperm in her body and dispenses them to fertilize her eggs as they are laid. Thus supplied, she needs just one more ingredient, blood, to nourish the eggs.

Though blood is vital to reproduction for most mosquitoes, a few kinds of mosquitoes are autogenous, meaning they can lay fertile eggs without blood. An even more surprising fact is that some males have been seen sucking human blood, although they have no use for it.

Bloodsucking female mosquitoes of various species search for meals at characteristic times of the day. The *Aedes aegypti* prefers to feed at dusk. The common house mosquito comes out to feed after dark. Other types are most active at midday.

The eyes of mosquitoes are incredible. At night, they can locate distant sources of light such as the moon or even stars and fly straight by keeping those lights on a constant bearing. The female mosquito fixates on people by her powerful eyes, which allow her to alight so softly that you may not notice her at all. Before actually feeding, she'll probe your skin as many as 20 times, like a blind phlebotomist who can taste blood with the end of his needle. The probing will be accomplished by a proboscis, which consists of 2 tubes surrounded by 2 pairs of cutting stylets that stick together in a tight bundle. Together they are called the fascicle. The fascicle lies in a gutter-shaped sheath called the labium or lip. When the mosquito lands on the cutaneous oasis from which she'll drink, she applies this apparatus against the skin. With a bit of pressure the labium bends back toward her body as the cutting edges—stylets—of her fascicle break the surface of the skin. Once below the surface, the fascicle bends at a sharp angle to begin exploring for blood. With each insertion, the mosquito attempts to nick a venule or arteriole. If she doesn't succeed with the first try, she will withdraw the fascicle slightly while leaving it in the original hole and angle it in a different direction. With each insertion, defined salivary tubes in her fascicle deliver an anticoagulant. Once a mosquito tastes blood, she holds very still, and her sucking pulls the wall of the blood venule over her mouthparts. In 90 seconds she will suck a few micrograms—2 or 3 times her weight—up into her stomach. She stops her feeding when stretch receptors in her stomach signal her nervous system that she is full.

After she finishes her heavy meal, a female mosquito must struggle to become airborne. In flight, she is a slow target for a swatting hand. But if she escapes, she generally will land on the nearest vertical surface, where she will rest and perform one of the most notable feats of digestion in nature. For 45 minutes or more, the mosquito will allow her digestive system to draw water out of the precious blood she has stolen and excrete it as urine. If you happen across a mosquito in the middle of this process, you will likely see the pinkish droplets coming out of her anus. Only after her meal has been processed into lighter solids that

are stored for the future will the female mosquito fly away with the stuff to make her offspring. What she leaves behind in the saliva that was pumped into your skin might irritate you or, if your luck is very bad, kill you.

MUSTANG RANCH, LEGALIZED PROSTITUTION, AND DR. ALEXA ALBERT

Dr. Alexa Albert is now a resident in pediatrics at the University of Washington in Seattle. As an undergraduate in 1989 at Brown University, she became fascinated by public health issues. The AIDS crisis had exploded, and prostitution was the focus of national attention as public health officials hotly contested the role of sex workers in the transmission of HIV. She learned that certain areas of Nevada licensed brothel prostitution with ordinances established to safeguard the health and safety of the public. These controls were said to greatly reduce the dangers typically associated with street prostitution—violent crime, drug use, and disease transmission. Latex condoms were required for all brothel sexual activity, and women were tested regularly for sexually transmitted diseases, including HIV. Since HIV testing began in 1986, no brothel worker had tested positive, she was told, and the incidence of other sexually transmitted diseases was negligible. After about 3 years of trying, she received permission from the executive director of the Nevada Brothel Association to conduct a research study inside Nevada's legal brothels, the only licensed houses of prostitution in America. In 1992, George Flint, the executive director, invited her to Nevada and made arrangements for her to spend 24 hours a day in Mustang Ranch, which she did initially for 4 weeks (2).

When she entered the Mustang Ranch brothel, neither she nor the women of the brothel could have predicted the result. Having worked with homeless prostitutes at a drop-in center in New York City's Time Square, Albert, who was born in 1968, was intimate with the human devastation caused by the sex trade and curious to see if Nevada's brothels offered a less harmful model for a business that will always be with us. Mustang Ranch had never before let such an outsider in. She found Nevada's legal brothels to be far less repugnant than she had expected. They appeared to be clean, legitimate workplaces, and the women were not shackled hostages but self-aware professionals there of their own free will. She wanted to learn how Nevada had come to legalize brothel prostitution in the first place. How did one become a licensed prostitute? What drove individuals to abandon mainstream society to work in houses of prostitution? How did the women feel about the work they did and about each other? Who were their customers? Did their relationships with these men ever become more than professional? How did locals feel about the legal brothels and their prostitutes? How long did women do this work? Was there ever an end?

After 4 weeks in the Mustang Brothel trying to answer these questions, she returned to school. Two years later, during the summer between her first and second years of medical school, she returned and found that many of the same prostitutes were still there. They greeted her effusively. The prostitutes apparently enjoyed talking to her because they wanted to make it known that they are not bad people. Conversations with the prostitutes convinced Dr. Alexa Albert that she needed to write a book, and consequently she made repeated visits to Mustang Ranch and

Nevada's other brothels over the next 4 years, spending a total of nearly 7 months there.

The book *Brothel* is compelling. Dr. Albert tells the stories of many of these women: how they came to be at Mustang Ranch, their surprisingly deep sense of craft and vocation, and how they reconciled their profession with the attitudes of their families and the outside world. Consequently, what began as a public health project evolved into something more personal and ambitious—a study of the brothel and its women. Such a book has not appeared before. My hat is off to Dr. Albert for providing such an insight into this profession.

PREVENTING DIABETES MELLITUS AMONG PERSONS WITH IMPAIRED GLUCOSE TOLERANCE

The incidence of type 2 diabetes is increasing worldwide. There is strong evidence that obesity and physical inactivity are the main nongenetic determinants of the disease. Impaired glucose tolerance is an intermediate category between normal glucose tolerance and overt diabetes, and it can be identified by an oral glucose-tolerance test. Subjects with impaired glucose tolerance have an increased risk of diabetes and therefore form an important target group for interventions aimed at preventing diabetes.

The Finnish Diabetes Prevention Study was conducted to determine the feasibility and effect of a lifestyle modification program designed to prevent or delay the onset of type 2 diabetes in subjects with impaired glucose tolerance (3). A group of 522 overweight men and women with impaired glucose tolerance—mean age, 55 years; mean body mass index, 31—were divided into an intervention group and a control group. Each subject in the intervention group received individualized counseling aimed at reducing weight, total intake of fat, and intake of saturated fat and increasing fiber intake and physical activity. An oral glucose-tolerance test was performed annually. The mean duration of follow-up was 3.2 years. The mean weight loss between baseline and the end of 1 year was 4.2 kg in the intervention group and 0.8 kg in the control group. The cumulative incidence of diabetes after 4 years was 11% in the intervention group and 23% in the control group. During the trial, the risk of diabetes was reduced by 58% in the intervention group. The reduction in the incidence of diabetes was directly associated with changes in lifestyle. Thus, type 2 diabetes can be prevented in at-risk individuals when they lose weight and exercise regularly. The study cost \$174 million!

NEW GUIDELINES FOR DETECTING AND TREATING DIABETES MELLITUS

A conference of international diabetes experts, convened by the American College of Endocrinology and the American Association of Clinical Endocrinologists on August 21, 2001, recommended more aggressive guidelines to head off the disease's devastating complications (4). First, they recommended that screening people at high risk for diabetes should begin at age 30 rather than at age 45, as current guidelines suggest. There was a 71% increase in diabetes among people in their 30s during the 1990s. The second guideline was to further reduce blood sugar levels. The experts indicated that the ideal score for hemoglobin A_{1c}, a test that measures blood sugar control, should be 6.5% in

people with diabetes, down from the current 8%. A score of 6% is normal for people without diabetes. Third, they recommended that fasting blood glucose should be ≤ 110 mg/dL before eating and ≤ 140 mg/dL 2 hours after a meal. Fourth, they added new risk factors for diabetes, including delivering a baby weighing >9 lb and having polycystic ovarian syndrome. Other risk factors for diabetes, of course, include being overweight, sedentary, or a member of a certain ethnic minority group or having high blood pressure, high serum lipid levels, impaired glucose tolerance, a history of gestational diabetes, or a family history of diabetes.

LEPROSY CONTINUES

Although leprosy is a communicable disease that elicits powerful feelings of dread and stigmatizes sufferers, it is simple and inexpensive to treat, and, when arrested early, recovery is usually complete (5). It costs approximately \$3 to treat a mild case of leprosy with 2 antibiotics taken over 6 months and about \$20 to cure a more severe case with 3 antibiotics taken over 12 months. Nevertheless, leprosy continues to afflict several thousands worldwide as shown by the *Table*.

Many people refer to leprosy as Hansen's disease after the Norwegian physician Gerard Hansen, who discovered the bacterium that causes it. The disease spreads slowly, usually only after years of close contact. Left untreated, it attacks tissue and damages nerves, leaving skin scarred, muscles atrophied, and limbs deformed. Many leprosy patients end up with peg legs and clawed hands and historically, of course, have been treated as outcasts. They cease to be contagious after the first dose of medicine, but their scars and disfigurement are lasting. The World Health Organization provides medicines to treat leprosy free of charge, so the obstacle to its elimination is not money. The problem with leprosy is finding the victims and then getting them to take the drugs.

Table. Prevalence of leprosy in the top 10 endemic countries in 2000*

Country	Prevalence per 10,000	Registered cases
Myanmar	5.9	28,404
Nepal	5.7	13,572
India	5.0	495,073
Madagascar	4.7	7,865
Brazil†	4.3	78,068
Mozambique	3.9	7,403
Guinea	2.0	1,559
Tanzania	1.4	4,701
Ethiopia†	1.3	7,764
Indonesia	1.1	23,156

*Adapted from reference 5.

†1999 information.

CANCER DEATHS DECLINE

A report in the *Journal of the National Cancer Institute* shows that overall rates of new cases and deaths from cancer declined 1.1% each year in the USA from 1992 to 1998 (6). Death rates declined for lung and prostate cancer in men, breast cancer in women, and colorectal cancer in both men and women. Rates of new cases declined for lung cancer and prostate cancer in men.

The decline in lung cancer is attributed to reduced smoking rates since the 1960s. Breast cancer deaths in women declined 2.4% each year from 1992 to 1998 because of improvements in early screening and treatments, but new cases rose 1.2% per year for the same period. The trend might be a result of improved detection or the use of postmenopausal hormone therapy. Four cancers—lung, prostate gland, breast, and colorectal—account for more cases and deaths than all other cancers combined. Cancer cases were as follows: lung, 13%; prostate gland, 15%; breast, 16%; colorectal, 12%; and all others, 44%. Cancer deaths were as follows: lung, 29%; prostate gland, 6%; breast, 8%; colorectal, 10%; and all others, 47%.

USA 2000

On August 6, 2001, the Census Bureau released data taken in the year 2000 from 700,000 households. Some facts garnered for the year 2000 (7, 8): median household income, \$41,343; portion of Americans with college degrees, 25.1%; number of families living in poverty, 6.8 million or 9.6% of the population; mean commute time to work, 24.3 minutes with 15% <10 minutes and 7% >60 minutes; number of households without a telephone, 3.2 million; number of solar-heated households, 42,194; mean value of owner-occupied single-family housing units as estimated by their owners, \$120,162; median monthly mortgage costs, \$1,307; median monthly rent, \$612; portion of residents who speak a language other than English at home, 17.6%; number of immigrants arriving in the USA from 1991 to 2000, 13.3 million (or 44% of the 30.5 million living immigrants); median sizes of houses in the USA in 2000, 5.8 rooms; percentage of homes with 8 or more rooms (excluding bathrooms), 14.6% (an 8-room house typically contains 4 bedrooms, and in 2000 there were 17 million of them); percentage of households having ≥3 vehicles, 18.3%; percentage of households with no cars, 9.3% (10 million); percentage of workers driving to work alone, 76%; percentage of workers using public transportation to get to work, 5%; percentage using carpools to get to work, 11%; percentage working at home, 3%.

MEGACITIES AND THEIR CONSEQUENCES

Within the next 5 years, for the first time, more people will live in cities than in rural areas, and most population growth will occur in cities in Asia, Africa, and South America (9). Fifty years ago, only 18% of the population of developing countries lived in cities; in 2000, 40% lived in cities, and by 2030, an estimated 56% of people in the developing world will be urban dwellers. The number of megacities (populations with 10 to 20 million) is increasing. In 1975, there were only 5 metropolitan areas worldwide with populations >10 million—Tokyo, New York City, Shanghai, Mexico City, and Sao Paulo—and only 3 of them were in developing countries. By 2015, the number will increase >4-fold, and all but 4 of them will be in developing countries. These 23 such cities include Bombay, Lagos, Buenos Aires, Karachi, and Bangkok.

These megacities will have profound implications for the long-term health and living standards of much of our civilization. Already, over 600 million people in cities of developing countries cannot meet their basic needs for shelter, water, food, health, and education, according to a recent study by The Johns

Hopkins Bloomberg School of Public Health and Hygiene. Moreover, cities in developed and developing countries have a huge impact on the natural environment. Cities generate close to 80% of all carbon dioxide, a major cause of global warming. Throughout the world, atmospheric pollution afflicts more than 1.1 billion people, mostly in cities. An additional 2.5 billion are at risk from high levels of indoor air pollution. Water scarcity and water pollution pose serious urban problems. Dirty water is the largest environmental killer, claiming between 5 million and 12 million lives a year, and most urban populations in developing countries do not have access to proper sanitation facilities and lack a regular supply of potable water. Although many researchers have paid considerable attention to the dramatic increase of the overall world population (now 6.1 billion people), this study shows that it's not just how many people there are but where they're living that is important.

PREGNANCY RATES FALL

From 1991 to 1997, pregnancy rates dropped from 113 to 104 per 1000 women and, among teenagers aged 15 to 19, from 116 to 94 per 1000 girls. Live births dropped from 70 to 65 per 1000 women and, among teens, from 62 to 52. Abortions dropped from 26 to 22 per 1000 women and, among teens, from 38 to 28 (10). Approximately 10% of US women became pregnant in 1997—the lowest percentage in 20 years—and these pregnancies resulted in 3.88 million live births, 1.33 million induced abortions, and 0.98 million miscarriages. Among the 6.2 million total pregnancies in 1997, 21% ended in abortion, a record low. The record low was driven largely by the drop in teenage pregnancy, obviously a good trend.

FATAL FOOTBALL HEAT STROKE

Minnesota Vikings' offensive tackle Korey Stringer, 27, collapsed on Tuesday, July 31, 2001, and died 15 hours later (11–13). Korey Stringer weighed 335 lb and was 76 inches tall. He vomited several times during practice on Monday and Tuesday morning. After the morning practice Tuesday, he went to an air-conditioned shelter, where he developed weakness and rapid breathing. He was rushed to the hospital but developed multiple system failure and rapidly lost consciousness. His temperature was 108°F when he arrived at the hospital. He is survived by his wife and 3-year-old son.

According to the University of North Carolina's National Center for Catastrophic Sports Injury Research, 19 deaths from heat stroke have been reported among high school and college football players since 1995. Five of those 19 deaths occurred in 1995 when the summer was very hot. The heat index was 103°F at Korey's practice site on Tuesday. Until then, no National Football League (NFL) players had died of heat stroke during the league's 82-year history. However, even though water is freely available on all NFL practice fields, one former NFL player, Mike Golic, said, "Show me a football player who takes himself out of practice, and I'll show you a player who is probably not going to stay long in the league."

Football is probably the sport most liable to produce heat stroke. The practices begin in the summer when, of course, it is hottest, and these players are the largest of all athletes except for some wrestlers. The larger the person, the easier for heat

stroke to occur because the heavier person has greater difficulty dissipating heat. Furthermore, the football uniform prevents heat dissipation. A great deal of heat is lost through the head, which in football is covered by a helmet. Even though baseball players and others play in the summer, they are usually smaller and the equipment covering their bodies is less extensive than that of football players.

Football is a violent sport. There's contact on every play with varying degrees of pain, bruising, or breaks with every hit. Players run the risk of injury every time they step on the field. Each practice, play, game, and season increases that risk. Rick Gosselin described Hall of Fame blocker Roosevelt Brown as hobbling around the New York Giants' training camp these days with a cane, and American Football League legend E. J. Holub is getting around on crutches. Mark Schlereth played 12 NFL seasons and underwent 15 knee operations. Quarterbacks Troy Aikman and Steve Young were forced from the game by concussions. Johnny Unitas can barely grasp a pen these days to sign autographs. An elbow injury damaged nerves in his right hand. Joe Namath has 2 artificial knees. Everyone in the NFL over the age of 40 knows someone in the business with an artificial hip or knee. An accumulation of hits breaks down any body.

EFFECT OF FAMILIAL HYPERCHOLESTEROLEMIA ON LIFE SPAN: THE STORY OF WALTER PODNEY

On Saturday and Sunday, July 28 and 29, 2001, I participated in a medical meeting in La Jolla, California. *The San Diego Union Tribune* on that Saturday carried the obituary of Walter Podney, a 62-year-old physicist, the founder and chief executive officer of SQM Technology, Inc., who died on July 25 while cycling to work (14). The newspaper column indicated that Mr. Podney was an avid exerciser and led a healthy lifestyle. His mother, father, and 3 brothers had died from ages 56 to 63. On his mother's side, 2 uncles had also died of a sudden massive heart attack. After his father's death, when Walter was 36 years old, Walter began a lifestyle of heavy exercise and good nutrition. His company was located 14 miles from his home, and every day he rode his lightweight titanium bicycle the 14 miles over 2 relatively large mountains to work, and it took him just about an hour (*Figure*). At lunch time, he usually swam for 40 minutes. He had smoked for 2 years when he was young but gave it up. He did not consume alcohol. His diet consisted essentially of only vegetables and fruits, except for an occasional fish. He made his own bread, which was healthy. He added no salt to his food, and his wife did not cook with salt. He also cut all animal fat from his diet.

I called his wife, Anne, who lives in La Jolla, and she confirmed the accuracy of the newspaper piece and provided several additional facts about her husband's life. He was 69 inches tall and weighed approximately 150 pounds. His blood pressure was normal. He was on no medicines. The only time he was seen by a physician was when he had a bicycle accident, but it is unlikely that his blood cholesterol was tested then. His wife mentioned that there was nothing unusual about his health the morning he left for work or the preceding day or weeks. He died on a flat area while stopped at a stop sign. He simply fell off his bike. A fireman who was in an automobile close by saw him fall and took him to a nearby hospital, where he was pronounced dead. An autopsy disclosed severe coronary atherosclerotic disease.



Figure. Walter Podney with latest bicycle.

Certainly one could not live a healthier cardiovascular lifestyle than did Walter Podney. It seems clear that he had familial hypercholesterolemia, an occurrence in 1 of 500 persons, and probably would have died at a younger age had he not been an avid exerciser and a vegetarian/fruit eater. The cardiovascular lesson of Mr. Podney is that familial hypercholesterolemia requires lipid-lowering drug therapy, and today that means statin therapy, irrespective of the cholesterol level.

NEW THEORY ABOUT WOLFGANG AMADEUS MOZART'S DEATH

The latest theory about the composer's untimely death on December 5, 1791 (the same year that Benjamin Franklin died) at age 35 in Vienna suggests that the culprit was trichinosis (15). Dr. Jan V. Hirschmann of Puget Sound Veterans Affairs Medical Center in Seattle offers as evidence an innocuous letter Mozart wrote to his wife 44 days before his illness began, showing that Mozart was eating many pork cutlets. The incubation period for trichinosis is up to 50 days. Mozart died 15 days after he became ill. Dr. Hirschmann, an infectious disease specialist, said Mozart's symptoms matched those of an unspecified epidemic going around Vienna at the time. Trichinosis wasn't identified until the 1800s when there were several deadly outbreaks in Europe. Pneumonia and heart problems are recognized complications of trichinosis, and they were said to occur in Mozart's final illness. Unfortunately, Mozart's grave was dug up about 7 years after his death so it could be reused, and his remains were dispersed. Thus, we will never know for sure.

FULLY SELF-CONTAINED ARTIFICIAL HEART

A grapefruit-sized 2-lb titanium and plastic pump made by Abiomed Inc. of Danvers, Massachusetts, an entirely self-contained device with an internal battery that regulates the pumping speed, was inserted into Robert Tools, 59, at Jewish Hospital in Louisville, Kentucky, on July 2, 2001 (16-18). Thirty days later, the patient was walking up and down the hospital corridor without assistance, and his cognitive function appeared normal. By 30 days after implantation, the artificial heart had beaten approximately 6 million times and apparently was working flawlessly. If Mr. Tools is sitting down, the unit can draw power from

a wall socket. If he's walking, he carries a 2-lb battery pack. He is still trying to get used to not having a heartbeat. Hearing the "whir" of his artificial heart makes him know that he is alive. It is hoped that his frail and weak body will improve so that he can have a heart transplant.

LANCE DOES IT AGAIN

On July 29, 2001, Lance Armstrong won the Tour de France the third year in a row (19–25). This victory puts him in the class of athletes with Michael Jordan and Tiger Woods. Three others have won the Tour 3 times, including American Greg LeMond (1986, 1989, 1990); 4 men have won it 5 times, and 11 racers have won it 2 times since it started in 1903. The most stage victories is 34 by Eddy Merckx, who won the Tour 5 times; second is Bernard Hinault with 28, and he also won the Tour 5 times. Armstrong has won 11 Tour stages, and Greg LeMond has won 5.

Lance Armstrong was born in Dallas, raised in Plano, and now lives in both Austin, Texas, and Nice, France. It is hard to believe that nearly 5 years ago Armstrong was lying on his back in a hospital in Austin, Texas, with testicular cancer that had spread to his lungs and brain. He underwent operations to excise the metastases in both locations. He returned to the cycle 5 months later, and it may turn out that the cancer was the best thing that ever happened to him. At the beginning of 1996, he was the leading professional cyclist in the USA and had participated in 4 Tours de France before that: he failed to finish 3 of them and placed 36th in the fourth. Before his cancer, Armstrong's weight was 170 lb; during the past 3 years when he has won 3 Tours de France, it has been 150 lb. According to Armstrong's long-term coach, the 20 lb lost in his cancer recovery has made him a more efficient rider. At his precancer weight, he would need 3147 calories to climb the 30 hardest miles on the Tour de France; at his current weight, he would need only 2610 calories, and the excess calories would be stored in his body, giving him more fuel to stave off exhaustion.

Some statistics: Armstrong's maximum oxygen consumption is 84. (A value of 50 to 60 is considered very good.) His resting heart rate is usually 33 beats per minute, and his maximum is 201 beats per minute. He usually maintains about a 190 heart rate during hour-long time trials. His lactate threshold heart rate, the maximum before the muscles start to make lactic acid, is 178. Armstrong gets most of his power from his legs. Through aerobic training, he's been able to raise his tolerance for lactic acid buildup, the painful waste chemical that causes muscles to burn. Armstrong can go longer and harder before his muscles produce this chemical. Armstrong's trademark pedaling style pushes the pedals faster than anyone else in cycling. In the mountains he spins at 85 revolutions per minute, while in a time trial he increases it to 100 revolutions per minute. Unlike most cyclists, Armstrong regularly lifts weights. Stronger arms and shoulders help him endure the punishing miles, and strong abdominal muscles support and stabilize his body over the bike. He stretches up to 1 hour a day. During time trials Armstrong holds an aerodynamic tuck to slice through the wind. He conducts wind tunnel tests at Texas A&M at least once a year to perfect his position. Saving a second a kilometer quickly adds up to more than a minute in the Tour's long 21 days. Armstrong rides 3 bikes. His regular road bike is durable and made for day-in, day-out racing.

During mountain stages he races on a bike weighing 2 lb less. He rides a space-age time-trial bike in the shorter time trials.

The 3-week Tour covers 2150 miles of wet Belgium cobbles, steep alpine switchback turns, and thigh-melting highways. On the finish line he was greeted by his wife, Kirstin, pregnant with twins, and 21-month-old son, Luke. Pretty good for a fellow born to a single mom 29 years ago. And he has never failed a drug test.

DOUBLE AMPUTEE ED HOMMER, AN AMERICAN AIRLINES PILOT, TO TACKLE MT. EVEREST

As a young man, Ed Hommer ran marathons, climbed mountains, skied the deep powder of the Alaskan back county, and flew air taxis above those mountain peaks, giving tourists an aerial view of his weekend playground (26). In 1971 at age 26, a freak accident landed him on the frigid flanks of Mt. McKinley, and in the 5 days it took rescuers to reach him, his feet froze. Both feet were amputated just above the ankles. To complicate matters, Hommer was newly married and was a brand-new father. After about a year or so recuperating from the operation and depression, Hommer cut through both red tape and preconceptions to reach the cockpit of an American Airlines jet, becoming the first double amputee to fly for a major airline. In 1990, he started skiing again and progressed to rock climbing. In 1997, a better pair of prosthetics allowed him to return to the ice, and on June 3, 1999, he became the first double amputee to summit McKinley, the highest peak in North America. He is now going for Mt. Everest, the highest peak in the world.

Hommer trains by bicycling as much as 200 miles a week on the roads around his rural Minnesota home, and when traveling he carries a collapsible 5-gallon water jug. When staying in hotels he fills the water jug, stuffs it into his backpack, and hits the stairwell, climbing about 240 stories on an overnight stay.

He has also founded High Exposure, a nonprofit foundation that helps young, active amputees purchase prosthetics that will allow them to pursue their athletic dreams. High Exposure aims to take up where most insurance companies leave off. Insurance covers only the most basic prosthetics. Hommer's book *The Hill* will appear in October 2001, the proceeds of which will go directly to his foundation. Good luck, Ed, on the big mountain.

THE RED-LIGHT RUNNING CRISIS

House majority leader Dick Armey recently wrote a piece entitled "Let's increase time for yellow lights" (27). Armey is against red-light cameras, which photograph the license plates of red-light violators. While they are very profitable to the 50 cities that have them, they may diminish safety. According to Representative Armey, lengthening yellow signal times increases safety. Increasing yellow-light time by 1 or 2 seconds has relatively little impact on traffic flow but demonstrated impact on safety. Armey recommends eliminating the red-light cameras and lengthening the yellow-light times.

MCDONALD'S IN CHINA

The first McDonald's restaurant in China opened in Beijing 9 years ago; today, the country has 350 restaurants (28). Shanghai, a city of 13 million, has 41 McDonald's restaurants. I feel for the cows. But maybe it's not all bad. Newspaper columnist Thomas Friedman observed in his best-selling book, *The Lexus*

and the Olive Tree, that countries having McDonald's don't war with each other. Maybe globalization has hidden benefits.

TROPICAL STORM ALLISON AND THE TEXAS MEDICAL CENTER

The Houston flooding killed at least 22 people and caused \$2 billion in property damage (29). At Baylor College of Medicine and the University of Texas (UT) Health Science Center at Houston, the flood waters destroyed researchers' tissue samples, long-term cell cultures, genetically engineered lab animals, and, in one instance, data that took hundreds of people 25 years to accumulate. Allison came ashore in Houston on June 5, packing minimal winds but lots of rain. It stayed in the area for 5 days, causing scattered flooding the first few days and then unleashing its full fury the night of June 8. The Texas Medical Center, home to 42 institutions, suffered a knockout blow as 8.5 inches of rain fell from midnight to 2:00 AM on June 9. At that rate, the 24-hour total would have been 102 inches. Flood defenses were overwhelmed, and power was knocked out. Basements of several institutions, including Baylor and the UT Health Science Center, were flooded, and that's where much of the key data was kept. Even the freezers that weren't flooded lost power.

Confronted with a catastrophe, researchers, other faculty, and graduate students rushed from their homes to the Texas Medical Center, but it was too late. As flood waters were pumped out, Baylor researchers found >30,000 drowned caged rats, mice, and other animals. At the UT Health Science Center, about 5000 monkeys, dogs, and other animals drowned, and other data were lost. The damage has taken such a toll on morale that Baylor's psychiatric staff has offered counseling to those affected. UT Health Science Center's preliminary estimate of damage was at \$72 million. Baylor's estimates were incomplete but were expected to be many millions. The nondollar costs on the researchers' careers may be even more devastating. One of the most serious blows at Baylor was to breast cancer research. In the past 25 years, about 60,000 breast tumor samples were collected and kept in 30 special freezers in a basement lab.

There was some good news. Baylor's research into the human genetic code was untouched by the floods. More than 120,000 other lab animals escaped flooding in a new facility at Baylor, which is a major supplier of lab animals to institutions around the world. Tissue samples similar to those in the breast cancer collection are kept at other institutions around the country, and some of the Houston work may be reconstructed by using them.

Teamwork at the medical center warmed hearts. More than 25 tons of dry ice was trucked in, and medical students, housestaff, faculty, and volunteers carried it up hot, dark stairways and down dank corridors to try to minimize losses. The Texas Medical Center is now rethinking how to prevent such a catastrophe in the future.

MEDICAL ERROR RATE RECONSIDERED

Two years ago, a report by the Institute of Medicine said that medical mistakes in hospitals, such as prescription errors or misused equipment, killed as many as 98,000 hospitalized Americans a year. A study in the June 25, 2001, *Journal of the American Medical Association* suggested that the previous number was greatly overestimated and that the real total perhaps was between 5000 and 15,000 hospitalized patients per year in the USA (30).

OSLER ESSAYS REPUBLISHED

Although Sir William Osler (1849–1919) died over 80 years ago, his influence on the profession continues. His *Principals and Practice of Medicine*, the first edition of which appeared in 1892, became the standard for the English-speaking world and through translations far beyond. Today, it is his nonscientific books and articles that continue to be read and to inspire. Hinohara and Niki have gathered 20 of Osler's essays (31). The authors provide clarifications for the numerous literary illusions and metaphors that may now be unclear to a public less at home with the classics. This is a splendid book to own.

THE END OF CHEAP OIL AND ALASKA'S ARCTIC NATIONAL WILDLIFE REFUGE

Most employees and physicians working at Baylor University Medical Center get there via a motorized vehicle whose source of energy, of course, is oil. In recent months, the price of a gallon of oil in Dallas briefly reached \$2, and there have been many complaints about its high cost. In April 1998 the cost of a barrel (44 gallons) of oil was just over \$15. In contrast, a barrel of Coca-Cola was \$79; a barrel of milk, \$126; and a barrel of beer (Budweiser), \$343. A barrel of oil today is just over \$25, and costs of Coke, beer, milk, and bottled water also have risen (32).

The March 1998 issue of *Scientific American* contained an article by Dr. Colin J. Campbell and Jean H. Laherrère (www.hubbartpeak.com/sciam983.htm) (33). Their point was that cheap oil is at an end. The authors pointed out that we were rapidly approaching the point at which half of all oil reserves had been pumped out of the ground. Most of the recent increases in oil reserves were from relatively small fields, and global oil production would soon turn down as US oil production had done in the late 1960s. The authors predicted that oil production would increasingly rely on the Middle Eastern nations, particularly the 5 near the Persian Gulf (Iran, Iraq, Kuwait, Saudi Arabia, and the United Arab Emirates). Dr. Campbell and Mr. Laherrère expected that the Middle East's share of production would pass 30% by 2000 and probably hit 50% by 2010. The 30% level was that which set the stage for the price shocks of 1993 and 1999! The world is not running out of oil, but we are soon approaching the end of the abundant and cheap oil on which all industrial nations depend.

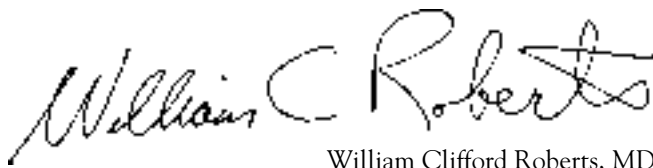
The next car I buy will not be one that gets 20 miles a gallon. I hope it will get twice that much. Americans constitute 6% of the world's population and use 25% of the world's energy. No wonder the USA is not the most popular nation on the planet. We all need to do our share. When we have to pay \$50 for a barrel of oil, there will not be many smiles on the faces of Americans, and that might not be too long from now. Those 5 nations bordering the Persian Gulf are not our good friends.

One of my sons is adamantly against drilling for oil on Alaska's Arctic National Wildlife Refuge. I learned that his office was 30 miles from his home, and I asked how he was going to get the oil to move his 4-wheeled motorized vehicle those 60 miles each day. None of us seem to want oil rigs in our backyard, but we all want our car to move freely when we want it to. The Oklahoma State Capitol has oil rigs on its grounds and none, as Frank Keating has described, have blown up, leaked, or polluted the soil, water, or air (34). Instead, they have provided relatively

cheap energy for Americans for 80 years. Indeed, there are >100,000 oil and gas wells in Oklahoma, and the people there seem to live fairly well adjacent to them. The massive oil field in Prudhoe Bay has been in production for >20 years, and there is no evidence of devastation of that area. There's more oil on the Anchorage International Airport landing strip than around the oil fields. There are far more oil spills apparently from transportation of refined petroleum products by truck or pipeline than from drilling. The first quarter of 2001 saw 288 spills of refined petroleum products, but only 8 involved crude oil at or near the wellhead. One of those crude oil spills amounted to 3 gallons. One of the great oil booms was in Oklahoma City in 1930 when drilling and production techniques were far less sophisticated than they are today. At one point, 1658 rigs were active within the city limits of Oklahoma City. One gusher, the Wild Mary Sudik, spewed crude oil for days. People happily live there now, and possums and raccoons roam the nearby fields, just as birds nest on the oil deck on many of the oil derricks. In fact, drilling for oil and natural gas is remarkably safe and clean.

In some areas of the Arctic National Wildlife Refuge, oil is very close to the surface where it already presumably threatens the immediate environment. Early explorers reported finding surface "oil seeps and oil-stained sands." Nearby were healthy bears, wolves, and caribou. Drilling for oil in Alaska's Arctic National Wildlife Refuge would not affect wildlife there because the drilling and production area would occupy as much land as a good-sized airport in an area estimated to be the size of South Carolina. Alaska has the nation's strictest environment regulations, so any oil spills there could be cleaned up readily. In 2000, 40% less oil was produced in the USA than in 1970. In the 1990s, domestic energy use rose by 17%, while domestic energy production increased 2%. We are already importing 10 million barrels of oil each day. Unless we develop our substantial domestic oil and gas reserves, including those in Alaska, we will continue to live at one end of a tenuous pipeline with actual or potential enemies controlling the spigot.

Unfortunately, the American appetite for energy will only become more of a problem in the future. The Energy Information Agency estimates that American demand for natural gas will increase by 62%, for electricity by 45%, and for oil by 33% over the next 20 years (35). Opening areas like Alaska's Arctic National Wildlife Refuge to oil drilling will provide only a slight and temporary change in this very long-term trend. Simply put, oil to support ever-expanding energy use is just not there. Nor will it be possible for the USA to continue to make up its shortfall with oil from abroad. International supplies of energy will be increasingly scarce as China and India, the 2 most populous nations, are likely to continue growing at rates of 5% to 10% a year, with energy consumption expected to increase at substantial rates. Increasing scarcity and rising prices could thus be a real long-term threat to US economic growth.



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